Document Type: EA-Administrative Record
Index Field: Environmental Assessment
Project Name: KIF Dewatering
Project Number: 2016-11

KINGSTON FOSSIL PLANT
BOTTOM ASH DEWATERING FACILITY
FINAL ENVIRONMENTAL ASSESSMENT
Roane County, Tennessee

Prepared by:
TENNESSEE VALLEY AUTHORITY
Chattanooga, Tennessee

March 2016

To request further information, contact:
Ashley R. Farless, PE, AICP
NEPA Compliance
Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402
Phone: 423-751-2361
Fax: 423-751-7011
E-mail: arfarless@tva.gov

Table of Contents

List of Appendices

List of Tables

List of Figures

Symbols, Acronyms, and Abbreviations

AADT	Average Annual Daily Traffic
APA	Ash Processing Area
APE	Area of Potential Effect
BMP	Best Management Practice
C&D	Construction and Demolition
CCP	Coal Combustion Products
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CRM	Clinch River Mile
dBA	A-weighted decibel
EA	Environmental Assessment
ELGs	Effluent Limitations Guidelines
EO	Executive Order
EPA	Environmental Protection Agency
GDA	Gypsum Disposal Area
gpm	gallons per minute
GW	gigawatt
KIF	Kingston Fossil Plant
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
mg/L	milligrams per liter
MGD	million gallons per day
NEPA	National Environmental Policy Act
NLEB	Northern long-eared bat
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSR	New Source Review
PCB	Polychlorinated Biphenyl
PM	Particulate Matter
PSD	Prevention of Significant Deterioration
SDCC	Submerged Drag Chain Conveyor
SWPPP	Storm Water Pollution Prevention Plan
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
tph	tons per hour
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method
USFWS	U.S. Fish and Wildlife Service

CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION

1.1 Introduction and Background

The Tennessee Valley Authority's (TVA) Kingston Fossil Plant (KIF) is located at the confluence of the Emory and Clinch Rivers and upstream of the confluence of the Clinch and Tennessee Rivers on Watts Bar Reservoir in Roane County, Tennessee. In December 2008, a coal ash spill occurred at KIF, releasing approximately 5.4 million cubic yards (cy) of coal ash. In July 2009, the Tennessee Valley Authority (TVA) Board of Directors passed a resolution to review and address systems, controls, and standards related to coal combustion residuals (CCRs) (i.e., fly ash, bottom ash, and gypsum) that result from the burning of coal to produce electricity. TVA has subsequently reviewed its practices for handling and storing CCRs at its generating facilities, including its coal-fired Kingston Fossil Plant (KIF). An outcome of that review was to consider the conversion of wet storage of CCR at KIF to dry storage (TVA 2010b).

On September 30, 2015, the U.S. Environmental Protection Agency (EPA) released its Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (ELGs). The final rule sets new or additional requirements for wastewater streams from fly ash and bottom ash operations.

On August 7, 2015, the Commissioner of the Tennessee Department of Environment and Conservation (TDEC) issued a Commissioners Order ("Commissioner's Order") to TVA in order to: 1. 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) and the Tennessee Valley Authority's (TVA) coal-fired plant in Tennessee; and

2. To establish the process whereby TDEC 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 (TDEC 2015).

KIF is a 1.7-gigawatt (GW) coal-burning power plant with nine generating units located in Harriman, Roane County, Tennessee, on the shore of Watts Bar Reservoir. TVA proposes to design and construct a new facility at KIF that would dewater the bottom ash/pyrite sluice stream to create a CCR product. The dry CCR product created by this process would be transported to either an approved on-site or off-site landfill. KIF is an important source of base load power to TVA in providing and maintaining safe, reliable, and cost-effective electricity for the people of the TVA Power Service Area. The proposed changes to dry storage at KIF would provide TVA with a secure storage system for the management of CCRs. These changes will also facilitate compliance with the CCR rule, the ELG rule and the Commissioner's Order.

The location of the proposed dewatering facility is shown on the map in Figure 1-1. The project boundary of the dewatering facility is shown on Figure 1-2. The scope of the proposed dewatering project includes the construction, commissioning, and startup support necessary to place a bottom ash dewatering facility for TVA's KIF into successful and reliable operation. The proposed design and proposed conceptual layout of the facility are shown in Figures 1-3 and 1-4, respectively.

The molten bottom ash from the bottom of the boilers is quenched or “sluiced” in the basement of the power plant. This sluiced waste stream would be routed in basalt-lined pipes to the separators of the new dewatering facility. Dewatered bottom ash would be stacked in a covered 3-day, 80-hour storage pile and would be trucked to an approved on-site or off-site landfill area. Following construction of the dewatering facility, a recirculation system would be built to return the sluice water to the power plant to be reused in the sluice stream or other uses on-site.

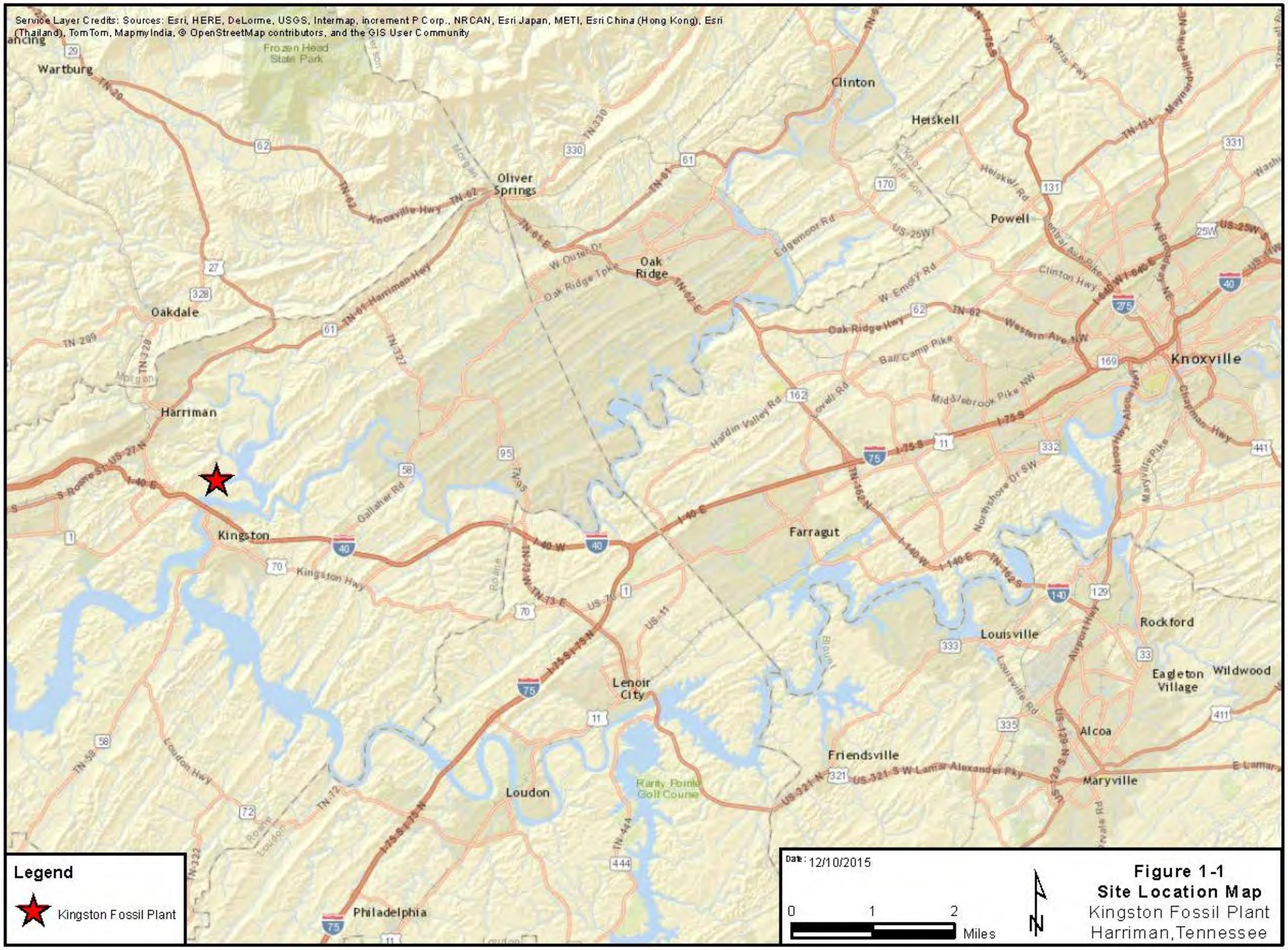


Figure 1-1. Map of Kingston Fossil Plant for the Proposed Action

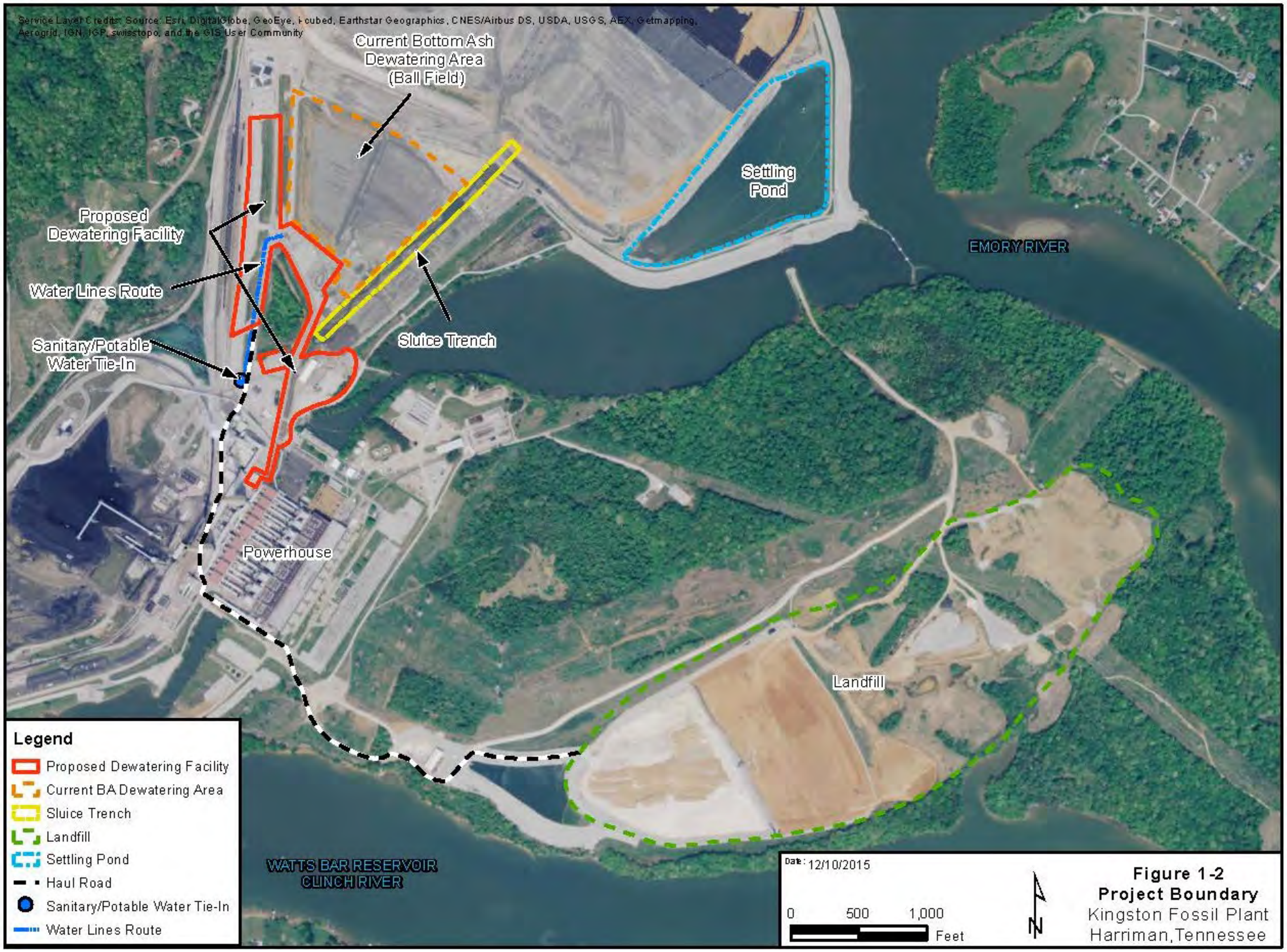


Figure 1-2. KIF Dewatering Project Boundary

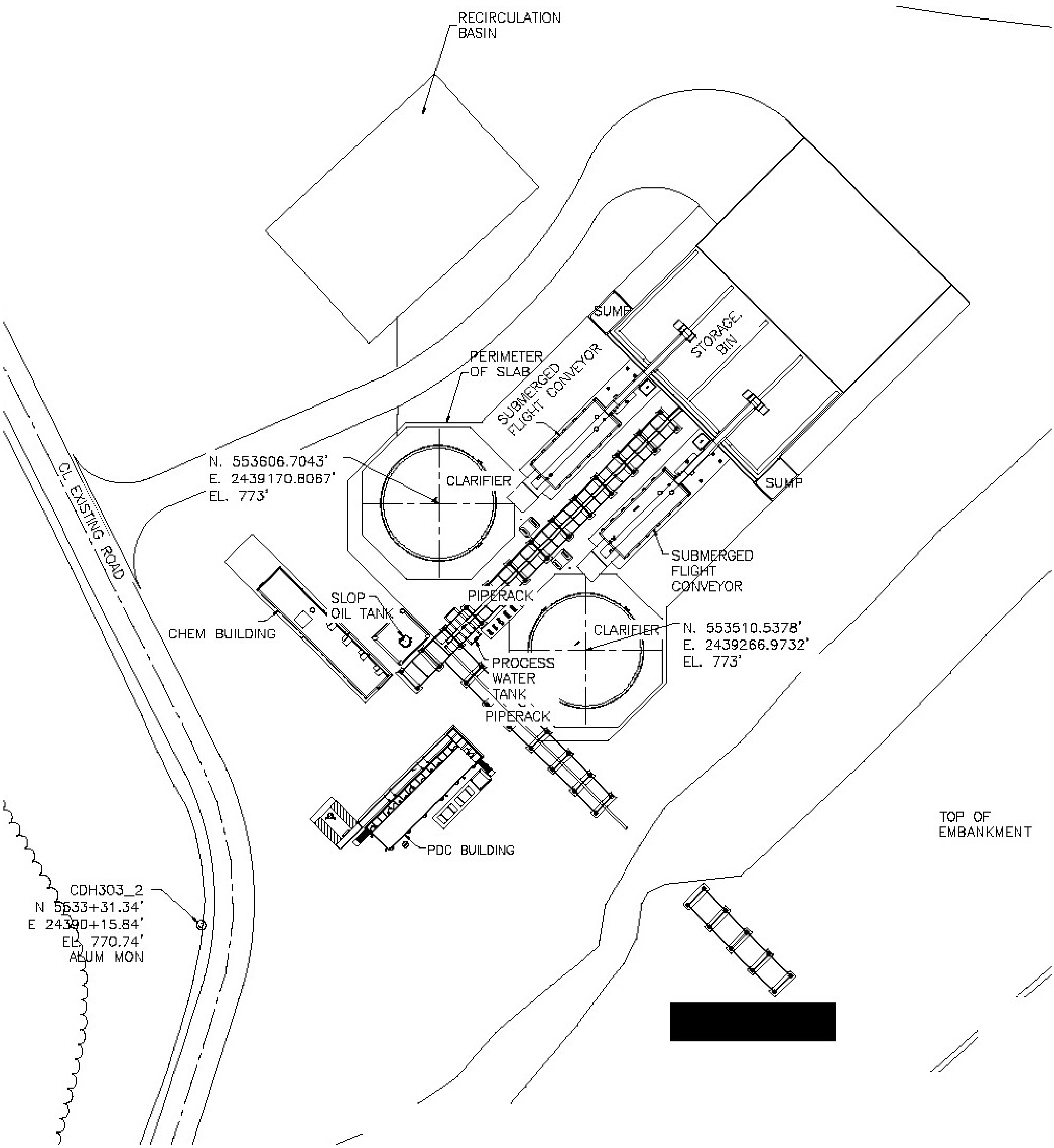


Figure 1-3. Proposed Dewatering Facility Civil Design Drawing

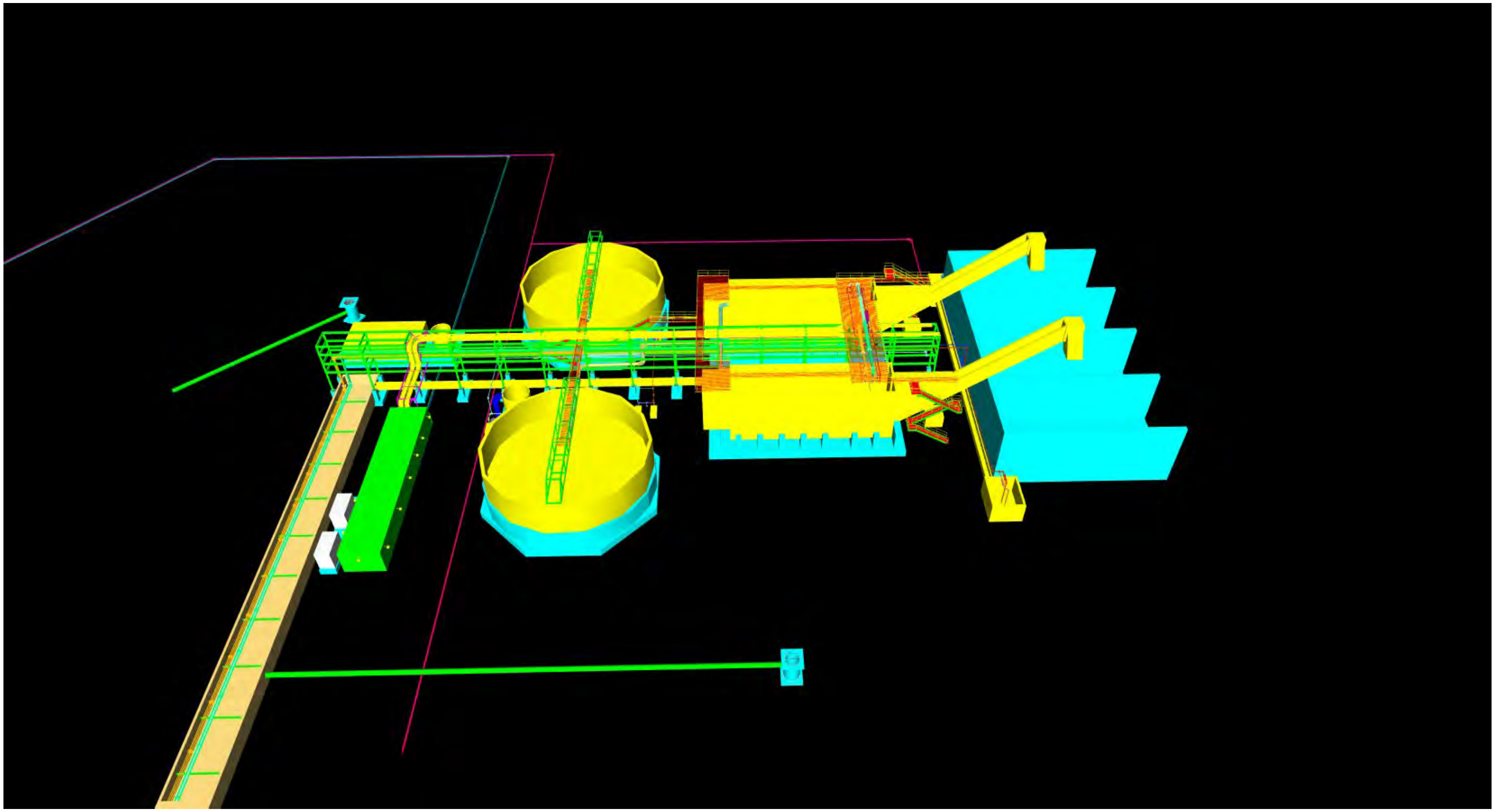


Figure 1-4. Proposed Dewatering Facility Conceptual Layout

The new dewatering facility would be designed to process a total slurry flow rate of 5,200 gallons per minute (gpm). This slurry flow would consist of 16.5 tons per hour (tph) of bottom ash (7.2 tph from Units 1 through 4 and 9.3 tph from Units 5 through 9). The slurry flow would also consist of 6.5 tph of pyrites on an intermittent basis (2.84 tph from Units 1 through 4 and 3.66 tph from Units 5 through 9). The dewatering facility would be designed to be "fully redundant" such that no single point failure could lead to an outage of the entire dewatering facility. The dewatering facility would be designed for 24/7 availability.

The CCR (bottom ash and pyrite mixture) would be pumped to conveyors in the new dewatering facility, dewatered, and conveyed to a covered concrete pad for removal. From the concrete pad, the dry CCR would be loaded onto trucks and hauled for disposal to an approved landfill.

1.2 Purpose and Need

In July 2009, the TVA Board of Directors passed a resolution for TVA to review its practices for storing CCRs at its generating facilities, including KIF, which resulted in a recommendation to convert the wet bottom ash management system at KIF to a dry storage system. To enable this wet-to-dry conversion, TVA proposes to install a dewatering facility for bottom ash at KIF. Further, the dewatering facility would foster TVA's compliance with present and future regulatory requirements related to CCR production and management, including the requirements of EPA's CCR rule and Effluent Limitations Guidelines (ELG) rule, and the requirements of the Commissioner's Order.

1.3 Decision to be Made

This environmental assessment (EA) is being prepared to inform TVA decision makers and the public about the environmental consequences of the proposed action. The decision TVA must make is whether or not to design a dewatering facility for the conversion of wet bottom ash generated at KIF to a dry CCR product.

1.4 Related Environmental Reviews and Consultation Requirements

Environmental documents and reviews have been prepared by TVA for actions related to the operation of KIF, the dewatering project at the Bull Run facility, and remediation of the Kingston coal ash spill. The contents of these documents help describe the KIF project area and the process for dewatering of CCRs, and are incorporated by reference.

- *Bull Run Fossil Plant Dewatering Project Environmental Assessment* (TVA 2013; TVA 2012a). The potential environmental effects of converting from wet bottom ash storage to a dry collection system by mechanically dewatering at the Bull Run Fossil Plant are evaluated and documented in this environmental review. The impacts of this process to similar resources at KIF were reviewed.
- *Installation of Flue Gas Desulfurization System at Kingston Fossil Plant, Final Environmental Assessment* (TVA 2006). This EA evaluated the impacts of the installation and operation of scrubbers for the removal of sulfur dioxide, and the associated on-site landfill for this system's waste disposal. The potential environmental impacts analyzed in the EA were air resources; solid waste and groundwater; transportation; natural areas and recreation; visual resources; surface water and wastewater; noise; wetlands; floodplains and flood risk; aquatic life; terrestrial ecology; endangered, threatened, and rare species; cultural resources; socioeconomics; environmental justice; and prime farmland.

- *Kingston Dry Fly Ash Conversion, Final Environmental Assessment* (TVA 2010b). This EA identified the alternatives for converting the fly ash handling system at KIF from a wet to dry system, evaluated the potential environmental impacts associated with those alternatives, described any conditions or commitments to mitigate environmental impacts, and described transportation of ash off-site.
- *Work Plan for Identification and Mitigation of Drop-Outs Coal Combustion Residuals Disposal Facility Peninsula Site – Phase II Area, Kingston Fossil Plant* (Geosyntec 2015). This plan, requested by TDEC, describes the modifications to the on-site landfill at KIF to receive bottom ash.
- *Installation of a Mechanical Gypsum Dewatering System at Kingston Fossil Plant Roane County, Tennessee, Final Environmental Assessment* (TVA 2010a). This EA describes the dewatering of gypsum at KIF and impacts to resources.

1.5 Scope of the Environmental Assessment

TVA has prepared this EA to comply with the National Environmental Policy Act (NEPA) and its implementing regulations. TVA considered the possible environmental effects of the proposed action and determined that potential effects to the environmental resources listed below were relevant to the decision to be made, and assessed the impacts on those resources in detail in this EA:

- Air quality
- Climate change
- Vegetation
- Wildlife
- Aquatic ecology
- Threatened and endangered species
- Surface water and wastewater
- Groundwater and geology
- Wetlands
- Floodplains
- Natural areas, parks and recreation
- Cultural and historic resources
- Solid and hazardous waste
- Land use and prime farmland
- Roadway transportation
- Visual resources
- Noise
- Socioeconomics and environmental justice
- Safety

1.6 Necessary Permits or Licenses

The environmental permits to be obtained for the activities related to TVA's action include:

- Air permitting regulations under the Clean Air Act require TVA to secure an Air Pollution Control Permit to Construct prior to the commencement of the proposed construction. The project would likely require revisions to TVA's Title V Permit under the Clean Air Act for operations.

- TVA's Solid Waste Permit has been modified to reflect a change in the manner in which the bottom ash is handled and disposed. The dry CCR product is permitted for disposal in the on-site landfill.
- A Storm Water Permit issued by TDEC, under the Clean Water Act, would be required prior to commencement of construction. This would require a storm water pollution prevention plan (SWPPP) to ensure that storm water would be controlled on-site.
- TVA's current National Pollutant Discharge Elimination System (NPDES) Permit would be evaluated and modified as necessary to accommodate operation of the proposed dewatering facility.

Information regarding the above permits is provided in Appendix A. No permits or licenses would be required specifically for solid or hazardous waste transportation-related activities under any of the potential alternatives.

CHAPTER 2 - ALTERNATIVES

Descriptions of the proposed action and its alternatives, a brief comparison of their environmental effects, and TVA's preferred alternative are presented in this chapter.

2.1 Description of Alternatives

TVA has determined that there are two action alternatives that meet the purpose and need defined in Chapter 1. These alternatives and a No Action Alternative were evaluated in this EA and are described below. In addition, three alternatives were considered but eliminated from further consideration. The following sections include summaries for each alternative proposed for this project.

2.1.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct the dewatering facility. TVA would continue to dispose of wet bottom ash in on-site impoundments. The existing associated impoundments shown on Figure 1-1 would continue to be operated as currently permitted. Wet ash is currently discharged to four dewatering bins located in a trench where the majority of the ash settles out while the waste water flows continue on to the stilling impoundment. The ash is dredged from the bins by track hoe and placed in mounds in a staging area, referred to as the "ball field." TVA began disposing of ash from the ball field area in an existing on-site landfill, following the September 29, 2015, TDEC approval of a permit modification that allows for the existing on-site landfill to receive this bottom ash. Alternatively, TVA may remove the ash from the ball field area to an appropriate off-site landfill. The environmental effects of continuing to store wet ash on the ball field and of transporting ash to an off-site facility have been previously addressed (TVA 2006, 2010*).*

Under the No Action Alternative, TVA would continue to operate the existing truck wash station, parking lots, and equipment storage in the 18-acre area proposed for the dewatering system. This alternative does not meet the purpose of achieving the overall TVA goal of converting the form of storage of the bottom ash at KIF from wet to dry. Nonetheless, as the No Action Alternative, this option is discussed in the EA to provide a benchmark against which to compare the impacts of the action alternative.

2.1.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Under Alternative B, TVA would construct a bottom ash mechanical dewatering facility at KIF to create dry CCRs for disposal in an approved on-site or off-site landfill. To meet requirements under EPA's CCR and ELG regulations that become applicable to KIF in the future, the current ash sluice bins would be by-passed and the stilling impoundment would eventually be closed. The dewatering facility would facilitate compliance with these requirements.

Under Alternative B, the discharge from this dewatering facility would be routed to an approved impoundment and then discharged through the existing NPDES Outfall 001. The bottom ash dewatering equipment would be located north of the powerhouse (Figure 1-2). A new drainage line running from the dewatering facility to the existing municipal infrastructure would be constructed, allowing a tie-in for sewage and wastewater from the new facility to KIF's existing system. Interconnected controls between the facility and the KIF control room would also be installed, with electric power provided from the transformer station just south of the proposed facility location.

Trucks would be used to haul dry bottom ash from the dewatering facility to the approved on-site or off-site landfill at a rate of 8,000 to 57,000 tons per year or approximately 1 to 10 truckloads per day (the on-site landfill was approved to accept this material by TDEC September 29, 2015). Trucks would follow the current roadway to and from the facility using a new turn-around area at the facility. Truck staging may take place in the current parking lot area as needed. The parking area contains a drainage swale with a small linear wetland and intermittent stream. Modification of this area is not anticipated.

Construction activities would require removing existing surface material to approximately three inches below grade; grading the 18-acre area; constructing the turn-around road, dewatering facility, and associated utilities; and removing the truck wash facility. Construction is expected to take place over a 12- to 15-month period.

Sluice lines for the bottom ash would be routed to the proposed dewatering facility. Bottom ash would be dewatered using specialized equipment that would operate continuously while KIF is generating. The dewatered material would be stacked in covered piles with a maximum height of 45 feet. Any remaining water in the material in the piles would evaporate or would drain by gravity and be collected in sumps. Under normal operating conditions Dewatered CCRs would be allowed to stand in the pile for approximately 80 hours.

Within the proposed dewatering facility, the equipment for dewatering bottom ash would be installed in pairs, which means that there would be two sets of operating equipment for dewatering bottom ash. These pairs would be designed to run in tandem. The redundant nature of this arrangement would allow dewatering operations to continue in the event of mechanical problems with either set of dewatering equipment. In the unlikely event that both sets of dewatering equipment become inoperative, necessary measures, including initiating a forced outage, would be implemented to meet the water quality limits under the KIF NPDES permit. During an outage, flows to the bottom ash dewatering units would cease.

The proposed dewatering facility would be designed to remain operational during a 100-year frequency, 24-hour rainfall event. During normal operations, process water and contact water (i.e., additional water from rainfall and surface runoff) would be processed through the bottom ash dewatering system. However, if or when the dewatering system storage or throughput capacity is exceeded, process and contact water streams could be discharged to a KIF NPDES permitted outfall. Details of the dewatering process and associated equipment are provided below.

The bottom ash to be dewatered is presently sluiced from the power plant to four dewatering bins located in a trench and then to an on-site stilling impoundment (described in Section 2.1.1). The bottom ash sluice stream also sluices pyrites in addition to the bottom ash. Pyrites, or ferrous sulfides (FeS_2), are impurities in coal that are removed during the coal pulverizing process prior to combustion. For the purposes of this project, the bottom ash and pyrites would remain commingled. The bottom ash and pyrites would go to the dewatering facility and would be dewatered and sent to an approved on-site or off-site landfill. The sluice water would then be released to an approved polishing impoundment and ultimately discharged through existing Outfall 001. Clarified water would meet current NPDES permit limits.

The proposed dewatering facility would be designed to process a total slurry flow rate of 5,200 gpm. This slurry flow would consist of 16.5 tph of bottom ash (7.2 tph from Units 1 through 4 and 9.3 tph from Units 5 through 9). The slurry flow would also consist of 6.5 tph of previously mentioned pyrites on an intermittent basis (2.84 tph from Units 1 through 4 and 3.66 tph from Units 5 through 9).

To ensure that the bottom ash would achieve the desired level of dewatering and meet the required discharge limits, two processes would be utilized. Two existing bottom ash lines from Units 1 through 9 that discharge to the existing dewatering bins would be tied into two new 10 inch basalt-lined bottom ash lines and would be routed north a distance of approximately 1,000 feet to the proposed dewatering facility. Manual knife gate valves would be provided at the tie-ins to select either the dewatering facility or the existing discharge path.

In the first process, wet bottom ash from the slurry lines would enter a submerged flight conveyor (Figure 2-1). Wet bottom ash slurry would fall into the submerged flight conveyor and accumulate in the upper trough. The ash would settle to the bottom of the submerged flight conveyor to a submerged drag chain conveyor. The ash would then be transported up an incline by the submerged drag chain conveyor, allowing for natural dewatering by gravity, and would be discharged to concrete bunkers.

In the second process, overflow water from the submerged drag chain conveyor would be gravity-fed into clarifiers for further sedimentation. A flocculant would be used, as needed, to help settle out the majority of the solids, which would have a tendency to entrain the metals in the ash matrix, thus further reducing the trace levels of metals in the wastewater stream that are already at trace levels. This stream would be further treated in an approved impoundment (polishing pond) prior to discharge. Clarifier underflow pumps would be provided to pump settled ash back to the submerged flight conveyor to help settle the remaining fine ash solids.

Figure 2-1. Submerged Flight Conveyor

Clarifier overflow water would be gravity-fed via a pipe to a single process water tank to provide a continuous source of process water to the dewatering facility. The process water tank would overflow to an approved polishing impoundment for discharge through the NPDES outfall. Redundant process water pumps would be installed to pump process water throughout the dewatering facility. Process water would be pumped to the polymer/alum skids, SDCC chain wash, underflow pump flush water, and utility stations.

The concrete pads would provide approximately three days (80 hours) of covered storage prior to removal by TVA. The dewatered bottom ash would be removed by trucks. Due to the commingled pyritic material, dewatered bottom ash would not be commercial-grade and would have limited marketable uses. Bottom ash production would be expected to range between 8,000 and 58,600 tons per year depending on the type of coal burned and generation demand at KIF.

Alternative B would be designed and operated in compliance with all current local, state, and federal regulations. The implementation of Alternative B would not preclude the design, construction, and/or operation of a recirculation system (Alternative C) in the future. TVA would work with TDEC and other agencies to ensure KIF's regulatory compliance with future Effluent Limitations Guideline regulations, including implementation of compliance deadlines. In September 2015, the U.S. Environmental Protection Agency (EPA) released its Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (ELGs). In preparation for meeting the CCR regulations, closure of stilling impoundments is under development by TVA and will be evaluated through the NEPA process in the future if Alternative B were chosen as the preferred alternative for this project.

2.1.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Under Alternative C, TVA would construct the same dewatering facility as described under Alternative B in the first phase but would add, in a subsequent phase at a later time, a recirculation system. In other words, the effluent sluice stream leaving the dewatering facility would not leave the KIF site through surface impoundments and out the existing NPDES Outfall 001 (as described above in Alternative B). Instead, the effluent sluice stream leaving the dewatering facility would be recycled back into the KIF powerhouse for future sluicing operations. This recirculated sluice stream would require a blow-down stream, make-up stream and outage waste stream. The layout of the recirculating system is depicted in Figure 2-2.

TVA would implement Alternative C in two phases: Phase 1 would include construction of the dewatering facility as described in Alternative B and Phase 2 would implement construction of the recirculation system.

The recirculation system would include additional recirculating pumps, sluice line, additional power from the electrical room and a water containment facility. The containment facility would hold previously dewatered sluice water for recirculation in the dewatering process and would make it readily available, when needed, for sluicing operations. Water recovered in the bottom ash dewatering process would be recirculated to the intake side of the bottom ash sluice pumps at the powerhouse. The proposed dewatering and recirculation systems would require approximately 250 to 300 gpm of make-up water for the vacuum pumps, vacuum box seal, cloth wash pumps, and bottom ash water losses. This water would be plant process water (i.e., "raw" water or possibly, excess rainwater following heavy rainfall events).

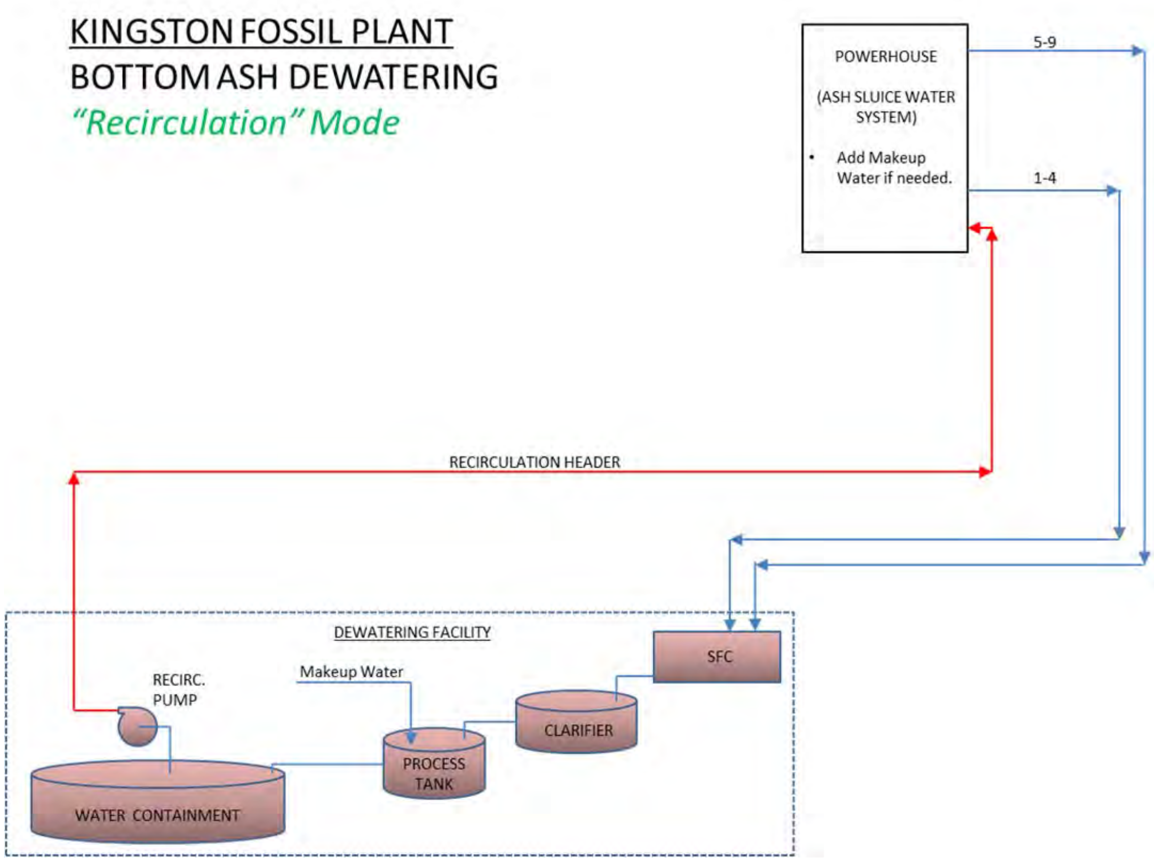


Figure 2-2. Conceptual Layout of Recirculation System

TVA estimates that the costs could range between $8 to $15 million more for the recirculation system, but could vary depending on the results of further evaluation and design studies. In October 2015, EPA finalized its Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (ELGs). Alternative C would be designed to comply with the ELGs and EPA's CCR Rule. Further study and design would be necessary in order to incorporate the proper treatment and disposal options for this alternative to comply with the ELG. Accordingly, Alternative C would be implemented in a phased manner, with the dewatering facility constructed in the first phase and the recirculating system in a subsequent phase.

2.1.4 Alternatives Considered but Eliminated From Further Consideration

2.1.4.1 Alternative D – Isolation and Separate Processing of Bottom Ash and Pyrite Streams

Under Alternative D, TVA would construct a pyrite (iron and manganese residue) separation system in addition to the bottom ash system. The pyrites and bottom ash would be conveyed in separate sluice streams, and each sluice stream would have its own dewatering facilities. This separation of pyrites would increase the potential marketability of the bottom ash and help mitigate the potential for surface water quality impacts associated with pyrites. This alternative was not selected and was eliminated from further consideration for the following reasons:

- The alternative would result in nearly doubling the cost of the dewatering process as compared to the cost of handling both streams combined due to the need to build a pyrite separator and bottom ash separator with similar footprint requirements. This would also double the construction period, and increase construction-related noise, transportation, and air impacts.
- While there is a potential market for the dewatered bottom ash (minus pyrite), the sale of dewatered bottom ash would not outweigh the cost of installing and operating two dewatering systems and making modifications to the power plant to separate the streams. Given the variability of the bottom ash market, which is dependent on construction needs, there is a high probability that bottom ash would need to be stored during low market periods, resulting in logistic, storage, and transportation issues. This storage would increase the handling requirements of the ash with a resulting increase in storm water discharge and air emissions.
- Disposal of pyrite would still be required. For pyrite alone, there is a greater potential for leaching of metals than with the buffering capacity provided in combination with bottom ash. This would increase the environmental liability and cost.

2.1.4.2 Alternative E – Use of Hydrobins

Hydrobin dewatering systems separate and dewater bottom ash from the conveying supply water. Bottom ash disposal with a dewatering hydrobin involves pumping the bottom ash as slurry from the ash hopper outside to the dewatering bin for ash water separation and loading of the dewatered ash into trucks for hauling to the disposal site. Therefore, a system similar to Alternative B (i.e., sluice pipes, construction site and temporary ash holding areas) would be required.

Under Alternative E, the use of hydrobins was considered but deemed not to be a suitable alternative as hydrobins are not capable of removing the small ash particles characteristic of KIF's process, which constitutes 93 percent of this ash. With this decreased effectiveness of primary dewatering, extensive additional finishing would be required. High total suspended solids entering the clarifier would require use of a solid contacts clarifier to reduce fines, thus adding to cost. A larger diameter clarifier would then also have an impact on the cost of the project and on the environment due to the larger foundation sizes and facility footprints than Alternative B. This increase would result in a 50 to 75 percent cost increase over a standard clarifier. Extensive maintenance would also be necessary to address wear and blockage in decanting screens from a hydrobin system.

Furthermore, leakage and ash spills have been noted in hydrobin setups. Leakage and spills may result in uncontrolled discharges to surface water and impacts to water quality. Moreover, structural steel erection for hydrobins was estimated to cost approximately 40 percent more than project estimates for SDCC and would require a much larger construction impact, resulting in a greater environmental footprint. For these reasons, TVA eliminated this alternative from further consideration.

2.1.4.3 Alternative F - Dry Boiler Bottom Conversion

Conversion from wet boiler bottoms to dry bottoms with ash removal was evaluated: pneumatic conveying, DRYCON, and vibrating ash conveying. Commercial systems that use these technologies, such as UCC, ASH, Magaldi, or other equivalent systems were evaluated for use at KIF. However, each was found to be infeasible for the technical reasons outlined below.

Boiler bottoms at the majority of TVA coal plants are in basements in close proximity to the powerhouse floor, but there is not enough physical clearance to accommodate the required dry ash conveyance equipment in the proximity of the boiler bottoms and there is not enough space to accommodate the supporting and auxiliary equipment in near proximity to boiler bottoms. There is no access for installation of a drag chain conveyor under the boiler bottom or a path for material removal in a conventional system. This restriction applied to numerous TVA coal-fired facilities including Allen, Bull Run, Kingston, Gallatin, Shawnee, Widows Creek, and Paradise. Further the cost of Dry Boiler Bottom Conversion systems was found to be at least an order of magnitude higher than the wet-to-dry system discussed under Alternative B of the EA. For these reasons, this alternative was eliminated from further consideration.

2.2 Comparison of Alternatives

The environmental impacts of the alternatives are summarized in Table 2-1. These summaries are derived from the information and analyses provided in Chapter 3.

Table 2-1. Summary and Comparison of Alternatives by Resource Area

Resource Area	Impacts		
	Alternative A – No Action	**Alternative B – Construction of Dewatering Facility**	**Alternative C – Dewatering plus Recirculation**
Air quality	No impact	Minor short-term construction impact	Minor short-term construction impact
Climate change	No impact	No significant impact	No significant impact
Vegetation	No impact	No significant impact	No significant impact
Wildlife	No impact	No significant impact	No significant impact
Aquatic ecology	No impact	No significant impact	No significant impact
Threatened and endangered species	No impact	No impact	No impact
Surface water and wastewater	No impact	No significant impact	Potential beneficial impact
Groundwater and geology	No impact	No significant impact	Potential beneficial impact
Wetlands	No impact	No impact	No impact
Floodplains	No impact	No impact	No impact
Natural areas, parks and recreation	No impact	No impact	No impact
Cultural and historic resources	No impact	No impact	No impact
Solid and hazardous waste	No impact	No impact	No impact
Land use and prime farmland	No impact	No impact	No impact
Roadway transportation	No impact	Minor short-term impact during construction	Minor short-term impact during construction
Visual resources	No impact	No impact	No impact
Noise	No impact	Minor short-term impact during construction	Minor short-term impact during construction
Socioeconomics and Environmental Justice	No impact	Short-term and long-term beneficial impact	Short-term and long-term beneficial impact
Safety	No impact	Minor short-term impact during construction	Minor short-term impact during construction

2.3 Identification of Mitigation Measures

The following mitigation measures and best management practices (BMPs) have been identified to reduce potential environmental effects:

- Best practices and limitations prescribed in the Storm Water and Air Permit for Construction Activities (for Alternative B and C)
- Erosion controls and BMPs for storm water impacts (for Alternatives B and C)
- Dust control during construction (for Alternatives B and C)
- Covering of the byproduct during transport and the use of dust control during dewatering facility operation (for Alternatives B and C)
- Use of wastewater treatment additives, as needed, to help with pH control, the settling of solids, and the reduction of metals during dewatering operations (for Alternatives B and C)

2.3.1 Air Quality

Under Alternative B and C, the construction contractor would be required to implement dust control measures during construction to prevent the spread of dust, dirt, and debris. These measures include wetting equipment and covering waste or debris piles, using covered containers to haul waste and debris, road sweepers on paved roads and wetting unpaved vehicle access routes with water wash trucks, during hauling. Wet suppression can reduce fugitive dust emissions from roadways and unpaved areas by as much as 95 percent. Wet suppression is and will continue to be routinely utilized for dust control during operations. Bottom ash would be moistened to 15 to 20 percent moisture content for dust control while bottom ash is temporarily stored at the dewatering facility and during loading onto trucks. The open trucks would then be covered to further reduce the chance of fugitive emissions while ash is transported to the on-site landfill. In the event fugitive dust becomes an issue that is not corrected by the above measures, TVA would conduct on-site air monitoring.

TVA routinely requires on-site contractors to maintain engines and equipment in good working order. With these measures in place, potential effects to local air quality from the proposed construction are expected to be minor and temporary.

2.3.2 Surface Water and Groundwater

Alternative B and C would involve land disturbance greater than 1 acre requiring a TDEC Construction Storm Water permit, which would include a SWPPP and BMP Plans. The current NPDES permit and Storm Water Multi-Sector Permit may require modification with this alternative. Mitigation measures prescribed in a project specific SWPPP and BMP Plans would reduce the potential for erosion of soil minimizing the potential for pollutants to reach waters of the state, streams and wetlands, and groundwater.

The use of wastewater treatment additives to help with pH control, the settling of solids, and the reduction of metals during dewatering operations would be implemented on an as needed basis. Additionally, wastewater characterization of the discharge of this facility and the Outfall 001 discharge would be evaluated once the system is operational to ensure that these waste streams comply with all NPDES permit limits and Tennessee Water Quality Criteria.

2.4 Preferred Alternative

TVA's preferred alternative is Alternative C, construction of the dewatering facility and the recirculation system to recycle sluice water back into the powerhouse for future sluicing operations. Alternative A is discussed and analyzed as an alternative for purposes of benchmarking against Alternatives B and C.   Alternatives B and C provide long-term benefits, and meet the purpose and need of the project as these alternatives support TVA's dry CCR storage approach and facilitate compliance with EPA’s CCR rule. Alternatives B and C also provide a greater level of safety to human health and the environment than Alternative A as wet impoundment of CCR waste and the commingling of wastewater and CCR product would be minimized. While Alternative C is more costly than Alternative B (because of the addition of a recirculation system), TVA prefers Alternative C because of the benefits of water reuse that facilitates TVA’s future compliance with the ELG and reduced need for surface impoundments. TVA would implement its preferred alternative (i.e. Alternative C) in a phased manner, starting with the construction of the dewatering facility in the first phase and then adding the recirculating system at a later time.

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment (existing conditions) of environmental resources in the project area and the anticipated environmental consequences that would occur from adoption of the alternatives described in Chapter 2. The affected environment descriptions below are based on surveys conducted in 2014, published and unpublished reports, historical data, and personal communications with resource experts.

3.1 Air Quality

3.1.1 Affected Environment

Roane County is currently in attainment with the national ambient air quality standards except for the 24-hour small particulate matter ($PM_{2.5}$) standard. The proposed dewatering facility would be subject to both federal and TDEC air quality regulations. These regulations impose permitting requirements and specific standards for expected air emissions. The standards and regulations that pertain to the proposed dewatering facility include:

- State of Tennessee Process and Fugitive Dust Regulation, TDEC Air Pollution Control; Chapter 1200-3-8, “Fugitive Dust”
- Review for Applicability of Prevention of Significant Deterioration (PSD) regulations (40 Code of Federal Regulations [CFR] 51.166)
- Review for applicability of Nonattainment New Source Review (NSR) (40 CFR 51.165)

The feasibility of operating a bottom ash dewatering system at the site may be affected by several air quality considerations. One such factor is regulatory status or attainment of air quality standards. Air emission sources located in clean air areas are subject to the PSD NSR rules, whereas those located in or affecting areas failing to attain air quality standards must comply with nonattainment NSR. An overriding constraint in either NSR program is that no source may cause or significantly contribute to a violation of an ambient air quality standard. The only emissions from the proposed dewatering facility would be fugitive particulate matter (PM).

Although the project site is located in a nonattainment area for the 24-hour $PM_{2.5}$ standard, the project would not be subject to nonattainment NSR review because the project would not be a major modification under state air quality regulations (TDEC Air Pollution Control 1200-03-09-.01(5)(b)(2) [TDEC 2009b]).

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue its current practice of ponding as the disposal method bottom ash. For the foreseeable future, current air quality conditions are not likely to change due to plant operations. Implementing the No Action Alternative would not result in any additional direct impacts to air quality.

3.1.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Construction

Transient air pollutant emissions would occur during the construction phase. Construction-related air quality impacts would be primarily related to site preparation and the operation of internal combustion engines.

Site preparation and vehicular traffic over paved and unpaved roads at the construction site would result in the emission of fugitive dust PM during active construction periods. The largest fraction (greater than 95 percent by weight) of fugitive dust emissions would be deposited within the construction site boundaries (Buonicore and Davis 1992). The remaining fraction of the dust would be subject to transport beyond the property boundary. If necessary, emissions from open construction areas and paved/unpaved roads would be mitigated by spraying water on the roadways to reduce fugitive dust emissions (see Section 2.3).

Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of PM, nitrogen oxides, carbon monoxide, volatile organic compounds, and sulfur dioxide during the site preparation and construction period. The total amount of these emissions would be small and would result in minimal impacts to air quality.

Air quality impacts from construction activities would be temporary (15 months), and would depend on both man-made factors (intensity of activity, control measures, etc.) and natural factors such as wind speed and direction, soil moisture, etc. However, even under unusually adverse conditions, these emissions would have, at most, a minor transient impact on off-site air quality and would be well below the applicable ambient air quality standard. Overall, the potential impacts to air quality from construction-related activities for the project would be minor.

Operations

The proposed dewatering facility would be in compliance with TDEC regulations.

Operation of the bottom ash dewatering system is subject to specific TDEC process regulations and fugitive dust regulations. Operations are also subject to review for applicability of the PSD regulations for large particulate matter (PM_{10}) and total particulates. Because the emissions of PM_{10} and total particulates would be below PSD significance levels of 15 tons per year and 25 tons per year, respectively, PSD does not apply to this project. Because the proposed project is located in a nonattainment area for $PM_{2.5}$, it is subject to nonattainment NSR analysis. The $PM_{2.5}$ emissions increase associated with the proposed dewatering facility would not be significant since a very small percentage of the fugitive dust generated would be in that size range.

Fugitive dust emission standards state that fugitive dust may not be emitted in quantities that produce visible emissions beyond the property for more than 5 minutes per hour or 20 minutes per day. During bottom ash loading to open trucks or rail cars, bottom ash would be moistened to 15 to 20 percent moisture content. This would be used for dust control while bottom ash is temporarily stored at the dewatering facility and loaded onto trucks. The open trucks would then be covered to further reduce the chance of fugitive emissions while ash is transported to the on-site landfill. Therefore, air quality impacts associated with project operations would be minor.

3.1.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Almost all activities described in Alternative B would occur under Alternative C in both the construction and operational phases. The primary difference under Alternative C is that a recirculation system would be constructed. The installation of equipment would require additional machinery to be run that would create more air pollution than in Alternative B. However, Alternative C would not create substantially more air pollutants than Alternative B given the same project footprint and the majority of the processes being the same. Thus, there would be short-term, minor impacts during construction. The additional electrical pumps would be served by the existing power infrastructure and contribute a negligible increase in air pollution at the power plant given their small power requirements.

3.2 Climate Change

3.2.1 Affected Environment

The 2014 National Climate Assessment concluded that global climate is projected to continue to change over this century and beyond. The amount of warming projected beyond the next few decades, by these studies, is directly linked to the cumulative global emissions of greenhouse gasses (e.g., carbon dioxide [CO_2], methane) and particles. By the end of this century, the 2014 National Climate Assessment concluded a 3° Fahrenheit (F) to 5°F rise can be projected under the lower emissions scenario and a 5°F to 10°F rise for a higher emissions scenario (Melillo, Richmond, and Yohe 2014). As with all future scenario modeling exercises, there is an important distinction to be made between a “prediction” of what “will” happen and a “projection” of what future conditions are likely given a particular set of assumptions (Melillo, Richmond, and Yohe 2014).

The southeastern United States is one of the few regions globally that does not exhibit an overall warming trend in surface temperature over the twentieth century. This “warming hole” also includes part of the Great Plains and Midwest regions in the summer. Historically, temperatures increased rapidly in the southeast during the early part of the twentieth century, then decreased rapidly during the middle of the twentieth century. Since the 1960s, temperatures in the southeast have been increasing. Recent increases in temperature in the southeast have been most pronounced in the summer season, particularly along the Gulf and Atlantic coasts. However, temperature trends in the southeast over the period of 1895 to 2011 are found to be statistically insignificant for any season. Generally, in the southeast, the number of extreme hot days has tended to decrease or remain the same, while the number of very warm summer nights has tended to increase. The number of extreme cold days has tended to decrease. Global warming is a long-term trend, but that does not mean that every year will be warmer. Day-to-day and year-to-year changes in weather patterns will continue to produce variation, even as the climate warms. Generally, climate change results in Earth’s lower atmosphere becoming warmer and moister, resulting in the potential for more energy for storms and certain severe weather events. Trends in extreme rainfall vary from region to region (Kunkel et al. 2013).

In 2013, worldwide man-made annual CO_2 emissions were estimated at 36 billion tons, with sources within the United States responsible for 14 percent of this total (Le Quéré et al. 2014). According to the official U.S. Greenhouse Gas Inventory, electric utilities in the United States were estimated to emit 2.039 billion tons, roughly 32 percent of the U.S. total in 2012 (EPA 2014). In 2014, fossil-fired generation accounted for 52 percent of TVA’s total electric generation, and the non-emitting sources of nuclear, hydro, and other renewables accounted for 48 percent. Compared to CO_2 emissions from the entire TVA system in 2005 to those in 2014, TVA has reduced its CO_2 emissions by about 30 percent and anticipates achieving a total CO_2 emission reduction of 40 percent by 2020.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a dewatering facility at KIF and the ash impoundments would continue to receive ash slurry. Implementing the No Action Alternative would not result in any new emissions of greenhouse gases and, therefore, there are no impacts to climate change.

3.2.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Construction

CO_2 emissions would occur during the construction phase. Construction-related CO_2 emissions would be primarily related to the combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.). The total amount of these emissions would be small and would result in no significant impact to climate change.

Operations

Operations at the dewatering facility would require the use of electricity provided by ongoing operations at KIF. The burning of the fossil fuels at the plant does generate CO_2 emissions. The additional energy required to operate the dewatering facility would not require enough increase in the amount of fossil fuel burned at KIF to significantly impact climate change.

3.2.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Implementing Alternative C would have the same impacts as Alternative B with the addition of the construction of a recirculation system. The CO_2 emissions from energy required for the dewatering facility and recirculation system would not cause significant impacts to climate change.

3.3 Vegetation

3.3.1 Affected Environment

KIF has been heavily disturbed by construction, maintenance, and operation of the facility for over 50 years. As a result of this alteration of the physical landscape, no portion of the potential project area supports a natural plant community. Most areas within the potential project area on the KIF site are mowed lawn islands in the parking area, un-vegetated, gravel, or paved lots, and a few very small locations do contain early successional vegetation dominated by nonnative weeds and shrubby trees. These vegetated areas primarily form the edges of parking lots and roadways.

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action

Adoption of Alternative A would not result in impacts to the vegetation of the region. TVA property within the proposed project area has no conservation value and adoption of Alternative A would not change that situation; the property would remain in its current condition. The few vegetated areas on the proposed project area would continue to be dominated by nonnative and early successional species indicative of disturbed habitats.

Any changes occurring in the vegetation on-site would be the result of other natural or anthropogenic factors and would not be the result of adoption of Alternative A.

3.3.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Adoption of Alternative B would result in the construction of a dewatering facility on approximately 18 acres on TVA property that is currently heavily disturbed. This area does not contain intact native plant communities and adoption of this alternative would not change that situation. The vegetation found on-site is comprised of nonnative weeds and early successional plants that have no conservation value. Adoption of Alternative B would, therefore, have no significant impact on vegetation.

3.3.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Because the project boundary and footprint would be the same under Alternative C as Alternative B and the recirculation basin would be constructed in a currently gravel lot, there is the same disturbance to vegetation as described in Alternative B. Therefore, adoption of Alternative C would have no significant impact on vegetation.

3.4 Wildlife

3.4.1 Affected Environment

Terrestrial habitat within the project footprint is described in Section 3.3. The surrounding area includes the shoreline of Watts Barr Reservoir around the north, south, and east of the KIF facility and heavily wooded landscape to the west and across the open water areas of the adjoining reservoir.

Mowed lawns and a bush-hogged wetland swale with small amounts of open water offer little suitable habitat for rare wildlife species, but can be used by many common species. Birds that utilize these grassy areas include Canada goose, eastern meadowlark, grasshopper sparrow, killdeer, European starling, and red-tailed hawk. Mammals that can be found in these grassy areas are common mole, coyote, ground hog, least shrew, white-footed mouse, and white-tailed deer. Birds that utilize bush hogged wetlands with standing water include great blue herons, green heron, song sparrow, swamp sparrow, and Wilson's snipe. Common amphibian and reptile species also use similarly disturbed, small wetlands including American bullfrog, American toad, eastern garter snake, eastern red spotted newt, Fowler's toad, northern cricket frog, red-eared slider, spring peeper, and upland chorus frog.

Birds that utilize the small patches of disturbed shrubby forest edge adjacent to industrialized areas include American crow, American robin, American goldfinch, blue jay, Carolina chickadee, Carolina wren, eastern towhee, osprey, tufted titmouse, northern cardinal, northern mockingbird, red-shouldered hawk, and yellow breasted chat. Mammals found in and around these industrialized areas include common raccoon, eastern gray squirrel, hispid cotton rat, and Virginia opossum.

In the past, shorebirds such as killdeer, least sandpiper, lesser yellowlegs, pectoral sandpiper, semi-palmated sandpiper, spotted sandpiper, and western sandpiper were found on adjacent ash impoundments (Fowler 1983). Most of these birds utilized the ash impoundments as stop-over grounds during migration events. However, due to the KIF ash spill event that occurred in 2008 and the resulting emergency cleanup efforts, the landscape at KIF has changed dramatically. Many of the areas previously used by shorebirds were impacted. Other areas not directly impacted by the spill have been continually modified in order to accommodate the ash removed by the cleanup of the ash spill. This loss of habitat and disturbance of remaining habitat during remediation reduced shorebird use of the KIF ash impoundments and adjacent shoreline. Restoration of this area (i.e., planting of trees, shoreline buffer restoration, installation of heron and osprey platforms, planting of native grasses, construction of a 3-acre wetland, and enhancement of existing wetlands) has corrected damages from the spill and restored much of the shorebird habitat.

As of January 2015, the TVA Regional Natural Heritage database indicated that no records of caves exist within three miles of the project area and none were found on the project site during field reviews on December 31, 2014. However, five heron rookeries have been reported within three miles of the proposed project area. Only one of these is still extant and is approximately 1.6 miles away. In addition, 11 osprey nests have been reported within three miles of the project; however, only seven of these are extant. The closest record of an extant osprey nest is approximately 310 feet from the project footprint on a lighting structure next to the railroad tracks.

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a dewatering facility at KIF and the ash impoundments would continue to receive ash slurry. Soil and vegetation would remain in their current state and tree clearing, earth moving, and removal of the truck wash facility and construction would not occur in association with this project. Terrestrial animals and their habitats would not be affected under Alternative A.

3.4.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Under Alternative B, TVA would design and erect a new dewatering facility that would dewater the KIF bottom ash/pyrite streams to create dry products for disposal in an approved on-site or off-site landfill. The truck wash facility within the project footprint would be removed and grassy areas and small wetlands may be impacted from new construction.

Alternative B may permanently alter the limited amount of wildlife habitat that is currently present in the 18-acre project area. This may result in the displacement of any wildlife (primarily common, habituated species) currently using the area. Direct effects to some individuals may occur if those individuals are immobile during the time of habitat removal. This could be the case if activities took place during breeding/nesting seasons. Habitat removal likely would disperse mobile wildlife into surrounding areas in an attempt to find new food and shelter sources and to reestablish territories, potentially resulting in added stress or energy use. In the event that the surrounding areas are already overpopulated, further stress to wildlife populations could occur to those individuals presently utilizing these areas as well as those attempting to relocate. Considering the amount of higher quality habitat in the surrounding area, however, overpopulation is unlikely. Therefore, the proposed project would have no significant impact on populations of common wildlife species.

Of the seven osprey nests located around the project footprint, the closest nest is approximately 310 feet from the project footprint. This nest is situated next to an active 13 track railroad and a coal storage area where heavy equipment is frequently used. Osprey have been nesting at KIF and foraging in the adjacent Emory River for decades. Those individuals nesting on the plant site are habituated to frequent disturbance by large, loud equipment. The osprey nest in question would not be impacted by the proposed actions taking place within the project footprint. The proposed project would have no significant impact on osprey that nest at the facility, the heron rookery located 1.6 miles away, and other migratory birds.

3.4.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

The project footprint and location would be the same for Alternatives B and C. The location of the proposed basin constructed under Alternative C is currently a gravel lot over ash. While the construction period would be somewhat longer for Alternative C there would be no substantial difference between Alternatives B and C as far as impacts to terrestrial wildlife. Therefore, no significant impacts to wildlife are expected.

3.5 Aquatic Ecology

3.5.1 Affected Environment

The KIF facility is located on Watts Barr Reservoir at the confluence of the Clinch and Emory rivers. The southeast section of the proposed facility is bordered by an embayment of the Emory River. One ephemeral stream is located within the parking lot area of the proposed action and one intermittent stream is located adjacent to the project footprint, but would not be affected. The ephemeral and intermittent streams drain to the parking area on the north end of the proposed project into a linear wetland feature. This area would be modified to include a larger turn-around roadway for haul trucks. The streams would not be affected by the project as trucks would use the current roadway.

TVA has systematically monitored the ecological conditions of its reservoirs since 1990 as part of the Vital Signs Monitoring Program (www.tva.gov/environment/ecohealth/index.htm). Vital signs monitoring activities focus on (1) physical/chemical characteristics of water, (2) physical/chemical characteristic of sediments, (3) benthic macroinvertebrate community sampling, and (4) fish assemblage sampling.

Several reservoir monitoring and evaluation tools were developed in the initial phase of the Vital Signs Monitoring Program, and those tools are often used in other TVA studies. Such is the case for KIF where TVA's fish assemblage monitoring tool, the Reservoir Fish Assemblage Index, has been used in recent years at Clinch River Mile (CRM) 1.5 downstream of KIF and CRM 4.4 upstream of KIF. The fish assemblage at these sites has consistently rated "good," except for lower scores in 2007, a likely result of widespread drought conditions that continued into 2008. In 2013, the fish assemblage at these sites continued to be rated "good" (TVA 2014a) throughout the ash spill and spill remediation process.

The mussel fauna in the Emory River near KIF has been substantially altered by the impoundment of Watts Bar Reservoir and upstream impacts including mining and urbanization. Six mussel species (giant floater, fragile papershell, pistolgrip, pimpleback, wartyback, and threehorn wartyback) and a common aquatic snail (hornsnail) were found in a recent survey of this area (Yokley 2005; Parmalee and Bogan 1998). All of these species, except pistolgrip, are considered tolerant of reservoir conditions.

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct and operate the proposed dewatering facility. Project-related environmental conditions in the project area would not change and aquatic resources and their habitats would not be impacted under Alternative A.

3.5.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Since intermittent streams contain water flow for only part of the year, and ephemeral streams only contain flowing water in response to rain events, they typically lack the biological and hydrological characteristics commonly associated with perennial streams. In addition the ephemeral stream in the project site is located in a highly disturbed area and was formed as a result of construction of the current parking area. Therefore, no significant impacts to aquatic ecology would be anticipated with adoption of Alternative B and the implementation of storm water erosion controls in accordance with an SWPPP. Invertebrates, fish, and mussel fauna of the Emory River would not be affected by the project as there would be no direct impact to the river or shoreline and discharges would take place through the permitted outfall.

3.5.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

The addition of a recirculation system is not anticipated to result in impacts to aquatic ecology since the water would be plant process water or excess rainwater and all clarified water would meet the NPDES permit limits. All other impacts would be the same as described in Alternative B, so no significant impacts to aquatic ecology are expected.

3.6 Threatened and Endangered Species

3.6.1 Affected Environment

The Endangered Species Act provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the United States or elsewhere. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize federally listed species or their designated critical habitat. The policy of Congress is that federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the Act’s purposes.

The TVA Natural Heritage database and USFWS Environmental Conservation Online System (http://ecos.fws.gov/ecos/home.action) in January 2015 indicated that there are no records of Tennessee state-listed terrestrial animal species within three miles of the project footprint on the KIF site (see Table 3-1). However, there are records of two federally listed terrestrial animal species (piping plover and red knot) within three miles of KIF. Two additional federally listed terrestrial animal species (Berry Cave salamander and gray bat) and one federally protected terrestrial animal species (bald eagle) have been reported from Roane County, Tennessee. The USFWS determined that the federally listed Indiana bat and federally proposed endangered northern long-eared bat (NLEB) also have the potential to occur throughout the state of Tennessee. Thus, potential for impacts to these species are evaluated in this document.

Table 3-1. Species of Conservation Concern Documented in Roane County, Tennessee

Common Name	Scientific Name	Status [a]	
		Federal	State (Rank) [b]
Amphibians			
Berry Cave salamander	*Gyrinophilus gulolineatus*	C	THR (S1)
Birds			
Bald eagle	*Haliaeetus leucocephalus*	DM	NMGT (S3)
Piping plover	*Charadrius melodus*	LE	TRKD (S2)
Red knot [c]	*Calidris canutus*	PS	--
Mammals			
Gray bat [d]	*Myotis grisescens*	LE	END (S2)
Indiana bat [e]	*Myotis sodalis*	LE	END (S1)
Northern long-eared bat [f]	*Myotis septentrionalis*	PE	NMGT (S4)
Fishes			
Ashy Darter	*Etheostoma cinereum*	THR (S2S3)	--
Blue Sucker	*Cycleptus elongatus*	THR (S2)	--
Flame Chub#	*Hemitremia flammea*	NMGT (S3)	--
Lake Sturgeon [g]	*Acipenser fulvescens*	END(S1)	--
Spotfin Chub	*Erimonax monachus*	THR (S2)	THR
Tangerine Darter	*Percina aurantiaca*	NMGT (S3)	--
Tennessee Dace	*Phoxinus tennesseensis*	NMGT (S3)	--
Mussels			
Alabama Lampmussel#	*Lampsilis virescens*	END (S1)	END
Fanshell#	*Cyprogenia stegaria*	END (S1)	END
Fine-rayed Pigtoe#	*Fusconaia cuneolus*	END (S1)	END
Orange-foot Pimpleback#	*Plethobasus cooperianus*	END (S1)	END
Pink Mucket	*Lampsilis abrupta*	END (S2)	END
Purple Bean	*Villosa perpurpurea*	END (S1)	END
Pyramid Pigtoe	*Pleurobema rubrum*	TRKD (S2S3)	--
Ring Pink#	*Obovaria retusa*	END (S1)	END
Sheepnose	*Plethobasus cyphyus*	TRKD (S2S3)	END
Spectaclecase#	*Cumberlandia monodonta*	TRKD (S2S3)	END
Aquatic Snails			
Ornate Rocksnail#	*Lithasia geniculata*	TRKD (S3)	--
Spiny Riversnail	*Io fluvialis*	TRKD (S2)	--
Plants			
American Hart's-tongue Fern	*Asplenium scolopendrium var. americanum*	THR	END (S1)
Spreading False-foxglove	*Aureolaria patula*	--	SPCO (S3)
Cumberland Rosemary	*Conradina verticillata*	LT	THR (S3)
Northern Bush-honeysuckle	*Diervilla lonicera*	--	THR (S2)
Mountain Bush-honeysuckle	*Diervilla sessilifolia var. rivularis*	--	THR (S2)
Western Wallflower	*Erysimum capitatum*	--	END (S1S2)
Schreber Aster	*Eurybia schreberi*	--	SPCO (S1)
Fetter-bush	*Leucothoe racemosa*	--	THR (S2)
Mountain Honeysuckle	*Lonicera dioica*	--	SPCO (S2)
Large-flowered Barbara's-buttons	*Marshallia grandiflora*	--	END (S2)
Monkey-face Orchid	*Platanthera integrilabia*	C	END (S2S3)
Prairie Goldenrod	*Solidago ptarmicoides*	--	END (S1S2)
Virginia Spiraea	*Spiraea virginiana*	LT	END (S2)
Northern White Cedar	*Thuja occidentalis*	--	SPCO (S3)

Source: TVA Natural Heritage database, accessed April 28, 2014.

Note: Species known only from historical records and no longer believed to be present in Roane County are denoted by this symbol (#).

[a] Status Codes: END = Endangered; LE = Listed Endangered; LT = Listed Threatened; SPCO = Listed Special Concern; NMGT = In Need of Management; THR = Threatened; TRKD = Tracked by the Tennessee Natural Heritage Program

[b] Status Ranks: S1 = Extremely rare and critically imperiled; S2 = Very rare and imperiled; S3 = Vulnerable; S4 = Apparently secure, but with cause for long-term concern; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)

[c] A subspecies of the red knot (*Calidris canutus rufa*) is federally threatened and may use stopover grounds in Tennessee during migration. Red knot (*Calidris canutus*) was observed at KIF in September 1980.

[d] Federally endangered species known from Roane County, Tennessee, but not within 3 miles of the project footprint.

[e] Federally proposed endangered species that is not yet known from Roane County, Tennessee, but is thought to occur statewide.

[f] Federally endangered species that is not yet known from Roane County, Tennessee, but is thought to occur statewide.

[g] Lake Sturgeon were stocked in the Tennessee River in 2000 by Tennessee Wildlife Resources Agency.

The database also indicated that three federally listed endangered mussels (pink mucket, purple bean, and sheepnose), one federally listed threatened fish (spotfin chub), and six state-listed aquatic animals (ashy darter, blue sucker, lake sturgeon, tangerine dater, Tennessee dace, pyramid pigtoe, and spiny riversnail) are currently known from Roane County and/or within a 10 mile radius of the proposed project area (see Table 3-1). An additional five federally listed endangered mussels (Alabama lampmussel, fanshell, fine-rayed pigtoe, orange-foot pimpleback, and ring pink), one state-listed fish (flame chub), and one state-listed snail (ornate rocksnail) are known only from historical records and are no longer considered to be present in Roane County, Tennessee. No further analysis of these historical species is presented.

The database indicated that two federally listed and 10 state-listed plant species are known from within five miles of the proposed project area. One additional federally listed plant, as well as one candidate for federal listing, is reported from Roane County, Tennessee (see Table 3-1). A desktop review of KIF indicated that no habitat for federally or state-listed plant species occurs in the potential affected area. The habitat on-site has been severely degraded and is populated primarily with nonnative species. No designated critical habitat for plants occurs in the proposed project area. Because of the lack of suitable habitat for any listed plant species within the project area, no further analysis of listed plant species is presented.

3.6.1.1 Species Descriptions

Bald eagles are protected under the Bald and Golden Eagle Protection Act (USFWS 2013). This species is associated with larger mature trees capable of supporting its massive nests. These are usually found near larger waterways where the eagles forage (USFWS 2007). Records document the occurrence of four bald eagle nests in Roane County, Tennessee; however, only two of these records are extant. The nearest nesting record is approximately five miles away from the project footprint. Bald eagles have been seen foraging over the Emory River adjacent to KIF in the past. However, no bald eagles or bald eagle nests were observed during a field review at KIF on December 31, 2014. No suitable nesting habitat for bald eagles exists in the project footprint.

Berry Cave salamanders are aquatic species known from caves in the ridge and valley areas of Tennessee (Petranka 1998). Berry Cave salamanders have been reported from only four places in the world. Berry Cave in Roane County, Tennessee, has one of the two known remaining viable populations of this species (NatureServe 2015). Berry Cave is approximately 10 miles from the proposed actions. No cave habitat is known from the project area and no caves were observed during field review on December 31, 2014. Suitable habitat for Berry Cave salamander does not exist in the proposed action area.

Piping plover forages in exposed sand flats, mudflats, sandy beaches, stream shorelines, and ephemeral ponds (USFWS 2003). Similarly, red knot feeds along sandy beaches and mudflats for invertebrates, especially mollusks (National Geographic 2002, NatureServe 2015). A subspecies of red knot (*Calidris canutus rufa*) that migrates from the Canadian Arctic to the Gulf Coast and South America was listed as federally threatened in January 2015. The populations of piping plover that can be found in the Tennessee Valley Region are rare fall and spring migrants, while populations of red knot in the Tennessee Valley are accidental fall migrants (Fowler 1983, Robinson 1990, Henry 2012). In the early 1980s, both red knot and piping plover were observed foraging at the KIF ash ponds during fall migration (Fowler 1983). Suitable habitat for piping plover and red knot previously existed on the KIF ash ponds and adjacent shoreline of the Emory River prior to the 2008 KIF ash spill. During this event 5.4 million cubic yards of coal ash slurry escaped into the Emory River and adjacent shoreline. Many of the ash storage areas and Emory River mudflats previously used by these shorebirds are no longer in existence. Other areas not directly impacted by the spill have been continually modified in order to accommodate the ash removed by the cleanup of the ash spill. Available suitable habitat for piping plover and red knot at KIF and adjacent shoreline has been dramatically reduced, and these species have not been observed on or near KIF in recent years.

Gray bats roost in caves year-round and migrate between summer and winter roosts during spring and fall (Brady et al. 1982, Tuttle 1976a). Bats disperse over bodies of water at dusk where they forage for insects emerging from the surface of the water (Tuttle 1976b). One gray bat hibernacula has been reported from Roane County, Tennessee. This cave is approximately 10.4 miles away from the project site. No caves are known from the project footprint. The nearest recorded cave is approximately 5.3 miles from the project. Small wetlands in the project footprint may offer moderately suitable foraging habitat for gray bat. The ponds at KIF offer low quality foraging habitat for gray bat as well. Higher quality foraging habitat and sources of drinking water exist at the Emory River adjacent to the project action area.

Indiana bats hibernate in caves in winter and use areas around them for swarming (mating) in the fall and staging in the spring, prior to migration back to summer habitat. During the summer, Indiana bats roost under the exfoliating bark of dead snags and living trees in mature forests with an open understory and a nearby source of water (Pruitt and TeWinkel 2007, Kurta, Murray, and Miller 2002). Indiana bats are known to change roost trees frequently throughout the season, while still maintaining site fidelity, returning to the same summer roosting areas in subsequent years (Pruitt and TeWinkel 2007). Although less common, Indiana bats have also been documented roosting in buildings. No records of Indiana bat are known from Roane County, Tennessee. The closest Indiana bat record is a summer mist net capture on Oak Ridge National Laboratory approximately 16.9 miles away. The closest known Indiana bat hibernaculum is approximately 24.6 miles away. No known caves or suitable winter roosting structures exist on the project footprint. One small area (0.2 acre) of upland forest exists within the project area. Tree species within this fragment include Bradford pear, black cherry, cherry bark oak, northern red cedar, slippery elm, southern red oak, sugar maple, Virginia Pine, and winged elm. None of these trees offer suitable summer roosting habitat for Indiana bat. Nonetheless, this forest fragment in addition to several small wetlands in the project footprint may offer some suitable foraging habitat for Indiana bat. Higher quality foraging habitat and sources of drinking water exist on the Emory River adjacent to the project action area.

NLEB was proposed for listing as federally endangered by USFWS in October 2013. In winter, this species roosts in caves or cave-like structures (such as buildings and mines), while summer roosts are typically in cave-like structures as well as live and dead trees with exfoliating bark and crevices. NLEB tend to forage within the midstory and canopy of upland forests on hillsides and ridges (USFWS 2014). There are no known records of NLEB winter hibernacula from Roane County, Tennessee. The nearest known NLEB hibernaculum is a cave approximately 28.4 miles away in adjacent Meigs County, Tennessee. No known caves or suitable winter roosting structures exist on the project footprint. No suitable summer roosting habitat exists within the small forest fragment or within the project footprint. However, this forested area and small wetlands in the project footprint may offer some suitable foraging habitat for NLEB. Higher quality foraging habitat and sources of drinking water exist on the Emory River adjacent to the project action area.

The ashy darter, flame chub, spotfin chub, tangerine darter, and Tennessee Dace are only reported from unimpounded sections of the Emory and Clinch rivers and their tributaries in Roane County, and none of these species is known to be present in Watts Bar Reservoir (impounded portions of the Emory and Clinch rivers) adjacent to KIF.

The blue sucker inhabits deep pools of large, free-flowing rivers with swift currents of up to 7,000 cubic feet per second. Once common throughout its range, populations of blue suckers have drastically declined due to impoundments and increasing siltation of big rivers. This species has been found infrequently in Watts Bar Reservoir.

The lake sturgeon prefers large lakes and rivers and spawns over rocky reefs. The Tennessee Wildlife Resources Agency has released approximately greater than 81,500 lake sturgeon into the French Broad, Holston, and Tennessee rivers downstream of Douglas and Cherokee reservoirs since 2000 as part of their reintroduction program. This species is routinely collected in Watts Bar Reservoir, including in areas of the Clinch and Emory rivers adjacent to KIF.

The purple bean, pyramid pigtoe, sheepnose, and spiny riversnail are known only from unimpounded portions of the Emory River and its tributaries in Roane County, Tennessee, and are not considered to be present in Watts Bar Reservoir adjacent to the project area.

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct a dewatering facility at KIF and the ponds would continue to receive ash slurry. Soil and vegetation would remain in their current state and tree clearing, earth moving, and building demolition and construction would not occur in association with this project. No impacts to threatened or endangered plant or animal species are anticipated to occur as a result of the No Action Alternative.

3.6.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Under Alternative B, TVA would design and construct a new facility that would dewater the KIF bottom ash/pyrite streams to create dry products for disposal in an approved on-site or off-site landfill. Some existing structures within the project footprint would be removed, the small area of shrubby upland forest may be cleared, and grassy areas and small wetlands may be impacted for new construction. The current stilling pond would no longer receive ash slurry inputs from the plant because the stream feeding the ponds would be pumped into the new dewatering facility to be dewatered and the dry product would be extracted. Water from the dewatering process would flow to an approved CCR pond system, minus the bottom ash.

Four federally listed species (gray bat, Indiana bat, piping plover, and red knot) and one federally proposed species (NLEB) may be present in the proposed project area. Bald eagle and Berry Cave salamander would not be impacted by the proposed actions, as suitable habitat for these species would not be impacted by actions associated with Alternative B.

No caves or other hibernacula for gray bat, Indiana bat, or NLEB exist in the project footprint or would be impacted by the proposed actions. Similarly, no summer roosting habitat for any of these species exists within the project footprint or would be impacted. Low quality foraging habitat exists for all three species over small wetlands located in the parking lot area within the proposed action area and over the ponds at KIF. Proposed activities may impact these wetlands and would eventually contribute to the drying of the ash ponds at KIF. The forest fragment found within the project area also may offer some foraging habitat for Indiana bat and NLEB. However, an abundance of higher quality drinking water and foraging habitat exists in the surrounding landscape over the Emory River and larger forested fragments. Proposed actions would not impact gray bat, Indiana bat, or NLEB.

Piping plover and red knot habitat does not exist within the project footprint. However, the proposed activities would eventually lead to the drying of the ash storage ponds at KIF where individuals of these species have been observed in the past. Prior to 2008, these ponds were frequently used by shorebirds and rare sightings of piping plover and red knot have occurred. Following the Kingston ash spill in 2008, most of the suitable habitat for these species has been removed, and the remaining portions have been repeatedly modified over the last six years. Shorebird use of this area has declined. Due to the loss of habitat and continual disturbance of any remaining habitat, it is unlikely that piping plover and red knot still utilize these ponds or would be impacted by any changes in these ponds. No impacts to piping plover and red knot are expected in association with the proposed action.

Previous construction, operation, and maintenance activities on KIF have resulted in significant disturbance that makes habitat on this parcel unsuitable for threatened or endangered plant species. Adoption of this alternative would result in some additional disturbance on the KIF site, but the action would not affect federal or state-listed plants because those species are not present within affected areas.

No suitable habitat for federally listed aquatic species occurs within the streams/ watercourses documented within the project area. Therefore, no direct impacts to state- or federally listed threatened and endangered aquatic species are anticipated to occur with adoption of Alternative B. Water discharges would be routed through Outfall 001 and would meet existing NPDES permit requirements. These NPDES requirements are designed to be protective of aquatic life in receiving waters. Therefore, no impacts to blue sucker or lake sturgeon found in Watts Bar Reservoir near KIF are anticipated.

3.6.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

No suitable habitat for federally listed aquatic species occurs within the streams/ watercourses documented within the project area. Therefore, no direct impacts to state- or federally listed threatened and endangered aquatic species are anticipated to occur with adoption of Alternative C. The proposed footprint of Alternative C would not impact any terrestrial habitat that would not be impacted by Alternative B.

3.7 Surface Water and Wastewater

KIF is situated on a peninsula formed by the confluence of the Clinch and Emory rivers at CRM 2.6. River flow rates past the site are regulated by upstream dams on the Clinch River (Melton Hill and Norris dams) and downstream on the Tennessee River by Watts Bar Dam. The flow rates are also influenced by upstream dam operations on the Tennessee River (Tellico and Fort Loudoun dams). Flow patterns can be complex in the Emory and Clinch rivers embayments. The Emory River flow fluctuates between flowing upstream from the Clinch River through the Emory River embayment to also flowing backwards upstream of KIF. Water is pushed up the Emory River because of inflows that raise the pool elevation in Watts Bar Reservoir. Such inflow typically occurs when the reservoir is filling in the spring or during a spring flood event. Different rates and timing of releases from Watts Bar, Fort Loudoun, and Melton Hill reservoirs can also cause reverse flows in the Clinch River arm of Watts Bar Reservoir. There is also the potential for water from the Clinch River to flow upstream into the Tennessee River during the filling of Watts Bar Reservoir.

These flow patterns are further complicated by temperature and density differences in the water. Warmer water is less dense and therefore stays on the surface of a reservoir. In the summer, the sun and ambient air temperatures warm the surface water, introduce thermal layering that becomes stable, and prevents mixing with deeper, cooler, and denser water. This stable thermal layering of water is known as stratification. The Emory River water also warms during summer. Norris Dam and Melton Hill Dam discharges tend to keep the Clinch River relatively cool despite increased air temperatures in the summer. When Clinch River water flows upstream into the Emory River embayment to the KIF water intakes in the summer, this cooler water flows along the bottom of the embayment, and the warmer Emory River water flows downstream over the top of the cooler Clinch River water.

Within the footprint of the proposed project area, one ephemeral and one intermittent stream are located in the median of the parking lot area on the northwest side of the project. This area would be used for truck staging or parking, as needed.

3.7.1 Affected Environment

3.7.1.1 Water Quality (Pre-December 2008)

The *Emergency Dredging for the Kingston Fossil Plant Ash Dike Failure Final Environmental Assessment* (TVA 2009a) describes the water quality prior to the December 2008 dike failure. The Emory River arm of Watts Bar Reservoir is on the state 303(d) list of impaired waters (TDEC 2014b) because of sediments contaminated with polychlorinated biphenyls (PCBs) and chlordane from industrial point sources. This area has been on the

303(d) list for these parameters since prior to 2002. The section of the Emory River above the influence of the Watts Bar impoundment is listed as impaired because of mercury from long-range atmospheric deposition (settling in the water from airborne sources). Several tributaries of the Emory River upstream of KIF are also listed as impaired because of manganese and iron concentrations and low pH; these conditions have most likely occurred from historic coal mining activities. A few of these upstream tributaries are also impacted by sediment due to construction and development or by pathogens from agriculture.

TVA conducted the Vital Signs Monitoring Program on Watts Bar Reservoir annually from 1991 through 1994. Values of good, fair, or poor are assigned to each metric monitored by TVA. The reservoir ratings for Watts Bar have fluctuated among “high,” “fair,” and “poor,” and have generally been influenced by reservoir flow conditions with the lowest ratings during droughts (TVA 2015).

3.7.1.2 Water Quality (KIF Dike Recovery, 2009 - Present)

The December 2008 KIF dike failure released approximately 5.4 million cubic yards of coal ash and about 327 million gallons of water.

Surface water monitoring has been conducted pursuant to the May 2009 Administrative Order and Agreement on Consent (the Order) between EPA Region 4 and TVA to address the December 2008 ash release from the KIF dike failure (EPA 2009).

As TVA’s remediation efforts progressed from completion of the time-critical removal action to implementation of the non-time critical removal action for the Swan Pond Embayment and Dredge Cell, surface water monitoring was tailored to collect data to assess the impact of these actions on river system water quality (TVA 2011a). TVA completed an evaluation of surface water monitoring data collected between January 1, 2011, and January 26, 2012, and concluded that a revision of the Surface Water Monitoring Plan was warranted (TVA 2012b).

To ensure that storm water run-off from the surrounding drainage basin was not contaminated as soon as it entered the embayment, an interim drainage system (the Clean Water Ditch) was constructed in mid-2009 to intercept clean run-off water and divert it around the ash, discharging to the Swan Pond Embayment and Emory River. A similar drainage system (the Dirty Water Ditch) was constructed to collect water flowing through the ash-filled embayment and routing it through a series of surface water sediment basins to allow the solids to settle out before discharging to the Clean Water Ditch.

Water from an adjacent ash-filled area, the East Embayment, also was collected and allowed to settle before discharging to the Clean Water Ditch and Emory River. Ash removal from this smaller embayment was completed in spring 2010 as part of the time-critical remediation phase; water from this embayment now flows directly into the Swan Pond Embayment and Emory River as it did before the spill.

The Surface Water Monitoring Plan was revised in January 2012, February 2013, and April 2014 as the restoration activities progressed. The monitoring plans varied with each revision, including reductions in the frequency of sampling at several locations (TVA 2014f).

Presently, the Clinch and Emory River arms of Watts Bar Reservoir are listed on the TDEC 303(d) list (TDEC 2014). The Clinch River arm continues to be listed because of PCBs, mercury, and chlordane contamination of the sediment from legacy (historical) pollutants, industrial point source discharges, and atmospheric deposition. Nearby tributaries to the Clinch River are also listed for PCBs, chlordane, and mercury; one nearby tributary is listed for arsenic.

The Emory River arm is also listed on the state 303(d) list (TDEC 2014) because of PCBs, mercury, and chlordane contamination of the sediment from legacy (historical) pollutants, industrial point source discharges, and atmospheric deposition. Additionally, the Emory River arm, including Swan Pond Creek embayment and the unnamed embayment, was previously listed because of ash spill related contamination, including arsenic and coal ash deposits; however, these areas have subsequently been delisted in the Proposed Final TDEC 2014, 303(d) list due to recovery efforts.

3.7.1.3 Existing Wastewaters and Drainage Areas

Several existing wastewater streams at KIF are permitted to be discharged by the Kingston NPDES permits (No. TN0080870 covers Outfall 01A and No. TN0005452 covers all other NPDES Outfalls) (TDEC 2003 and 2009a). The primary streams that would potentially be impacted by this proposed project would be the stilling impoundment discharge (Outfall 001), the Gypsum Disposal Area (GDA) leachate waste stream (currently discharged through Outfall 01A), and the condenser cooling water discharge (Outfall 002). Flows would be released to the Clinch River through the plant discharge channel (Outfall 002) at CRM 2.6.

3.7.1.4 Existing Coal Combustion Residuals Wastewater Treatment Facilities

KIF currently produces two ash-related CCR, fly ash and bottom ash, which are byproducts from coal combustion. Fly ash comprises approximately 80 percent and bottom ash is the remaining 20 percent of these CCR streams. Currently, fly ash is handled dry and is pneumatically conveyed to silos and stored at the Ash Processing Area (APA), also known as the “ball field.”

Stilling Impoundment (Outfall 001)

On average, 15.31 million gallons per day (MGD) of bottom ash sluice water and other constituent flows are discharged from the stilling impoundment via Outfall 001. Current inflow sources to this impoundment and its average annual daily flow is summarized in Table 3-2. The largest source other than the bottom ash sluice is the station sump discharge (7.712 MGD). The station sump primarily receives equipment cooling water, unit leakage, etc. The parameters of interest in the station sump discharge are pH, total suspended solids, oil, and grease. However, the sump discharge pH and alkalinity are usually near that of the KIF intake water.

Currently, the bottom ash sluice waste streams and other low volume waste streams are discharged from the plant into four dewatering bins that are approximately 40 feet long and approximately 16 feet wide. These bins are constructed of steel and are positioned in parallel in a trench to aid in the dewatering or settling out of the bottom ash. After which the bottom ash is removed via track hoe and dewatered in the ball field area. The wastewater continues on from the bins to the stilling impoundment, where it is discharged from Outfall 001.

Table 3-2. Inflow Sources to KIF Outfall 001

Stilling Impoundment (DSN 001)	Inflow to Impoundment (MGD)
Bottom ash sluice water and groundwater	6.814
Station sump discharge	7.712

Stilling Impoundment (DSN 001)	Inflow to Impoundment (MGD)
Precipitation	0.574
Water treatment plant wastes	0.267
Coal yard runoff pond discharge	0.145
Miscellaneous	0.031
Evaporation	-0.238
Total	15.305

Source of Flow Rates: Kingston Fossil Plant Storm Water and Wastewater Flow Schematic, NPDES Permit No. TN0005452.

A description of the ash pond mass balance of current operations is detailed in the Operational Impacts section below.

Flue Gas Desulfurization Storm Water Discharge (Outfall 01A)

Currently only the flue gas desulfurization wastewater stream and the GDA leachate are permitted to be discharged through Outfall 01A. Solids discharged from ash handling operations are not commingled with the gypsum waste stream. However, the solid waste permit has recently been modified to include the fly ash, bottom ash, and pyrite waste streams in addition to gypsum-related wastes in the GDA.

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct the proposed dewatering facility and the bottom ash sluice would continue to be handled as previously described and in accordance with the NPDES permit. KIF would continue to use the dewatering bins and ponding as a storage method for bottom ash. Thus, continued operations at KIF under the No Action Alternative would not be expected to cause any additional direct, indirect, or cumulative effects to local surface water resources. No impacts would occur to the ephemeral or intermittent streams in or adjacent to the proposed project area.

3.7.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Surface Water Withdrawal and Discharge

Withdrawal and discharge rates would not change with the implementation of Alternative B. The remainder of the discharges from the site would be leachate, minimal low volume wastewater flows, and storm water driven flows. The majority of the storm water flows would be managed through the implementation of BMPs and cleaning and maintenance plans. All other flows would be co-treated as process wastewater in the current impoundment system before discharge. The primary withdrawal usage plant-wide is for the condenser cooling water, which carries the majority (99.9 percent) of the thermal loading from KIF discharges at Outfall 002.

The discharge characteristics (including thermal loading) at Outfall 002 would not be changed by the current project. Thermal discharges from Outfall 001 would also not change. Raw and potable waters utilized in the bottom ash dewatering process, and storm water flows associated with this project would remain at ambient temperatures; therefore, no additional thermal impacts would be anticipated. Additionally, the discharge rate from this outfall would remain unchanged.

TVA would maintain wet surface impoundments on-site as required to support KIF's operations and continued management of wastewater streams. This treatment system would potentially be altered in the future in preparation for compliance with the CCR Rule, but would treat the same flows. This system change would be detailed and impacts assessed in a subsequent NEPA evaluation. When surface impoundments are closed, the closure would be regulated either by the NPDES permit or a closure plan.

Bottom Ash Dewatering Streams

The wastewater streams that could change under this alternative would be:

- Bottom ash sluice waste stream
- Surface runoff from the proposed bottom ash dewatering facility area
- Surface runoff from the APA area
- Altered GDA leachate
- Outage washes associated with plant activities and the bottom ash dewatering facility

Construction Impacts

Wastewaters generated during construction of the proposed project may include construction storm water runoff, dewatering of work areas, domestic sewage, non-detergent equipment washings, dust control water, and hydrostatic test discharges.

- **Surface Runoff**. Demolition and construction activities have the potential to temporarily affect surface water via storm water runoff. TVA would comply with appropriate state and federal permit requirements. Demolition and construction activities of the associated project would be located on the plant property. Appropriate BMPs would be followed, and proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to the receiving waters would be minimized. A General Permit for Storm Water Discharges Associated with Construction Activities is in effect that requires development of a project-specific SWPPP. This plan would identify specific BMPs to address construction-related activities that would be adopted to minimize storm water impacts. Additionally, BMPs, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* (Bowen et al. 2012), would be used to avoid contamination of surface water in the project area. Therefore, no significant impacts to surface water would be expected due to surface water runoff from the construction site. Additionally, impervious buildings and infrastructure prevent rain from percolating through the soil and result in additional runoff of water and pollutants into storm drains, ditches, and streams. The existing structures and infrastructure would be removed from the project site; however, they would be replaced with the covered dewatering facility, thus altering the current storm water flows. Because the site was partially covered with impervious structures, this construction would not significantly impact impervious surface area, but it would increase. Under the preferred alternative, the concentrated storm water flow from the project area would come primarily from the proposed facility's roof drains. This flow would need to be properly treated with either implementation of the proper BMPs or by diverting the storm water discharges to the stilling pond for co-treatment.

- **Domestic Sewage**. Portable toilets would be provided for the construction workforce as needed. These toilets would be pumped out regularly, and the sewage would be transported by tanker truck to a publicly-owned wastewater treatment works that accepts pump out.

- **Equipment Washing and Dust Control**. Equipment washing and dust control discharges would be handled in accordance with BMPs described in the Storm Water Pollution Prevention Plan for water-only cleaning and/or NPDES Permit TN 0005452.
- **Hydrostatic Testing**. These discharges would be handled in accordance with NPDES Permit TN0005452 or the TDEC General NPDES Permit for Discharges of Hydrostatic Test Water (TN670000).

With the implementation of appropriate BMPs, no significant impacts to surrounding surface waters are expected from construction activities.

Operational Impacts

Bottom Ash Dewatering Operations

The bottom ash that would be dewatered is presently sluiced from the power plant to a series of dewatering bins and then to the stilling impoundment. Currently the bottom ash sluice stream also sluices pyrites in addition to the bottom ash. For the purposes of this project the bottom ash and pyrites would remain commingled. The bottom ash and pyrites would go to the dewatering facility and would be dewatered and sent to an on-site landfill. The sluice water would then be released to an approved polishing/settling impoundment and ultimately discharged through Outfall 001. Clarified water would meet current NPDES permit limits.

To support the dewatering effort, an internal study was performed in 2011 to determine the potential wastewater management issues of the bottom ash and pyrite reject waste streams during the dewatering process. This study specifically focused on the solubility of the pyrite/coal mixture, both separately and combined, in the sluice water prior to and after the dewatering process. This study was performed utilizing KIF's dewatering design specifications, which included two submerged drag chain conveyors with clarifiers. KIF bottom ash and Widow's Creek Fossil Plant pyrite was used as source material and represented the worst case in this study as coal burned at Widows Creek Fossil Plant was similar to that burned at KIF (TVA 2011b).

The results of this study determined that the dewatering was of such a short duration that the metals and pyritic bacteria had little time to react and cause significant water chemistry changes, reducing the likelihood of pH and metal accumulation problems in the dewatered liquor stream. All metals concentrations were below TDEC's Water Quality Criteria limits. Furthermore the pH throughout the study period was found to be within pH range of 6 to 9 standard units. This study's results indicate that the waste stream that would be generated by this process would potentially meet the current TDEC pH and metals limits. These results; however, could vary greatly based on the nature and composition of the coal burned, the make-up water used in the system, and the moisture level of the bottom ash. The study did bring to light that the fines associated with this waste stream were much finer than were previously theorized and that meeting NPDES total suspended solids requirements in view of this discovery could possibly be more challenging should the discharge be routed directly to the Outfall 001 discharge (TVA 2011b).

Any discharges would initially be sent to either the dewatering bins and/or an on-site stilling or polishing impoundment for co-treatment and then released through a permitted outfall. No direct negative impacts to the surface waters would be anticipated from the operation of this facility because any discharges would be required to meet NPDES limits and

Tennessee Water Quality Criteria that are developed to be protective of designated uses. Additionally, associated process storm water associated with this facility would be routed to the stilling/polishing impoundment or a water treatment facility for treatment and release.

Discharge Characterization

In both the existing operation and the proposed mechanical dewatering operation, any discharges from the dry bottom ash system would initially discharge into an approved CCR polishing impoundment and then leave the facility through Outfall 001 to the condenser cooling water channel and discharge to the Clinch River at River Mile 6.2. The dewatering project would change the dynamics of the outfall discharge by removing the bottom ash in the transport water that would be treated by the impoundment system. The removal of this waste stream from the water stream along with implementation of wastewater treatment additives should reduce metals in this waste stream, along with controlling pH and total suspended solids concentrations.

To evaluate and characterize the changes in the Outfall 001 discharge once this alteration in receiving waters takes place, a mass balance of the stilling impoundment and the dewatered bottom ash was conducted to thoroughly evaluate the pond loading and chemical characteristics. A mass balance is a mathematical accounting of the sources (inflows) and sinks (outflows) of a substance within a system, such as a water body. A mass balance model for a water body is useful in understanding the relationship between the loadings of a pollutant and the levels in the water, biota, and sediments. These measures are useful in predicting potential impacts to water quality that may arise in the ash impoundment resulting from the changes to the bottom ash handling systems.

Results of the metals mass balance analysis under current operations and for future operations (i.e., following the bottom ash conversion) are presented in Tables 3-3 and 3-4, respectively. For the current operations analysis, metals data were collected from the Outfall 001 stilling impoundment discharge, the Flue Gas Desulfurization Storm Water Impoundment Outfall 01A discharge (including the GDA leachate), and the plant intake, from special studies of these waste streams. For the future operations analysis, metals data for the contributing streams were collected during a special TVA study to evaluate impacts of bottom ash dewatering. The projected river loadings were based on analyses of the KIF intake and the minimum one- day low flow that occurs once in 10 years (i.e., the “1Q10”) of 155.8 MGD from the Water Quality Based Effluent Calculations in the KIF NPDES Permit TN0005452 Rationale. The 1Q10 stream flow is the regulated low flow condition according to U.S. Geological Survey data for the protection of fish and aquatic life. The input data and assumptions used in the mass balance analysis are given in Tables 3-3 and 3-4.

Results of the mass balance analysis show that all the constituents except thallium would meet the TDEC lowest criteria (i.e., limit equal to minimum of the drinking water and aquatic toxicity limits). The thallium exception is an artifact produced by the method of treating censored data in mass balance calculations (i.e., values below detection limits set equal to one-half detection limit), and the fact that the thallium detection limit of 0.002 milligrams per liter (mg/L) exceeds the TDEC criterion of 0.00024 mg/L. The mass balance analysis indicates that the overall impact of current and future CCR operations would have no impacts to surface water quality.

The metals mass balance analysis for the proposed operations did not take into account any settling or treatment of metals that could occur in the ash treatment system. However, even without taking this into account, the in-stream metals concentrations would be below the Tennessee Water Quality Criteria as shown in Table 3-4, except for thallium for the same reason described above. Actually, as part of this proposed action, concentrations of aluminum, arsenic, barium, lead, manganese, nickel, thallium, and zinc all showed decreased concentrations. While chromium and iron concentrations increased in the dewatered waste stream, this increase could potentially be attributed to the pyrite component in the waste stream, which should be minimized due to the short duration contact with bottom ash. Consequently, future operations of the bottom ash dewatering facility would be expected to have minor impacts on the receiving stream and to be retrofitted to meet ELG requirements.

Table 3-3. KIF Mass Balance of Current Operations Alternative B

	Current Baseline Conditions		Current Operations							
Element	Intake Conc. (mg/L)	Intake Loading (lbs/day)	FGD SWP 01a** Conc. (mg/L)	FGD SWP 01a** Loading (lbs/day)	Ash Stilling Pond*** Conc. (mg/L)	Ash Stilling Pond*** Loading (lbs/day)	Projected Loading at DSN 002 (lbs/day)	Projected Conc. at DSN 002 (mg/L)	Total Discharge Conc. at Clinch River 1Q10 (mg/L)	Water Quality Criteria * Conc., (mg/L)
Aluminum	0.484	5172.45	2.700	0.12	0.793	103.17	5275.740	0.48193	0.48215	
Antimony	<0.002	10.687	<0.0010	0.00002	<0.002	0.130	10.817	0.00099	0.00099	0.0056
Arsenic	<0.002	10.687	<0.002	0.00004	0.00544	0.708	11.395	0.00104	0.00104	0.01
Barium	0.023	245.798	0.65	0.02873	0.051	6.609	252.436	0.02306	0.02305	2.0
Beryllium	<0.002	10.687	<0.001	0.00002	<0.002	0.130	10.817	0.00099	0.00099	0.004
Cadmium	<0.001	5.343	0.0144	0.00064	<0.001	0.065	5.409	0.00049	0.00049	0.002
Chromium	0.00411	43.923	0.013	0.00057	0.0022	0.286	44.210	0.00404	0.00405	0.1
Copper	0.00204	21.801	<0.002	0.00004	0.0033	0.432	22.233	0.00203	0.00203	0.013
Iron	0.454	4851.842	0.6	0.02652	1.01	131.405	4983.273	0.45521	0.45508	
Lead	<0.002	10.687	<0.002	0.00004	<0.002	0.130	10.817	0.00099	0.00099	0.005
Manganese	0.0334	43.399	0.024	0.00106	0.116	15.092	58.492	0.00534	0.00835	
Mercury	0.00000291	0.031	0.000515	0.00002	0.00000448	0.001	0.032	0.00000	0.000003	0.00005
Nickel	<0.002	10.687	0.0427	0.00189	0.00445	0.579	11.268	0.00103	0.00103	0.1
Selenium	<0.002	10.687	0.7336	0.03243	<0.002	0.130	10.849	0.00099	0.00099	0.02
Silver	<0.002	10.687	<0.0005	0.00001	<0.002	0.130	10.817	0.00099	0.00099	0.0032
Thallium	<0.002	5.343	<0.002	0.00002	<0.002	0.065	5.409	0.00049	0.00055	0.00024
Zinc	<0.0250	13.359	0.777	0.03434	0.0259	3.370	16.763	0.00153	0.00271	0.13

lbs/day = conc. in mg/L X flow in MGD X 8.34 lbs/gal.

	1297 MGD	Discharge at Outfall 002
CCW Flow	1281.4 MGD	River flow and data from KIF NPDES Permit application for Intake
FGD Storm Water (Outf:	0.0053 MGD	Outfall 01A Pond flow from Nalco Phase II
Stilling Pond Flow	15.6 MGD	Background during Phase I test Outfall 001
1Q10 River Flow	155.8 MGD	Low flow to evaluate Fish and Aquatic Life Criteria

Flows taken from NPDES flow schematic 2010 for permit No. TN0005452, except for Outfall 01A which was taken from discharge flow data.

Mass Discharge and Loadings were calculated using 0.5 the Minimum Detection Limit

*TDEC Criteria, Rule 1200-4-3-.03

**Ash Stilling Pond Data was taken during the Phase I Nalco testing event and the highest concentration during that testing was used

*** The FGD SWP (Outfall 01A) data were taken during Phase II Nalco sample event and the highest concentration during the testing was used with the corresponding intake data

Used ¼ of the RDL for thallium concentrations in the future ash pond discharge concentration because of continuous BDL results.

Table 3-4. KIF Mass Balance of Estimated Future Operations Alternative B

Element	Current Baseline Conditions		Current BAS		Estimated Future Operations									Water Quality Criteria * Conc., mg/L
	Intake Conc. (mg/L)	Intake Loading (lbs/day)	Current Bottom Ash Sluice Conc. (mg/L)	Current Bottom Ash Sluice Loading (lbs/day)	Dewatered*** Bottom Ash Sluice Conc. (mg/L)	Dewatered*** Bottom Ash Sluice Loading (lbs/day)	FGD SWP 01a** Conc. mg/L	FGD SWP 01a** Loading lbs/day	Ash Stilling Pond** Conc. mg/L	Ash Stilling Pond** Loading lbs/day	Projected Loading at DSN 002 lbs/day	Projected Conc. at DSN 002 mg/L	Total Discharge Conc. at Clinch River 1Q10 (mg/L)	
Aluminum	0.484	5172.45	3.92	222.77	1.70	96.61	2.700	0.12	0.793	103.17	5149.580	0.47606	0.47692	
Antimony	<0.002	10.687	<0.002	0.06	<0.001	0.03	<0.0010	0.00002	<0.002	0.130	10.789	0.00100	0.00100	0.0056
Arsenic	<0.002	10.687	0.007	0.42	0.002	0.12	<0.002	0.00004	0.00544	0.708	11.093	0.00103	0.00102	0.01
Barium	0.023	248.791	0.422	23.98	0.050	2.84	0.65	0.02873	0.051	6.609	234.288	0.02166	0.02180	2.0
Beryllium	<0.002	10.687	<0.002	0.06	<0.001	0.03	<0.001	0.00002	<0.002	0.130	10.789	0.00100	0.00100	0.004
Cadmium	<0.001	5.343	<0.001	0.03	<0.0005	0.01	0.0144	0.00064	<0.001	0.065	5.395	0.00050	0.00050	0.002
Chromium	0.00411	43.923	0.007	0.42	<0.001	0.03	0.013	0.00057	0.0022	0.286	43.815	0.00405	0.00406	0.1
Copper	0.00204	21.801	0.009	0.53	0.005	0.30	<0.002	0.00004	0.0033	0.432	21.996	0.00203	0.00203	0.013
Iron	0.454	4851.842	<0.001	0.03	1.600	90.93	0.6	0.02652	1.01	131.405	5074.171	0.46909	0.46747	
Lead	<0.002	10.687	0.006	0.33	<0.001	0.03	<0.002	0.00004	<0.002	0.130	10.520	0.00097	0.00098	0.005
Manganese	0.0334	356.942	0.097	5.54	0.043	2.44	0.024	0.00106	0.116	15.092	368.937	0.03411	0.03403	
Mercury	0.00000291	0.031	0.000003	0.00	No Data		0.000515	0.00000	0.00000448	0.001	0.032	0.00000	0.0000029	0.00005
Nickel	<0.002	10.687	0.006	0.32	0.002	0.13	0.0427	0.00189	0.00445	0.579	11.075	0.00102	0.00102	0.1
Selenium	<0.002	10.687	<0.002	0.06	<0.001	0.03	0.7336	0.03243	<0.002	0.130	10.821	0.00100	0.00100	0.02
Silver	<0.002	10.687	<0.002	0.06	<0.0005	0.01	<0.0005	0.00001	<0.002	0.130	10.774	0.00100	0.00100	0.0032
Thallium	<0.002	10.687	<0.002	0.03	<0.001	0.01	<0.002	0.00002	<0.002	0.065	10.738	0.00099	0.00094	0.00024
Zinc	<0.0250	13.359	0.055	3.11	<0.010	0.03	0.777	0.03434	0.0259	3.370	13.677	0.00126	0.00247	0.13

lbs/day = conc. in mg/L X flow in MGD X 8.34 lbs/gal.

	1297	MGD	Discharge at Outfall 002
CCW Flow	1281.4	MGD	River flow and data from KIF NPDES Permit application for Intake
FGD Storm Water	0.0053	MGD	Outfall 01A Pond flow from DMR data
Stilling Pond Flow	15.6	MGD	Average during Phase I test of flow from Outfall 001
1Q10 River Flow	155.8	MGD	Flow to evaluate Fish and Aquatic Life Criteria
BAS Flow	6.814	MGD	

Mass Discharge and Loadings were calculated using 0.5 the Minimum Detection Limit

*TDEC Criteria, Rule 1200-4-3-.03

**Ash Stilling Pond Data was taken during the testing event and background informaiton was used in this evaluation

*** Bottom Ash Dewatering Data was collected during the Bottom Ash Recycle Study and was taken from a once through recycle with a TSS of 120 mg/L

Used ¼ of the RDL for thallium and beryllium concentrations in the future ash pond discharge concentration because of continuous BDL results.

Flows taken from NPDES flow schematic 2010 for permit No. TN0005452, except for Outfall 01A which was taken from discharge flow data.

On-site Landfill Leachate

The dewatered bottom ash would be trucked and stored in the on-site landfill which has a liner system that consists of a 2 feet compacted clay layer with hydraulic conductivity of less than 1 x 10^{-7} centimeters per second with a 60-milimeter high density polyethylene (HDPE) flexible membrane layer above the clay. The leachate collection system is comprised of a drainage blanket that drains to sumps. The leachate is collected and pumped into the lined Flue Gas Desulfurization Storm Water Impoundment and discharges via NPDES Outfall 01A. The current leachate waste stream is a low flow waste stream with relatively low levels of solids and metals. The addition of the bottom ash, pyrite, and fly ash waste streams to this landfill has the potential to change the characterization of the leachate waste stream. The flow is not expected to change because it is precipitation driven, but the concentrations of constituents could possibly change. Reactions of the pyritic solid with storm water in the landfill would be buffered by the unreacted lime in the gypsum and the medium in the leachate collection system, thus reducing the potential of a concentrated acidic leachate stream. A more neutral leachate stream would prohibit metal accumulation issues in this waste stream. This leachate waste stream can either be discharged out of Outfall 01A or, if it requires additional treatment, can be diverted to leachate holding tanks where it can be treated and released or adequately disposed of off-site. Consequently, potential impacts to surface water under Alternative B would be minor.

3.7.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

This alternative would have similar impacts to the construction, dewatering and leachate impacts noted above in Alternative B. However, the operational, withdrawals, and discharges details and impacts would be altered with this alternative as discussed below.

Surface Water Withdrawal and Discharge

Withdrawal and discharge rates would be altered with the implementation of Alternative C. This alternative would require additional make-up/recirculation water streams consisting of approximately 300 to 600 gpm, which would result in increasing the withdrawal for this stream by approximately 0.864 MGD. This would increase the total withdrawals by 0.07 percent plant wide.

Discharge rates would also change with this alternative. It is assumed that 15 percent blowdown would be required in order to maintain a balance in the recirculating system. Theoretically, approximately 1.02 MGD of blowdown water would be managed for this system in accordance with ELG and CCR regulations. Therefore, no bottom ash sluice transport water would be discharged from Outfall 001, thus reducing this flow by 6.814 MGD. During outages the waste stream from the system could range between 0.2 to 0.5 MGD to purge the system. This waste stream would also be managed to comply with the ELGs and the CCR rule. The primary withdrawal usage plant-wide is for the condenser cooling water, which carries the majority (99.9 percent) of the thermal loading from KIF discharges at Outfall 002.

The discharge characteristics (including thermal loading) at Outfall 002 would change very little by the current project. Thermal discharges from Outfall 001 would also not change. Raw and potable waters utilized in the bottom ash dewatering process, and storm water flows associated with this project would remain at ambient temperatures; therefore, no additional thermal impacts would be anticipated.

Operational Impacts

Bottom Ash Dewatering Operations with Recirculating Sluice Water

The bottom ash dewatering process would be similar to the process described in Alternative B with the addition of recirculating the majority of the bottom ash sluice transport water. This recirculation would include a make-up water stream, a continuous blowdown stream and a waste stream. The make-up water stream would be additional raw water that would replace or supplement the water lost from evaporation or leakage. As mentioned above this waste stream withdrawal rate would range from 300 to 600 gpm. Not only would make-up water ensure that water lost in the system was replaced, but it would help to balance the pH and other chemical constituents in the recirculating system. This would ensure the integrity of the system's infrastructure and materials of manufacture.

Wastewater would flow from the dewatering conveyor to the clarifier and process flow tanks and lastly into a wastewater containment facility prior to being recirculated. The containment facility would be a place where water would be temporarily held to ensure sufficient resources would be available to support bottom ash sluicing operations for all nine units. The blowdown stream would blow down from the containment facility and would help to regulate the hydraulic flow levels from all nine generation units. A 15 percent blowdown stream has been approximated for this process stream, which would reduce the existing bottom ash discharge by 5.79 MGD to 1.02 MGD. Any discharge from the system would be contained and reused on site to support and improve current operations.

Due the decrease in discharge rate and concentrations from this process under Alternative C, potential benefits to water quality are anticipated.

Stilling Impoundment Characterization

In this alternative, any discharges from the bottom ash system would be managed in accordance with the ELGs. In this case, it is assumed that no bottom ash stream is directly discharged to comply with ELG regulations. To evaluate and characterize the changes in the Outfall 001 discharge once this alteration in receiving waters takes place, a mass balance of the stilling pond and the dewatered bottom ash with recirculation was conducted to thoroughly evaluate the pond loading and chemical characteristics.

Results of the metals mass balance analysis for future operations, i.e., following the bottom ash conversion with recirculation, is presented in Table 3-5. As in Alternative B, for the future operations analysis, metals data for the contributing streams were collected during a special TVA study to evaluate impacts of bottom ash dewatering.

Results of the mass balance analysis show that all the constituents except thallium would meet the TDEC lowest criteria (i.e., limit equal to minimum of the drinking water and aquatic toxicity limits). The thallium exception is an artifact produced by the method of treating censored data in mass balance calculations (i.e., values below detection limits set equal to one-half detection limit), and the fact that the thallium detection limit of 0.002 mg/L exceeds the TDEC criterion of 0.00024 mg/L. The mass balance analysis indicates that the overall impact of current and future CCR operations do not have significant impacts to surface water quality.

Table 3-5. KIF Mass Balance of Future Operations with Bottom Ash Recirculation System

Element	Current Baseline Conditions		Current BAS		Estimated Future Operations							
	Intake Conc. (mg/L)	Intake Loading (lbs/day)	Current Bottom Ash Sluice Conc. (mg/L)	Current Bottom Ash Sluice Loading (lbs/day)	FGD SWP 01a** Conc. mg/L	FGD SWP 01a** Loading lbs/day	Ash Stilling Pond** Conc. mg/L	Ash Stilling Pond** Loading lbs/day	Projected Loading at DSN 002 lbs/day	Projected Conc. at DSN 002 mg/L	Total Discharge Conc. at Clinch River 1Q10 (mg/L)	Water Quality Criteria * Conc., mg/L
Aluminum	0.484	5172.45	3.92	222.77	2.700	0.12	0.793	103.17	5052.971	0.46713	0.46894	
Antimony	<0.002	10.687	<0.002	0.06	<0.0010	0.00002	<0.002	0.130	10.760	0.00099	0.00100	0.0056
Arsenic	<0.002	10.687	0.007	0.42	<0.002	0.00004	0.00544	0.708	10.974	0.00101	0.00101	0.01
Barium	0.023	245.798	0.422	23.98	0.65	0.02873	0.051	6.609	228.454	0.02112	0.02132	2.0
Beryllium	<0.002	10.687	<0.002	0.06	<0.001	0.00002	<0.002	0.130	10.760	0.00099	0.00100	0.004
Cadmium	<0.001	5.343	<0.001	0.03	0.0144	0.00064	<0.001	0.065	5.381	0.00050	0.00050	0.002
Chromium	0.00411	43.923	0.007	0.42	0.013	0.00057	0.0022	0.286	43.787	0.00405	0.00405	0.1
Copper	0.00204	21.801	0.009	0.53	<0.002	0.00004	0.0033	0.432	21.701	0.00201	0.00201	0.013
Iron	0.454	4851.842	<0.001	0.03	0.6	0.02652	1.01	131.405	4983.245	0.46069	0.45997	
Lead	<0.002	10.687	0.006	0.33	<0.002	0.00004	<0.002	0.130	10.491	0.00097	0.00097	0.005
Manganese	0.0334	356.942	0.097	5.54	0.024	0.00106	0.116	15.092	366.500	0.03388	0.03383	
Mercury	0.00000291	0.031	0.000003	0.000187	0.000515	0.00000	0.00000448	0.001	0.031	0.000003	0.0000029	0.00005
Nickel	<0.002	10.687	0.006	0.32	0.0427	0.00189	0.00445	0.579	10.943	0.00101	0.00101	0.1
Selenium	<0.002	10.687	<0.002	0.06	0.7336	0.03243	<0.002	0.130	10.793	0.00100	0.00100	0.02
Silver	<0.002	10.687	<0.002	0.06	<0.0005	0.00001	<0.002	0.130	10.760	0.00099	0.00100	0.0032
Thallium	<0.002	5.343	<0.002	0.03	<0.002	0.00002	<0.002	0.065	5.380	0.00050	0.00050	0.00024
Zinc	<0.0250	13.359	0.055	3.11	0.777	0.03434	0.0259	3.370	13.648	0.00126	0.00247	0.13

lbs/day = conc. in mg/L X flow in MGD X 8.34 lbs/gal.

	1297 MGD	Discharge at Outfall 002
CCW Flow	1281.4 MGD	River flow and data from KIF NPDES Permit application for Intake
FGD Storm Wate	0.0053 MGD	Outfall 01A Pond flow from DMR data
Flow	15.6 MGD	Average during Phase I test of flow from Outfall 001
1Q10 River Flow	155.8 MGD	Flow to evaluate Fish and Aquatic Life Criteria
BAS Flow	6.814 MGD	

Mass Discharge and Loadings were calculated using 0.5 the Minimum Detection Limit

*TDEC Criteria, Rule 1200-4-3-.03

**Ash Stilling Pond Data was taken during the testing event and background informaiton was used in this evaluation

*** Bottom Ash Dewatering Data was collected during the Bottom Ash Recycle Study and was taken from a once through recycle with a TSS of 120 mg/L

Used ¼ of the RDL for thallium and beryllium concentrations in the future ash pond discharge concentration because of continuous BDL results.

Flows taken from NPDES flow schematic 2010 for permit No. TN0005452, except for Outfall 01A which was taken from discharge flow data.

The metals mass balance analysis for the proposed operations with the recirculation system did not take into account any settling or treatment of metals that could occur in the ash treatment system. However, even without taking this into account, the in-stream metals concentrations would be below the Tennessee Water Quality Criteria, as shown in Table 3-4, except for thallium for the same reason described above. Due to the proposed decreased discharge rate as part of this alternative, slight decreases were noted in most of the metals concentrations when compared to the results of the future operations without recirculation concentrations in Table 3-3. Consequently, future operations of the bottom ash dewatering facility with a recirculating system would be expected to have minor effects on the receiving stream.

3.8 Groundwater and Geology

3.8.1 Affected Environment

KIF is located in the Valley and Ridge Physiographic Province and is underlain by Cambrian-aged rocks of the Conasauga Group and Ordovician-aged rocks of the Knox group. The Valley and Ridge aquifer consists of folded and faulted carbonate, sandstone,

and shale. Soluble carbonate rocks and some easily eroded shales underlie the valleys in the province, and more erosion-resistant siltstone, sandstone, and cherty dolomite underlie ridges. The arrangement of the northeast-trending valleys and ridges is the result of a combination of folding, thrust faulting, and erosion. Compressive forces from the southeast have caused these rocks to yield, first by folding and subsequently by repeatedly breaking along a series of thrust faults. The result of the faulting is that geologic formations are repeated several times across the region. Carbonate-rock aquifers in the Chickamauga, Knox, and Conasauga groups are repeated throughout the Valley and Ridge Physiographic Province (Lloyd and Lyke 1995).

Groundwater is derived from infiltration of precipitation and from lateral inflow along the western boundary of the reservation. Groundwater movement generally follows topography with flow in an easterly direction from Pine Ridge toward the Emory River and Watts Bar Reservoir. An exception to this trend occurs on the northern margin of the ash disposal area where groundwater movement is northerly toward Swan Pond Creek. Groundwater originating on, or flowing beneath, the site ultimately discharges to the reservoir without traversing off-site property.

The chemical quality of water in the freshwater parts of the Valley and Ridge aquifers is similar for shallow wells and springs. The water is hard, is a calcium-magnesium-bicarbonate type, and typically has a dissolved-solids concentration of 170 mg/L or less. In places where the residuum that overlies the carbonate rocks is thin, the Valley and Ridge aquifers are susceptible to contamination by human activities (U.S. Geological Survey and TDEC 1995).

Public drinking water for Roane County is supplied by surface water sources. Public groundwater sources in Roane County were closed prior to December 2008, except for one, and it is located approximately 10 miles east of the project area.

3.8.1.1 Groundwater Monitoring

Historically, prior to the KIF dike failure, unfiltered groundwater samples were collected semiannually from at least four monitoring wells associated with the Dredge Cell and analyzed for 17 inorganic constituents. Following the December 2008 KIF dike failure, EPA, TDEC, and TVA crews sampled water to assess the quality of public drinking water supplies, private wells, in-stream river water (both near the slide and at multiple downstream locations), and local springs. Currently, plant-wide, groundwater monitoring plans require monitoring of wells associated with the Dredge Cell, the Ash Disposal Area, the APA (the ball field area that is currently used as storage for bottom and fly ash), and the on-site landfill. Groundwater monitoring of the Dredge Cell and the Ash Disposal Area is accomplished through a network of six wells, while the on-site landfill monitoring is accomplished through a network of seven wells, and the APA requires the monitoring of three wells. While there have been a few detections of some groundwater constituents in samples collected at the site since 2009, at very low levels, none of these constituents were detected at levels that exceeded the applicable regulatory maximum contaminant levels.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct and operate the proposed dewatering facility. KIF would continue to use ponding as a storage method for bottom ash. Project-related environmental conditions in the project area with respect to groundwater are not expected to change. Thus, continued operations at KIF under the No Action Alternative would not be expected to cause any additional direct, indirect, or cumulative effects to local groundwater resources.

3.8.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Construction

The majority of excavations associated with the proposed dewatering facility would be shallow (less than about eight feet deep), and would not be expected to encounter significant groundwater. Pilings which would be installed to support the dewatering facility may be deeper. Pilings would be driven into the ground and would not expose surface activity to groundwater. The pilings are constructed of re-enforced concrete and would not impact groundwater. Groundwater control, if needed, would be limited to short-term dewatering from excavations. BMPs, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* (Bowen et al. 2012), would be used to avoid contamination of groundwater in the project area. BMPs would be used to control sediment infiltration from storm water runoff during construction phases of the project. With the use of BMPs, and adherence to TDEC Rule 0400-11-7, there would be no significant impacts to groundwater or groundwater resources.

Operations

Potential sources of groundwater contamination resulting from operations of the proposed dewatering facility include releases resulting from the transfer pipe system and run-off from the covered storage silos and bottom ash dry storage areas. Much like the construction-related affects, these potential impacts can be sufficiently mitigated with the use of appropriate BMPs.

The dewatered bottom ash would be trucked and stored in the GDA, which has a liner system that consists of a two foot thick compacted clay layer with hydraulic conductivity of less than 1×10^{-7} centimeters per second with a 60-mil HDPE geomembrane liner over that. The leachate collection system is comprised of a granular drainage blanket that drains to sumps. The leachate is collected and pumped into the lined Flue Gas Desulfurization Storm Water Pond and discharges via NPDES Outfall 01A. Groundwater resource impacts of this option would be insignificant. The liner and leachate collection system would essentially eliminate downward migration of gypsum and ash leachate from the landfill into the underlying groundwater system. This, in turn, would mitigate metals- and ammonia-related impacts to the Clinch River resulting from potential influx of local groundwater. Additionally, holding tanks have been constructed to collect leachate wastewater where it can be treated or adequately disposed of. Consequently, no significant impacts to groundwater under Alternative B are expected.

3.8.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

The impacts to groundwater from this alternative would be identical to those of Alternative B. The construction of the dewatering facility with recirculation system would decrease the volume of water discharged, resulting in a potential benefit to groundwater quality.

3.9 Wetlands

3.9.1 Affected Environment

Wetlands are those areas inundated by surface or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas are also found along the edges of most watercourses and impounded waters (both natural and man-made). Wetland habitat provides valuable public benefits, including flood/erosion control, water quality improvement, wildlife habitat, and recreation opportunities.

Wetland determinations were performed at KIF according to the U.S. Army Corps of Engineers standards, which require documentation of hydrophytic (wet-site) vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Lichvar and Kartesz 2009). Broader definitions of wetlands, such as that used by the USFWS (Cowardin et al. 1979), the Tennessee definition (Tennessee Code 11-14-401), and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review. The TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001), specific to the TVA region (TVA Rapid Assessment Method, or TVARAM) was used to categorize wetlands by their functions, sensitivity to disturbance, rarity, and ability to be replaced (Appendix C).

TVARAM scores are used to classify wetlands into three categories. Category 1 wetlands are considered “limited quality waters.” They represent degraded aquatic resources having limited potential for restoration with such low functionality that lower standards for avoidance, minimization, and mitigation can be applied. Category 2 and 3 wetlands are moderate and high quality, respectively.

The proposed project lies within the KIF property along the Emory River, near the Clinch River confluence. KIF is located in the Southern Limestone/Dolomite Valleys and Low Rolling Hills of the Ridge and Valley ecoregion. Land use/land cover data show that wetlands comprise less than 1 percent of the overall land use within the Emory River watershed (TDEC 2002). In January 2015, wetlands surveys were conducted within the proposed dewatering facility site boundary. Three wetland features were identified and mapped within the project footprint (Table 3-6, Figure 3-1).

Table 3-6. Wetlands Identified within the Project Footprint

Wetland ID	Wetland Type [a]	TVARAM Category (Score)	Acreage
W01	PEM1E	1 (19)	0.25
W02	PEM1E	1 (13)	0.01
W03	PEM1E	1 (13)	0.01
		TOTAL	0.27

[a] Classification (Cowardin et al. 1979): E = Seasonally flooded/saturated; PEM1 = Palustrine emergent, persistent vegetation

Wetland 001 (W001) consists of a linear drainage feature in a wide flat that has developed wetland parameters. This drain is a man-made feature created, straightened, and/or aligned for the purpose of channeling water on the site. W001 is bound on either side by gravel haul roads. This wetland feature runs 750 feet long by 12 feet wide, comprising 0.25 acre. W001 contained standing water at the time of the site visit, and presumed hydrologic connectivity via culverts. This wetland area exhibited the presence hydric soils. W001 was dominated by hydrophytic vegetation consisting of cattails (*Typha latifolia*) and soft pathrush (*Juncus effusus*).

Wetland 002 (W002) is 0.01 acre and contains emergent vegetation and a ponded area that appears to have resulted from a blocked culvert. W002 contained approximately 12 inches of standing water at the time of the site visit, with wetland vegetation identified peripherally and central to this pocket depression within a longer drain. Soils were saturated and there were indicators of hydric soils. Hydrophytic vegetation dominated the emergent strata of W002 and consisted of soft path rush.

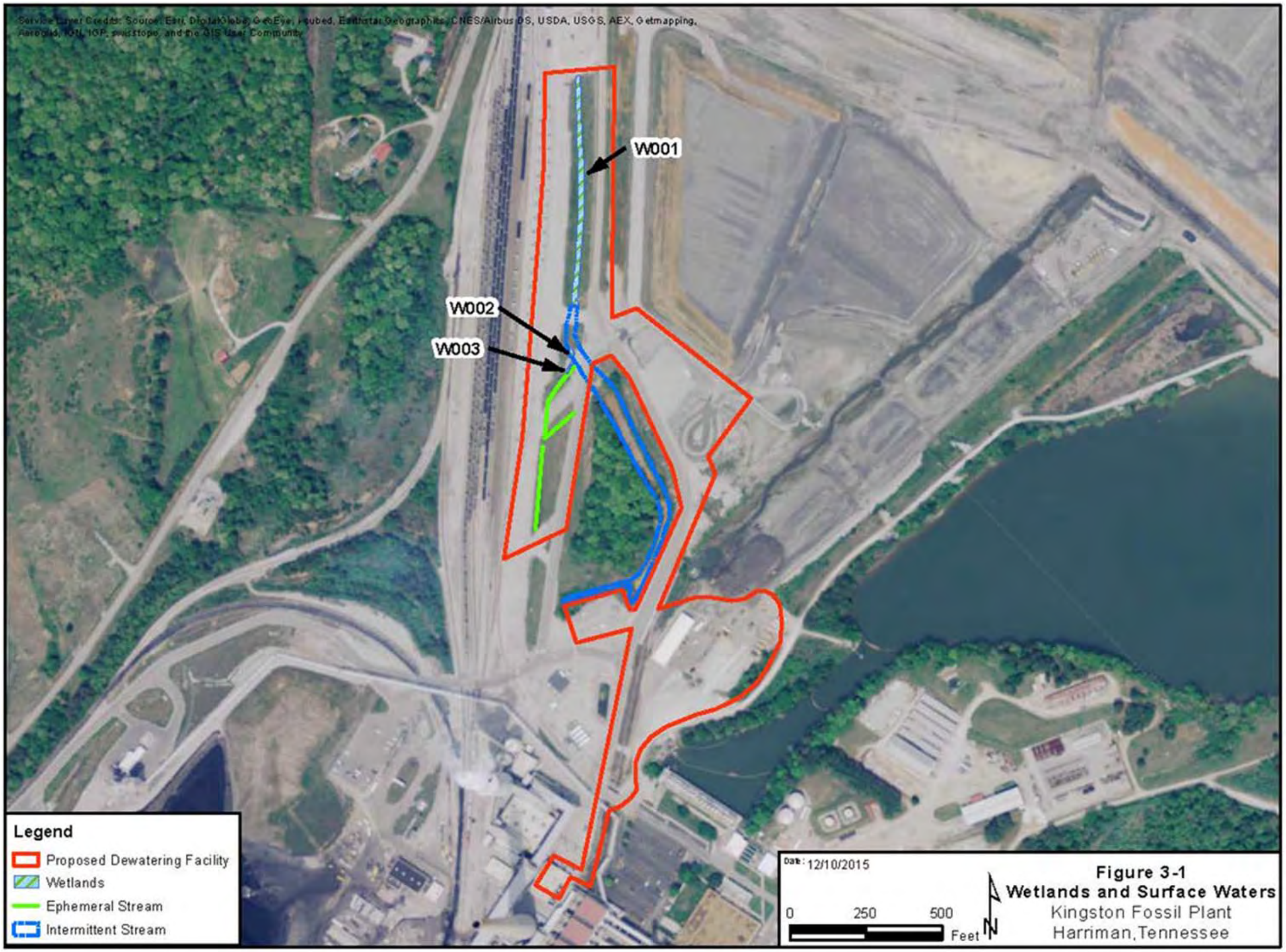
Wetland 003 (W003) has developed in a small drain feeding W002. W003 is 0.01 acre and contains emergent wetland vegetation within a heavily disturbed channel containing rip-rap. Some large rocks have fallen into the channel bed, restricting the soil profile to 6 inches depths in parts. Standing water, hydric soil indicators, and saturated soils were evident during the site visit. W003 was dominated by mowed cattails, a hydrophytic species.

Based on the connectivity of these wetlands via an intermittent stream upgradient and to the Emory River downgradient, they were considered waters of the United States and under the jurisdiction of the U.S. Army Corps of Engineers and State of Tennessee.

3.9.2 Environmental Consequences

Activities in wetlands are regulated under Section 401 and 404 of the Clean Water Act and are addressed by Executive Order (EO) 11990 (Protection of Wetlands). Section 401 requires water quality certification by the state for projects permitted by the federal government (Strand 1997). Section 404 implementation requires activities resulting in the discharge of dredge or fill material into waters of the United States be authorized through a Nationwide General Permit or Individual Permit issued by U.S. Army Corps of Engineers. EO 11990 requires federal agencies to minimize wetland destruction, loss, or degradation, and preserve and enhance natural and beneficial wetland values, while carrying out agency responsibilities. The executive order is not intended to prohibit impacts to wetlands in all cases, but rather to create a consistent government policy against such disturbance unless there is no practicable alternative.

Figure 3-1. Wetlands and Surface Waters



3.9.2.1 Alternative A – No Action

Adoption of the No Action Alternative would not result in impacts to wetlands as no alterations or construction activities would occur to or near wetlands. Wetlands within the project footprint would experience continued influence from operation and maintenance of the site, and would likely be maintained in their current state as emergent wetland habitat.

3.9.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Under Alternative B, construction, operation, and maintenance of the proposed dewatering facility would occur adjacent to the project footprint where the three identified wetlands are located. These wetlands are located in the parking lot area. This area would not be impacted by construction or operation of the project. TVA would implement BMPs to minimize wetland impacts, obtain required permits, adhere to permit conditions, and provide compensatory wetland mitigation as mandated such that no net loss of wetland resources would occur.

Cumulative impact analysis of wetland effects takes into account existing wetland function related to wetland loss and conversion at a watershed scale. Proposed wetland impacts would be insignificant on a cumulative scale due to the existing poor condition these wetlands maintain coupled with federal wetland regulations and associated permit conditions governing no net loss of wetland resources. Similarly, the wetlands on-site are in poor condition and provide low function to the surrounding watershed as indicated by the TVARAM scores (Appendix C). Therefore, potential impacts to 0.27 acre of low quality wetland would not contribute to a cumulative loss of wetland resources within the watershed.

In compliance with the Clean Water Act, EO 11990, and NEPA, TVA has considered all alternatives to avoid and minimize wetland impacts. The proposed dewatering facility would be situated within the KIF property to avoid wetland impacts to the extent practicable while allowing for construction of the dewatering facility.

Any temporary wetland impacts resulting from the construction of the dewatering facility would be minimized to the extent possible through the implementation of BMPs. If permanent wetland dredge or fill is proposed, TVA will comply with the Clean Water Act, adhere to permit requirements as dictated by U.S. Army Corps of Engineers, and ensure no net loss of wetland resources. Therefore, with these measures in place, and no plan to modify these wetlands, the proposed project would have no direct, indirect, and/or cumulative impacts to wetland areas and the associated wetland functions and values.

3.9.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Because Alternative C has the same project boundary as Alternative B and would be similar in operation, Alternative C would have the same wetland impacts as Alternative B. The major difference is the basin, which is currently a gravel lot over ash. Therefore, with the measures in place as described in Alternative B and no plan to modify these wetlands, the proposed project would have no impacts to wetland areas and the associated wetland functions and values.

3.10 Floodplains

3.10.1 Affected Environment

A floodplain is the relatively level land area along a stream or river that is subjected to periodic flooding. The area subject to a 1 percent chance of flooding in any given year is normally called the 100-year floodplain. The area subject to a 0.2 percent chance of flooding in any given year is normally called the 500-year floodplain.

The Emory River 100-year flood elevation at the proposed project area is 747.8 feet above mean seal level; and the 500-year flood elevation is 750.2 feet above mean sea level. The existing ground elevation of the proposed dewatering facility is about elevation 760 feet above mean sea level.

3.10.2 Environmental Consequences

As a federal agency, TVA is subject to the requirements of EO 11988, Floodplain Management. The objective of EO 11988 is "…to avoid to the extent possible the long- and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (U.S. Water Resources Council 1978). The Executive Order is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances. The Executive Order requires that agencies avoid the 100-year floodplain unless there is no practicable alternative. For certain "critical actions," the minimum floodplain of concern is the 500-year floodplain, which is the area subject to inundation from a 500-year (0.2 percent annual chance) flood.

The Federal Emergency Management Agency defines "critical actions" as follows: "Critical actions include, but are not limited to, those which create or extend the useful life of structures or facilities: …(d) such as generating plants, and other principal points of utility lines" (44 CFR Chapter 1, Part 9.6, Floodplain Management and Protection of Wetlands, Definitions, last amended October 1, 1985). Therefore, the proposed dewatering facility would be considered a "critical action."

3.10.2.1 Alternative A – No Action

Under the No Action Alternative, construction and operation of the dewatering facility would not occur. Therefore, there would be no direct, indirect, or cumulative impacts to floodplains because there would be no physical changes to the current conditions found within the local floodplains.

3.10.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Under Alternative B, TVA would design and construct a new bottom ash dewatering facility located at approximate ground elevation 760 feet above mean sea level. Potential flooding of the dewatering facility could occur from the Emory River. The dewatering facility would be located outside of the Emory River 100-year floodplain and above the 500-year flood elevation, which would be consistent with EO 11988 requirements for critical actions. Therefore, there would be no direct, indirect, or cumulative impacts to floodplains because there would be no physical changes to the current conditions found within the local floodplains.

3.10.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Given that Alternative C has the same project boundary as Alternative B, the project impacts would be the same on floodplains under Alternative C as in Alternative B. The recirculating basin would be outside the 100-year floodplain and above the 500-year flood elevation. Therefore, there would be no impacts to floodplains because there would be no physical changes to the current conditions found within the local floodplains.

3.11 Natural Areas, Parks and Recreation

3.11.1 Affected Environment

Six developed public recreation areas are located in the general vicinity of the project site. Two of these areas, which include a boat launching ramp on the KIF reservation, and a boat launching ramp on the left bank of Watts Bar Reservoir, are located within 0.5 mile of the proposed dewatering project boundary. Other recreation areas in the area, including Kingston City Park, Ladd Park, Sugar Tree boat ramp, and Swan Pond recreation area, are located more than one mile from the project. Recreational use patterns in this area of Watts Bar Reservoir include general boating, boat and bank fishing, swimming, water sports, and shoreline picnicking.

The TVA Natural Heritage database indicated that Kingston State Wildlife Management Area and Refuge occurs within 0.10 mile of the proposed project. Kingston State Wildlife Management Area is 1,900 acres managed by the state of Tennessee for waterfowl and small game hunting.

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action

Under this alternative, the project would not be undertaken and the natural areas, parks recreation facilities, and public use patterns on this section of Watts Bar Reservoir would not be affected.

3.11.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Because developed public recreation areas in the vicinity of the project and the Kingston Wildlife Recreation Area are a minimum of 0.1 mile from the project site, and considering that the project would be located within a developed power plant reservation, no direct or indirect impacts to natural areas, parks, or recreational use of these areas are anticipated. Likewise, the project would have no impacts on surface water recreational use patterns in this area of the Watts Bar Reservoir.

3.11.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Given that Alternative C has the same project boundary as Alternative B, the project impacts under Alternative C would be the same on natural areas, parks, and recreation as Alternative B, which would have no impact.

3.12 Cultural and Historic Resources

3.12.1 Affected Environment

Cultural resources include prehistoric and historic archaeological sites, districts, buildings, structures, and objects, and locations of important historic events that lack material evidence of those events. Cultural resources that are included or considered eligible for inclusion in the National Register of Historic Places (NRHP) maintained by the National Park Service are called historic properties. Federal agencies are required by the National Historic Preservation Act and by NEPA to consider the possible effects of their undertakings on historic properties.

To be included or considered eligible for inclusion in the NRHP, a cultural resource must possess integrity of location, design, setting, materials, workmanship, feeling, and association. In addition, it must also meet one of four criteria: (a) association with important historical events; (b) association with the lives of significant historic persons; (c) having distinctive characteristics of a type, period, or method of construction, or representing the work of a master, or having high artistic value; or (d) having yielded or having the potential to yield information important in history or prehistory.

The area of potential effect (APE) is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The APE for archaeological resources consists of the proposed dewatering facility. The APE for architectural resources consists of the 0.805-km (0.5 mile) area surrounding the proposed dewatering facility as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

On March 2, 2015, Tennessee Valley Archaeological Research conducted the architectural survey of the APE (Karpynec and Weaver 2015). An archaeological study was not warranted due to the highly disturbed nature of the proposed project area. The survey identified one previously unrecorded architectural resource (HS-1/KIF). TVA provided their findings to the Tennessee State Historic Preservation Office on May 23, 2015 indicating that the project would not impact historical or cultural resources. The State Historic Preservation Office replied May 29, 2015 and concurred with TVA's findings. TVA finds KIF is ineligible for inclusion in the NRHP due to modern alterations and additions that have compromised the physical integrity of the facility. The United Keetoowah Band of Cherokee Indians in Oklahoma responded on April 30, 2015 and had no comments or objections.

3.12.2 Environmental Consequences

3.12.2.1 Alternative A – No Action

No historic properties would be affected under the No Action Alternative.

3.12.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Significant ground disturbance associated with the construction of KIF has occurred within the archaeological APE and the proposed project area. TVA finds that the undertaking would not affect archaeological or historic resources included or eligible for inclusion in the NRHP.

3.12.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Since Alternative C will remain inside the project boundaries described in Alternative B, the cultural resource impacts of implementing Alternative C are the same as Alternative B and TVA finds that the undertaking would not affect archaeological or historic resources included or eligible for inclusion in the NRHP.

3.13 Solid Waste and Hazardous Waste

3.13.1 Affected Environment

A site visit to the proposed project site was conducted on November 17, 2014. Site conditions were noted and photos were taken of the current conditions. The project includes five separate areas that constitute the 14 acre site. Features present in these areas were evaluated and photographed during the site visit and any issues related to potential solid or hazardous waste noted. Results are summarized in Table 3-7. Concrete slabs and foundations to be removed are not listed in Table 3-7, as they do not contain any materials of concern.

Table 3-7. Summary of Materials of Concern by Structure

Building or Area Name	Materials of Concern Potentially Present	Proposed Action
Transformer Station	None	This area would be unchanged except for additional tie-ins for the new building.
Truck Wash Staging Area	Potential ash, asphalt	This area would have vehicles and equipment removed and the ground leveled for new construction, any ash removed would be disposed of on-site. Asphalt would be disposed at a C&D landfill.
Parking Lot	Asphalt	This area may have new asphalt applied and old removed.
Building Site	Ash pile or ash below grade	This area would have vehicles and equipment removed and the ground leveled for new construction and any ash disposed of on-site.
Sluice Pipe	Potential ash removal in sluice channel prior to connecting pipe, old pipe	This area would have some piping removed and the ditch modified where construction would take place.

Solid waste (construction debris and graded surfaces [potentially ash]) would be generated during the construction and earth moving activities. Any construction debris generated from the project would be disposed of on-site, in an existing construction and demolition (C&D) landfill or recycled. Also, construction vehicles and equipment activities on-site would require specialized materials that would need to be handled with care, including but not limited to, fuels, lubricating oils, welding materials, paints, and sealants. The truck wash facility is the only structure proposed for demolition as part of this project. Hazardous materials are not expected to be used in the construction or operation of the new dewatering facility; therefore, it is not anticipated that the proposed project would generate any hazardous wastes.

3.13.2 Environmental Consequences

3.13.2.1 Alternative A – No Action

Under the No Action Alternative the dewatering facility would not be built and no hazardous or solid substances would be generated from construction or operation activities.

3.13.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Under this alternative, generation of hazardous waste is not anticipated. However, a limited amount of construction debris would be generated, which would be placed in roll-offs and disposed of as construction waste in an off-site C&D landfill. Limited amounts of used oil, paint, welding material, etc., could be generated from construction equipment. Any wastes, such as paint waste or used oil, generated or spilled during the actual construction project, would be characterized for the appropriate disposal option or recycled.

During operation of the proposed dewatering facility solid wastes would be generated. The dewatering facility would handle 16.5 tph of combined bottom ash and pyrite slurry from the generating units. These solid waste materials would be disposed of in the on-site or off-site landfill. TVA received permit approval from TDEC for disposal of the CCR in the on-site landfill on September 29, 2015. To accommodate the potential addition of the dewatered CCR to the on-site landfill, a more enhanced liner and leachate collection system would be incorporated in the facility design in order to be protective of groundwater. The design of this containment system exceeds the standards and requirements of TDEC Class II rules, and the newly promulgated CCR regulations. To address potential subgrade issues, a robust subgrade construction quality assurance plan and an enhanced mitigation work plan have been developed.

Any solids generated during construction of the project due to grading would be disposed of in the on-site landfill (ash) or used as potential fill or grading material during the project. Material that might be used as fill consists of parking lot material (gravel) or clean soil, as generated from the excavation of the top three inches of surface material from the entire dewatering site. Based on the waste handling procedures and lack of hazardous materials during the construction and operation of the proposed facility, no impacts from the release or solid or hazardous waste are anticipated.

3.13.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

The requirements for Alternative C would be similar to Alternative B as the footprints and processes are similar. It is not anticipated that the operation of the dewatering facility would vary significantly in terms of its effects on solid and hazardous wastes as compared to Alternative B since the ash would still need to be hauled to a landfill. Alternative C would still generate ash to be hauled to the landfill, but no impacts from the release of solid or hazardous waste are anticipated.

3.14 Land Use and Prime Farmland

3.14.1 Affected Environment

Prime farmland soils, as defined by the U.S. Department of Agriculture, are those soils that have the best combination of physical and chemical properties for production of agricultural crops (United States Department of Agriculture 1995). The concern that continued conversion of prime farmland to nonagricultural use would deplete the nation’s resource of productive farmland prompted creation of the 1981 Federal Farmland Protection Policy Act. The act set guidelines that require federal agencies to evaluate land prior to permanently converting it to nonagricultural land use. Form AD 1006, “Farmland Conversion Impact Rating,” is required to be completed with assistance from the Natural Resources Conservation Service before an action is taken when prime farmland is involved.

The proposed dewatering facility would be located on the northern portion of the KIF site. The soils in the area of the KIF site have formed in residuum and alluvium deposits of limestone, shale, and dolomite bedrock. Most are considered deep to moderately deep soils and are either moderately well-drained or well-drained soils. Two soil types are identified on the Kingston site, Ash Disposal Area (377 acres) and Urban Land (243 acres), according to the Web Soil Survey of Roane County, Tennessee (National Resources Conservation Service 2013). The soils identified on the proposed dewatering site are identified as Urban Land. The Roane County Zoning Office indicates that the TVA property is zoned as industrial (Roane County personal communication, 2015). The project site area is currently in an industrial setting and consists of soils that are not classified as prime farmland and Form AD 1006 is not required.

3.14.2 Environmental Consequences

3.14.2.1 Alternative A – No Action

Under the No Action Alternative, the potential impacts to the site would be similar to Alternative B. Land use and prime farmland classification would not change. No direct or indirect impacts to land use would occur under the No Action Alternative.

3.14.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Land use under this alternative would not change. The current land use designation for the project area is industrial and would remain industrial. The dewatering facility would be constructed on the KIF site in an area previously classified as not prime farmland. Therefore, no impacts to land use or prime farmlands would occur under this alternative.

3.14.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Alternative C would also not change the land use, and Alternative C's footprint is outside of prime farmlands. Therefore, no impacts to land use or prime farmlands would occur under this alternative.

3.15 Roadway Transportation

The existing conditions of resources along the proposed transport route and the potential effects of the proposed alternatives on these resources are described in this section.

3.15.1 Affected Environment

The site is generally accessible via Swan Pond Circle Road as it comes off U.S. Highway 70, goes beneath I-40, and then splits into Swan Pond Road and Steam Plant Road. Steam Plant Road goes directly to the facility, while Swan Pond Road passes to the north. Population in the immediate area is sparse, with only a few dwellings in the vicinity. KIF is served by highway and railway modes of transportation. U.S. Highway 70 provides truck and automobile access via Steam Plant Road to KIF. Access from I-40 is via SR 66 south to U.S. Highway 70 to Steam Plant Road. Table 3-8 compares existing roadway capacities with current average annual daily traffic (AADT) (Tennessee Department of Transportation 2013, North Carolina Department of Transportation 2011). Traffic volumes on the existing roadway system are currently below capacity.

Table 3-8. Current Average Annual Daily Traffic

Roadway	Typical Section	AADT Capacity	2013 AADT
I-40	Freeway	58,500	34,400
U.S. Highway 70	Major thoroughfare, two-lane	12,900	9,970
SR 66 south of I-40	Minor thoroughfare, two-lane	12,700	8,735
Swan Pond Road at KIF	Rural, two-lane	12,100	3,038

3.15.2 Environmental Consequences

3.15.2.1 Alternative A – No Action

If Alternative A is selected, TVA would continue to follow the current operating plan, which includes the ongoing maintenance of the coal-fired powerhouse and its related structures and parking. No changes or impacts to current transportation activities associated with KIF are anticipated under this alternative.

3.15.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Alternative B would involve construction and operation of the proposed dewatering facility. Transportation-related concerns for the surrounding roadway infrastructure under this alternative would be minor and would consist primarily of temporary increases of construction traffic to and from the facility. Truck traffic volumes in the vicinity could increase temporarily for a short period, having a short-term impact on the capacity of the roadway system in the area.

The dewatering facility is projected to generate approximately 16.5 tph of bottom ash and 6.5 tph (on an intermittent basis) of pyrites, which would result in approximately 200,000 tons per year of CCR. The assumption was made that CCR hauling would begin as soon as the proposed dewatering facility is operational. A truck has a 30-ton capacity, and CCR was assumed to have 20 percent moisture content once it was loaded onto the truck.

Based on 260 work days per year, approximately 26 truck trips per day would be generated on days the CCR would be hauled. Since CCR would be hauled to an on-site landfill, consideration must be given to the impacts of additional truck traffic to the internal roadway infrastructure at KIF. For an assumed 8-hour work day, approximately three to four truck trips per hour would result. This level of truck traffic is expected to have a minor impact on the KIF roadways. The proposed action would not affect traffic on public roads.

3.15.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

If Alternative C is selected, the effects of construction activities would be similar to those resulting from Alternative B. Although the construction would take approximately the same amount of time, related activities would be somewhat more pronounced because of the greater complexity of the project, creating a higher level of additional construction-related traffic. As with Alternative B, construction activities are not expected to have a minor impact on the KIF roadways. There would be no difference in operational transportation impacts than described in Alternative B.

3.16 Visual Resources

Visual resources were evaluated based on existing landscape character, distances of available views, sensitivity of viewing points, human perceptions of landscape beauty/sense of place (scenic attractiveness), and the degree of visual unity and wholeness of the natural landscape in the course of human alteration (scenic integrity).

3.16.1 Affected Environment

KIF is located near the towns of Harriman and Kingston. The surrounding topography ranges from gently sloping near the banks of the Clinch River to moderate to steeply sloping ranges at Pine Ridge to the northwest. Forest is visible along the slopes leading up from the valley floor to the hilltops above. Scattered private residences are visible to the west along Swan Pond Road. To the northeast and the southeast, slightly obscured from view, residential development increases in density.

The KIF stacks and plant buildings are dominant elements in the landscape for recreational river users and motorists traveling on nearby roadways within the foreground (i.e., within 0.5 mile from the observer) and middleground (0.5 mile to four miles from the observer) (Figure 3-2) viewing distances. Plant employees, visitors, and visitors to the recreational area, located along the Watts Bar Reservoir and Clinch River, currently have views of taller elements within the plant site.

The proposed dewatering facility would be constructed within the KIF site boundary. The proposed project would be located near the existing Bottom Ash Dewatering Area and dewatering bins and to the north of the powerhouse building. The facility would include a building for the SDCCs, clarifiers, process water tank, and utility lines. Maximum height of these structures would be 45 feet. Views from the south of the proposed dewatering facility would be blocked due to large plant structures and changes in elevation. The scenic attractiveness of the proposed project area is common to minimal, and the scenic integrity is low due to the existing industrial nature of the site.

Parks, places of worship, cemeteries, schools, and medical centers were identified within the middleground viewing distance of the proposed dewatering facility. However, due to changes in elevation, vegetation, and existing plant structures, the majority of these landmarks would not be visually impacted by the construction of the new dewatering facility. Approximately eight private residences and/or homesteads and one place of worship were identified as being located within 0.5 mile of the proposed dewatering facility (Figure 3-3). Line of sight analysis determined that the view from Swan Pond Baptist Church is slightly obscured due to vegetation and elevation changes (Figure 3-4).

3.16.2 Environmental Consequences

3.16.2.1 Alternative A – No Action

Adoption of the No Action Alternative would mean that KIF would remain as is and there would be no changes to the viewshed. Alternative A would pose no impacts to existing visual resources.

3.16.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Alternative B would not significantly alter the current visual environment. Views to and from the Clinch River would remain the same with the KIF stacks and associated buildings at heights of over 1,000 feet as major visual features in the foreground and intercepting the view of the new dewatering facility, which would have a maximum height of approximately 45 feet.

Under Alternative B, the proposed dewatering facility may be visible to the dispersed private residences in the foreground and middleground to the north and west. With the new dewatering facility construction, the adoption of this alternative would have no impacts to existing visual resources.

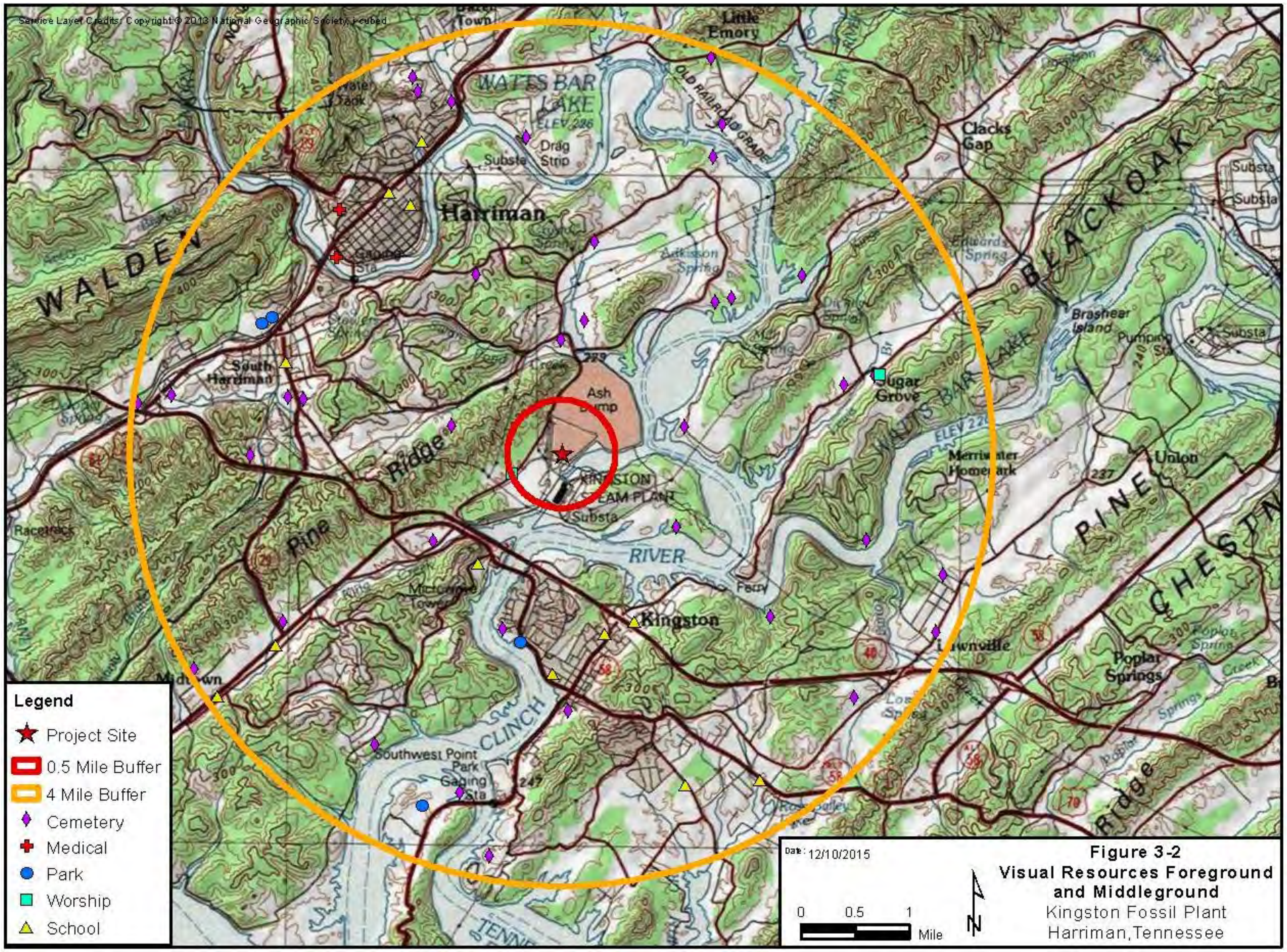


Figure 3-2. Visual Resources Foreground and Middleground

Figure 3-3. Visual Resources Foreground

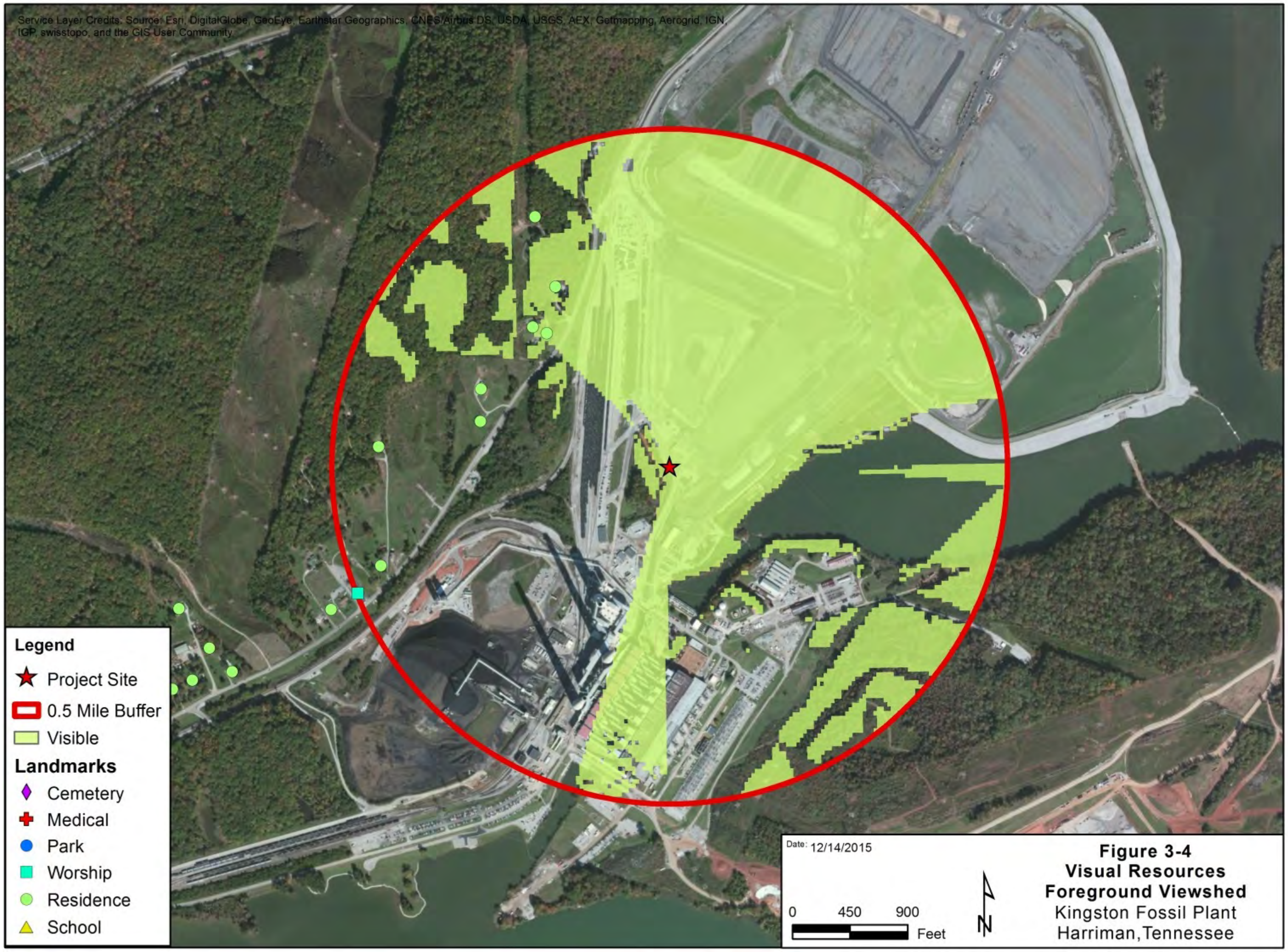


Figure 3-4. Foreground Viewshed

3.16.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Implementing Alternative C would create similar visual changes as Alternative B given the similarities of processes and buildings. The view of the new dewatering facility and the recirculation basin would be expected views given the industrial setting, so viewers would adapt quickly to the new buildings. Therefore, there are no impacts to existing visual resources.

3.17 Noise

3.17.1 Affected Environment

The area surrounding KIF consists for the most part of semi-rural, sparsely populated areas along the outer limits of the towns of Harriman and Kingston, Tennessee. There are some small waterfront subdivisions along the bank of the Clinch River south of KIF. The closest homes are located approximately 1,000 to 2,000 feet west of KIF. Population density within one mile of KIF is low.

Noise is measured in logarithmic units called decibels (dB). Given that the human ear cannot perceive all pitches or frequencies in the sound range, noise measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel, or the dBA. A-scale weighting reflects the fact that a human ear hears poorly in the lower octave-bands. It emphasizes the noise levels in the higher frequency bands heard more efficiently by the ear and discounts the lower frequency bands.

The equivalent sound level, or L_{eq}, is the constant sound level that conveys the same sound energy as the actual varying instantaneous sounds over a given period. It averages the fluctuating noise heard over a specific period as if it had been a steady sound. The day-night sound level, or L_{dn}, is the 24-hour average noise level with a 10-dBA penalty between 10 p.m. and 7 a.m. to account for the fact that most people are more sensitive to noise while they are sleeping.

There are no federal, state, or local regulations for community noise in Roane County; however, EPA (1973) guidelines recommend that L_{dn} not exceed 55 dBA. Research by the U.S. Air Force has established suggested levels of annoyance experienced by nearby receptors to various background L_{dn} levels (Table 3-9).

Table 3-9. Estimated Annoyance from Background Noise

L_{dn} (dBA)	Percent Highly Annoyed	Average Community Reaction
75 and above	37%	Very severe
70	25%	Severe
65	15%	Significant
60	9%	Moderate
55 and below	4%	Slight

Source: U.S. Air Force et al. 1992.

As noted earlier, noise levels near KIF typically are well below 55 dBA, with only occasional excursions beyond that level.

Typical noise measurements at residences in a semi-rural setting can average 46 dBA during periods without trains or coal unloading. Usually the loudest noises are from cars driving on the gravel road; traffic in this type of area is typically very light. Based on 2009 background noise level measurements made under similar conditions at KIF, noise from ash handling at the power plant along with coal unloading can create average noise levels of 51 dBA near the residences (TVA 2009b). Periodically, while trains are passing on the main railroad tracks, noise levels can approach approximately 73 dBA near the residences. Overall, the homes experience relatively low noise levels much of the time; however, there are intermittent periods of high noise levels caused by passing trains and coal delivery trains.

3.17.2 Environmental Consequences

3.17.2.1 Alternative A – No Action

If Alternative A is selected, TVA would continue to follow the current operating plan, which includes the ongoing maintenance of the coal-fired powerhouse and its related structures and parking. No changes to current noise levels surrounding KIF are anticipated, and therefore there would be no noise related impacts, under this alternative.

3.17.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

If Alternative B is selected, construction activities would last approximately 12 to 15 months. Most of the work would occur during the day on weekdays. Construction activities would result in a minor increase to traffic on roads near the plant, which would result in minor increases in intermittent noise at some nearby residences. During construction, noise would be generated by a variety of construction equipment, including compactors, front loaders, backhoes, graders, and trucks. Due to the temporary nature of construction, and the site's semi-rural location and distance to the nearest receptors (approximately 0.5 mile), noise from construction is expected to cause no minor, short-term impacts. Operation of the dewatering facility would result in low noise levels as the SDCC would be contained in a building and would be inaudible to local residence. No noise related impacts are anticipated related to operation of the facility.

3.17.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

If Alternative C is selected, the effects of construction activities would be similar to those resulting from Alternative B. Although the construction would take approximately the same amount of time, related activities would be somewhat more pronounced because of the greater complexity of the project, creating a higher level of additional construction-related noise. As with Alternative B, noise from construction activities is expected to cause minor, short-term impacts. The operation of the additional equipment under this alternative, such as electric pumps, inside the building should not perceptively change the ambient noise environment. The other activities are the same as Alternative B, so the operational noise is expected to cause no noise related impacts.

3.18 Socioeconomics and Environmental Justice

3.18.1 Affected Environment

KIF is located northwest of the City of Kingston in Roane County, Tennessee, and southwest of the city of Harriman. Roane County is part of the Knoxville Metropolitan Statistical Area, which includes Anderson, Blount, Campbell, Grainger, Knox, Loudon, Morgan, Roane, and Union counties in Tennessee.

3.18.1.1 Socioeconomics

According to 2008-2012 American Community Survey estimates the population of Roane County is estimated to be 53,047. Of the other counties in the project area, the largest county is Knox, with an estimated population of 444,622. The next largest county is Blount County with a population of 125,099. Anderson County has an estimated population of 75,542, and Loudon County's population is 50,448. Union County has a population of 19,102, which is the least of all counties in the project area (U.S. Census Bureau, 2014).

Average income levels in Roane County are slightly lower than the state and national levels. According to estimates from 2012, per capita personal income was $36,356 in Roane County, almost 83 percent of the national average of $43,735 and 94 percent of the state average of $38,752. The workforce in Roane County is mostly comprised of Educational Services, Health Care and Social Assistance, with 18.2 percent of employment, which is less than the 22.53 percent state average and 22.9 percent national average. Professional, Scientific, Management, and Administrative Services account for approximately 16 percent of employment in the county, which is greater than the state and national average (Bureau of Economic Analysis 2014).

3.18.1.2 Environmental Justice

Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Under EO 12898, Environmental Justice, federal agencies identified in that Executive Order are to address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. While EO 12898 does not apply to its actions, TVA assesses environmental justice impacts in its environmental reviews.

The minority population in Roane County is 6 percent of the total, according to the American Community Survey 2008-2012 estimates. This is well below the state and national levels of 23.3 percent and 28.5 percent, respectively. KIF is located in Census Tract 307, Block Group 2. The minority population is about 2 percent of the total population of the block group (U.S. Census Bureau 2014).

The poverty level in Roane County is 14.4 percent, which is slightly lower than the state average of 17.3 percent and the national average of 14.9 percent. Poverty levels in the vicinity of KIF are similar to those in the county. Census Tract 307 has a poverty level of 15.8 percent, which is slightly higher than the county level of 14.4 percent but lower than the state level of 17.3 percent (U.S. Census Bureau 2014).

No concentrations of minority or low-income populations have been identified, and population in the area is generally dispersed.

3.18.2 Environmental Consequences

3.18.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct the dewatering facility. There would be no project related changes to population under this alternative. Under the No Action Alternative current employment trends in the area would likely continue with most of the employment in the existing economic sectors of Education, Health Care and Social Assistance. There would be no new job creation. Minority and low-income populations in the area would not be impacted. Therefore, no impacts to socioeconomics or to environmental justice would be anticipated under the no action alternative.

3.18.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

All work for the proposed project would be conducted on-site and would create temporary construction jobs for 65 full-time construction workers over a period of 1.5 years, adding short-term benefits to the economy of the region, while 10 to 12 new operation jobs would be created to provide long-term benefits. The dewatering facility would be operated through existing employees in the main power plant. Therefore, there would be a beneficial impact to socioeconomics associated with the creation of short-term and long-term construction jobs.

Minority and low-income populations in the area would not be disproportionately impacted by the project. While minority and/or low-income populations are present in the project vicinity, no notably adverse community impacts are anticipated with this project; no disproportional impacts to minority and low-income populations are anticipated. There would be a potential beneficial impact to minority and low-income populations associated with the creation of short-term and long-term construction jobs.

3.18.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

The impacts of implementing Alternative C would be similar to Alternative B as the majority of the processes are the same. The construction period would be similar, but the additional equipment and basin would cost several million dollars more. Temporary construction jobs for Phase 1 of over 65 full-time workers for a period of 1.5 years are anticipated. This would increase the potential positive economic benefit, but given the size of the project and the lack of an environmental justice community compared to other areas, the additional money would cause only a short-term and minor benefit. Phase 2 would require additional time and workers at levels yet to be determined. As with Phase I, given the size of the project and the lack of an environmental justice community compared to other areas, this would only constitute a short-term and minor benefit. The operation of the recirculation basin and associated equipment would not change the maintenance requirements considerably, so no additional operational jobs would be required. As described for Alternative B existing employees would handle operations associated with the dewatering system. Therefore, as described for Alternative B, there would be a potential beneficial impact to minority and low-income populations associated with the creation of short-term and long-term construction jobs.

3.19 Safety

3.19.1 Affected Environment

KIF is bounded by the Clinch River to the south and the Emory River to the east. The areas north and west of KIF are sparsely populated.

The site is generally accessible via Swan Pond Circle Road as it comes off U.S. Highway 70, goes beneath I-40, and then splits into Swan Pond Road and Steam Plant Road. Steam Plant Road goes directly to KIF, while Swan Pond Road passes to the north. The KIF campus is surrounded by a chain link security fence, with guarded entrance gates. Population in the immediate area (within approximately 0.5 mile to the south) is very sparse, with only a few dwellings in the vicinity. A recreation area and a scenic overlook are located north of KIF. Because activity related to the proposed alternative would take place at KIF, public health and safety-related impacts to the general population would be insignificant.

It is TVA policy that contractors have in place a site-specific health and safety plan prior to conducting construction activities at TVA properties. A health and safety plan would also be required for workers responsible for operating the systems after construction is complete.

3.19.2 Environmental Consequences

3.19.2.1 Alternative A – No Action

If Alternative A is selected, TVA would continue to follow the current operating plan, which includes the ongoing maintenance of the coal-fired powerhouse and its related structures and parking. No changes to current public health and safety concerns associated with KIF are anticipated under this alternative. There would be no impacts to safety under Alternative A.

3.19.2.2 Alternative B – Construction/Operation of Dewatering Facility without Recirculation

Alternative B would involve construction and operation of the proposed dewatering facility. Public health and safety concerns related to this activity would be minor and would consist primarily of potential incidents with construction traffic to and from the facility. No hazardous materials that might affect human safety are expected to be utilized under this alternative. Therefore, the impacts to safety are expected to be minor and temporary under Alternative B.

3.19.2.3 Alternative C – Dewatering System with a Recirculated Bottom Ash Sluice Stream

Alternative C would involve construction and operation of the coal ash dewatering system with a recirculated bottom ash sluice basin. As with Alternative B, public health and safety concerns related to this activity would be minor and would consist primarily of potential incidents with construction traffic to and from the facility. No hazardous materials that might affect human safety are expected to be utilized under this alternative. Therefore, the impacts to safety are expected to be minor and temporary under Alternative C.

3.20 Cumulative Impacts

Cumulative impacts are defined in the *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (Council on Environmental Quality 1987) as follows:

> "Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

This section discusses those resources and receptors that could result in perceivable, but insignificant, cumulative impacts from TVA's alternative actions. For the proposed alternative, no substantive cumulative impacts are expected.

The past present and future projects anticipated at KIF include the following:

- **Complete Haul Road and Leachate Collection on Phase 1B Landfill (GDA)**. The haul road and leachate collection system would enhance hauling capability of dry ash to the on-site landfill. The leachate collection system would provide a more efficient collection of leachate from the landfill such that any additional leachate from the bottom ash disposed of in the landfill could be collected and treated in compliance with new CCR rules.

- **Closure of the Interim Ash Processing Area (commonly referred to as the "ball field site")**. Closure of this area would remove any storage area for the current bottom ash dredged from the dewatering bins. Alternative C will not be impacted by the closure of this area as it is not required for this alternative. The Ash Processing Area flows are precipitation driven and drain to the stilling pond. This waste stream would change once the dry bottom and fly ash streams are moved to the GDA landfill. The preliminary plan for this Interim Ash Processing Area would be to remove the existing ash and to cap the storage area for other various uses that have yet to be fully evaluated. Impacts associated with this project would be evaluated at a later time in a subsequent NEPA evaluation and design process. However, with the removal of the ash and the capping of this area the water quality of this waste stream would be expected to improve and should not pose a threat to surface water quality.

- **Drainage and Flow Management Design and Stilling (Settling) Impoundment Closure**. Construction of a new drainage system and closure of the stilling impoundment would not impact the proposed project as the wastewater generated by the dewatering facility would be recirculated while the plant process water would be directed to the Coal Yard Runoff Impoundment and/or Polishing Impoundment. As part of the potential drainage and flow management changes, KIF outage washes would include periodic discharge from the facility to the dewatering bins and/or the stilling impoundment, and ultimately through Outfall 001. These washes are usually released from the facility through the station sumps or the bottom ash sluice lines. As part of preparation for compliance with the CCR Rule, plans are under development to alter the routing of these waste streams to be held and reused on-site. Impacts associated with these waste streams will be evaluated at a later time in a subsequent NEPA evaluation and design process. However, the water quality of this waste stream would not be expected to change and with proper treatment should not pose a threat to surface water quality.

- **Permitting of the On-Site Landfill**. A permit modification to the Kingston Class II GDA to include the bottom ash was approved by TDEC September 29, 2015. This disposal area design includes a composite liner system consisting of a 2-feet thick low permeability compacted clay liner coupled with 60-mil HDPE geomembrane liner that encompasses the entire cell floor and side slopes. This is a significant improvement to the original permit and construction, where the liner system consisted of a higher permeability compacted clay liner with a geosynthetic clay liner placed only at the cell floor. The proposed liner system under the major permit modification meets the liner system requirements set forth by EPA's Final CCR Rule published in December 2014.

For the proposed alternative, no substantive cumulative impacts are expected in association with most resource areas. The implementation of the proposed alternative could have cumulative impacts to air quality, transportation, noise, visual resources, and water quality. These resource areas are addressed in the following sections.

3.20.1 Air Quality, Transportation, and Noise

Slight amounts of dust, traffic, and noise would result from the construction of the dewatering facility and associated truck traffic. Impacts would be cumulative with the construction of the new haul road, closure of the ballfield, construction of new drainage system, and closure of the stilling pond. However, these impacts would be minimized by dust suppression and watering of roads and traffic impacts and noise would be temporary and minor.

3.20.2 Visual Resources

Implementation of Alternative C would have cumulative but minor visual impacts with the above other projects identified at KIF. There may be some visual discord during the construction and subsequent post-construction maintenance period due to an increase in personnel and equipment and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until all areas have been restored through the use of TVA standard BMPs.

3.20.3 Water Quality

Water quality of Outfall 001 is currently in compliance with all NPDES permit requirements and TDEC’s water quality criteria. The dewatering and recirculation facility would remove bottom ash and pyrites that are currently sluiced to the stilling impoundment and would reuse the sluice water to recirculate bottom ash to the dewatering facility. With the removal of bottom ash and particularly pyrites, the concentration of trace metals – particularly iron and manganese, which make up the largest percentage of pyrites, would be reduced. This and the recirculation of sluice water would lower the potential risk of discharge of these and other metals from Outfall 001.

3.21 Unavoidable Adverse Environmental Impacts

Construction of the proposed dewatering and recirculation facility would cause minor, temporary adverse effects to air quality in the form of fugitive dust and exhaust emissions from construction equipment. On-site handling and transportation of CCRs are expected to generate minor amounts of fugitive dust. Similarly, hauling CCRs off-site to market or disposal would also produce vehicular exhaust emissions and contribute to traffic loads on local roadways. However, these cumulative effects are expected to be minor.

3.22 Relationship of Short-Term Uses and Long-Term Productivity

KIF will be used exclusively for the purpose of generating electric power for the foreseeable future. Much of the plant site is occupied by generating equipment and associated facilities, such as the coal storage area, switchyard, ash ponds, and ash disposal areas. However, some portions of the site are vacant, undeveloped areas. The proposed dewatering facility would be constructed on an area currently occupied by a gravel lot and a truck wash area with paved pad. Because the entire site is dedicated to electric power production, no loss of productivity of other natural resources, such as timber, minerals, etc., is anticipated. Likewise, use of a portion of KIF for the proposed dewatering and recirculation facility is not expected to result in a short-term or long-term loss of productivity of the site.

3.23 Irreversible and Irretrievable Commitments of Resources

As used here, irreversible commitments of resources include the use or consumption of nonrenewable resources as a result of a decision or implementing a proposed action. For example, extraction of ore is an irreversible commitment. Irretrievable commitments involve the use or commitment of resources for a period of time, even a long period. An example of an irretrievable resource commitment is the loss of timber production on a newly-cleared transmission line right-of-way through a previously forested area. In that case, removal of the transmission line and the right-of-way would eventually result in the restoration of forest land and timber productivity.

Construction and operation of the proposed dewatering and recirculation facility would result in the irreversible commitment of certain fuels, energy, building materials, and process materials, such as thickening agents. TVA's use of portions of the KIF site for the proposed dewatering facility would constitute a cumulative irretrievable commitment of land resources and land use for the life of KIF. However, as stated above, this land is currently in some form of industrial use and will not include conversion of natural resources or other land use.

CHAPTER 4 - LIST OF PREPARERS

4.1 NEPA Project Management

Ashley Farless, PE, AICP (TVA)
Position: NEPA Specialist
Education: BS, Civil Engineering
Experience: 14 years in NEPA compliance
Involvement: Project Management

Roberta Hurley (AECOM)
Position: Project Manager
Education: BS and MS, Engineering
Experience: 30 years of experience in NEPA document preparation
Involvement: Project Management, ITR

James Orr (AECOM)
Position: Senior Project Scientist
Education: BS and MS, Biology
Experience: 20 years of experience in NEPA document preparation
Involvement: Project Management, Document Review

4.2 Other Contributors

Brittany W. Bishop, EIT (AECOM)
Position: Environmental Engineer
Education: MS, Environmental Engineering
Experience: 3 years
Involvement: Land Use and Prime Farmland, Socioeconomics and Environmental Justice, Visual Resources

Cindy Camacho, AICP (AECOM)
Position: Environmental Engineer
Education: MS, Environmental Engineering
Experience: 3 years
Involvement: Land Use and Prime Farmland, Socioeconomics and Environmental Justice, Visual Resources

Steve Cole (TVA)
Position: Contract Archaeologist
Education: MA, Anthropology, PhD, Anthropology (Archaeology specialization)
Experience: 12 years in cultural resources, 4 years teaching at universities/colleges
Involvement: Cultural and Historic Resources

Adam Dattilo (TVA)
Position: Botanist
Education: MS, Forestry
Experience: 10 years botany, restoration ecology, threatened and endangered plant monitoring/surveys, invasive species control, as well as NEPA and Endangered Species Act compliance
Involvement: Threatened and Endangered Species, Vegetation

Elizabeth Hamrick (TVA)
Position: Biologist (Zoologist)
Education: MS, Wildlife, BS Biology
Experience: 4 years in Biological Surveys and Environmental Reviews
Involvement: Threatened and Endangered Species (Terrestrial Animals), Wildlife

Andrew Henderson (TVA)
Position: Biologist
Education: MS, Fisheries (Conservation), BS, Fisheries
Experience: 10 years in aquatic monitoring, rare aquatic species surveys
Involvement: Threatened and Endangered Species

Britta Lees (TVA)
Position: Wetland Biologist
Education: MS, Botany
Experience: 16 years
Involvement: Wetlands

Robert Marker (TVA)
Position: Recreation Specialist
Education: BS, Outdoor Recreation Resources Management
Experience: 40 years in outdoor recreation resources planning and management
Involvement: Natural Areas, Parks and Recreation

Carrie Mays, PE (TVA)
Position: Civil Engineer, Flood Risk
Education: BS and MS, Civil Engineering
Experience: 2 year Floodplains, 3 years River Forecasting, 7 years compliance monitoring
Involvement: Floodplains

Michael Meulemans, PE (AECOM)
Position: Civil Engineer
Education: MS, Engineering Management
Experience: 30 years
Involvement: Noise, Safety, Roadway Transportation

Hayden Orr (AECOM)
Position: Engineer
Education: Chemical Engineering
Experience: 3 years
Involvement: Solid and Hazardous Waste

Craig Phillips (TVA)
Position: Aquatic Ecologist
Education: MS and BS, Wildlife and Fisheries Science
Experience: 6 years sampling and hydrologic determination for streams and wet-weather conveyances; 5 years in environmental reviews
Involvement: Aquatic Ecology and Threatened & Endangered Species

Marianne Shuler (TVA)
Position: Archaeologist
Education: BA, Religion, emphasis in Middle Eastern Archaeology
Experience: 11 years
Involvement: Cultural and Historic Resources

Mark Smith (AECOM)
Position: GIS Specialist
Education: Forestry
Experience: 16 years
Involvement: Visual Resources

Karen Utt (TVA)
Position: Senior Program Manager, Climate Policy
Education: BA, Biology, JD
Experience: 24 years in environmental compliance, corporate carbon risk management, and climate change adaptation planning
Involvement: Air Quality, Climate and Greenhouse Gas

A. Chevales Williams (TVA)
Position: Environmental Engineer
Education: BS, Environmental Chemical Engineering
Experience: 10 years in water quality monitoring and compliance; 9 years in NEPA planning and environmental services
Involvement: Surface Water, Industrial Wastewater, and Groundwater

CHAPTER 5 - ENVIRONMENTAL ASSESSMENT RECIPIENTS

5.1 Federal Agencies

National Park Service
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

5.2 Federally Recognized Tribes

The following federally recognized tribes were contacted regarding the availability of this EA:

Absentee Shawnee Tribe of Oklahoma
Alabama-Quassarte Tribal Town
Cherokee Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Kialegee Tribal Town
Muscogee (Creek) Nation of Oklahoma
Shawnee Tribe of Oklahoma
The Chickasaw Nation
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

5.3 State Agencies

Tennessee Department of Environment and Conservation
Tennessee Historical Commission
Tennessee Wildlife Resources Agency

5.4 Individuals and Organizations

Earthjustice
Environmental Integrity Project
Global Environmental, LLC
Sierra Club
Southern Alliance for Clean Energy
Southern Environmental Law Center
Statewide Organizing for Community eMpowerment
Tennessee Clean Water Network
Whaley & Sons, Inc./southern Design Group, Inc.

CHAPTER 6 - LITERATURE CITED

U.S. Bureau of Economic Analysis. 2014. Personal Income Summary: Personal Income, Population, Per Capita Personal Income. Roane County Tennessee, and United States. Last updated November 20, 2014. Bowen, A., J. Branum, C. Chandler, A. Dattilo, B. Dimick, S. Gaither, C. Henley, T. Liskey, J. Melton, C. Minghini, P. Pearman, K. Smithson, J. Turk, E. Willard, and R. Wilson. 2012. *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities*, Revision 2.1 - 2012. Tennessee Valley Authority. Chattanooga, Tennessee.

Brady, J., T.H. Kunz, M.D. Tuttle and D. Wilson. 1982. *Gray bat recovery plan*. U.S. Fish and Wildlife Service, Denver, Colorado. 143 pp.

Buonicore, A. J. and W. T. Davis (eds.). 1992. *The Air Pollution Engineering Manual*. Air & Waste Management Association. New York: Van Nostrand Reinhold Company.

Council on Environmental Quality. 1987. *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. 40 CFR 1500 - 1508.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetland and Deepwater Habitats of the United States*. Washington, D.C.: U.S. Fish and Wildlife Publication FWS/OBS-79/31.

Environmental Laboratory. 1987. *Corps of Engineers Wetland Delineation Manual*. Vicksburg, Miss.: U.S. Army Corps of Engineers Waterways Experiment Station. Technical Report Y-87-1.

Environmental Protection Agency (EPA). 1973. *Public Health and Welfare Criteria for Noise*. EPA 550/9-73-002.

EPA. 2009. *Administrative Order and Agreement on Consent*, Docket No. CERCLA-04-2009-3766, Region 4. May 11.

EPA. 2014. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012*. U.S. EPA 430-R-14-003. April 2014. http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2014-Main-Text.pdf. http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

Fowler, L. J. 1983. "Shorebirds of Kingston Steam Plant." *The Migrant*. Vol. 54 Issue No. 2.

Geosyntec. 2015. *Work Plan for Identification and Mitigation of Drop-Outs Coal Combustion Residuals Disposal Facility Peninsula Site – Phase II Area, Kingston Fossil Plant*.

Henry, T. H. 2012. *Results of the Tennessee River Valley Shorebird Initiative*. Final Report, July 2012. 123 pp.

Karpynec, Ted and Meghan Weaver. 2015. *Phase I Architectural Assessment for the Proposed Construction of a Dewatering Facility at TVA's Kingston Fossil Plant (KIF),* *Roane County, Tennessee*. Report submitted to Tennessee Valley Authority, Cultural Compliance, Knoxville, Tennessee.

Kunkel, K. E., L. E. Stevens, S. E. Stevens, L. Sun, E. Janssen, D. Wuebbles, and J. G. Dobson. 2013. *Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 9*. Climate of the Contiguous United States. NOAA Technical Report NESDIS 142-9. http://www.nesdis.noaa.gov/technical_reports/NOAA_NESDIS_Tech_Report_142-9-26 Climate_of_the_Contiguous_United_States.pdf.

Kurta, A, S. W. Murray, and D. H. Miller. 2002. *Roost selection and movements across the summer landscape*. Kurta, A. and J. Kennedy, eds. The Indiana Bat: Biology and Management of an Endangered Species. Bat Conservation International, Austin, Texas.

Le Quéré C. Le Quéré, R. Moriarty, R. M. Andrew, G. P. Peters, P. Ciais, P. Friedlingstein, S. D. Jones, S. Sitch, P. Tans, A. Arneth, T. A. Boden, L. Bopp, Y. Bozec, J. G. Canadell, F. Chevallier, C. E. Cosca, I. Harris, M. Hoppema, R. A. Houghton, J. I. House, A. K. Jain, T. Johannessen, E. Kato, R. F. Keeling, V. Kitidis, K. Klein Goldewijk, C. Koven, C. S. Landa, P. Landschützer, A. Lenton, I. D. Lima, G. H. Marland, J. T. Mathis, N. Metzl, Y. Nojiri, A. Olsen, T. Ono, W. Peters, B. Pfeil, B. Poulter, M. R. Raupach, P. Regnier, C. Rödenbeck, S. Saito, J. E. Sailsbury, U. Schuster, J. Schwinger, R. Séférian, J. Segschneider, T. Steinhoff, B. D. Stocker, A. J. Sutton, T. Takahashi, B. Tilbrook, G. R. van der Werf, N. Viovy, Y. P. Wang, R. Wanninkhof, A. Wiltshire, and N. Zeng. 2014. “Global Carbon Budget 2014.” Earth System Science Data Discussions, doi:10.5194/essdd-7-521-2014. http://www.globalcarbonproject.org/carbonbudget.

Lichvar, R.W. and J.T. Kartesz. 2009. North American Digital Flora: National Wetland Plant List, version 2.4.0. U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC. May 2014. https://wetland_plants.usace.army.mil.

Lloyd, Orville B. Jr., and William L. Lyke. 1995. *Groundwater Atlas of the United States*, Segment 10. Reston, Va.: United States Geological Survey.

Mack, J. 2001. *Ohio Rapid Assessment Method for Wetlands*, *Version 5.0, User’s Manual and Scoring Forms*. Columbus: Ohio Environmental Protection Agency, Division of Surface Water, 401/Wetland Ecology Unit, EPA Technical Report WET/2001-1.

Melillo, J. M., Terese Richmond, and G.W. Yohe. 2014. *Climate Change Impacts in the United States: The Third National Climate Assessment*. J.M. Melillo, Terese (T.C.) Richmond, and G.W. Yohe, Eds. U.S. Global Change Research Program. doi:10.7930/JON-P22CB. http://nca2014.globalchange.gov/report/regions/southeast.

National Geographic. 2002. *Field Guide to the Birds of North America*. Fourth Edition. National Geographic Society, Washington D.C. 480 pp.

NatureServe. 2015. NatureServe Web Service. Arlington, VA. U.S.A. Accessed January 21, 2015. http://services.natureserve.org.

North Carolina Department of Transportation. 2011. *Level of Service D Standards for Systems Level Planning*.

Natural Resources Conservation Service. 2013. *Web Soil Survey of Roane County, Tennessee*. U.S. Department of Agriculture.

Parmalee, P.W. and A.E. Bogan. 1998. *The Freshwater Mussels of Tennessee*. The University of Tennessee Press, Knoxville, Tennessee.

Petranka, J. W. 1998. *Salamanders of the United States and Canada*. Smithsonian Institution Press, Washington D.C. 587 pp.

Pruitt, L., and L. TeWinkel. 2007. *Indiana Bat (Myotis sodalis) Draft Recovery Plan*: First Revision. U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp.

Robinson, J. C. 1990. *An annotated checklist of the birds of Tennessee*. Univ. Tenn. Press, Knoxville. 274 pp.

Strand, M. N. 1997. *Wetlands Deskbook*, 2nd Edition. Washington, D.C.: The Environmental Law Reporter, Environmental Law Institute.

Tennessee Department of Environment and Conservation (TDEC). 2002. *Emory River Watershed (06010208) of the Tennessee river Basin - Group 1: Water Quality Management Plan*. Accessed January 2015. http://www.state.tn.us/environment/water/watersheds/emory-river.shtml.

TDEC. 2003. NPDES Permit No. TN0005452, TVA Kingston Fossil Plant - Flue Gas Desulfurization System, Kingston, Roane County, Tennessee. Issued September 1, 2003. Nashville: TDEC, Division of Water Pollution Control.

TDEC. 2009a. NPDES Permit No. TN0080870, TVA Kingston Fossil Plant, Kingston, Roane County, Tennessee. Issued September 22, 2009. Nashville: TDEC, Division of Water Pollution Control.

TDEC. 2009b. “Process Emission Standards,” Chapter 1200-3-9 in Rules of Tennessee Department of Environment and Conservation Bureau of Environment. Nashville, Tenn.: TDEC, Division of Air Pollution Control, April 2009 (revised).

TDEC. 2012. *Erosion & Sediment Control Handbook. A Stormwater Planning and Design Manual for Construction Activities*. Fourth Edition. http://tnepsc.org/TDEC_EandS_Handbook_2012_Edition4/TDEC%20EandS%20Handbook%204th%20Edition.pdf.

TDEC. 2014. *Draft 2014 303(d) List*. Nashville: TDEC, Division of Water Pollution Control, Planning and Standards Section, July 2014.

TDEC, 2015. Commissioner’s Order, OGC15-0177.

Tennessee Department of Transportation. 2013. AADT data.

Tuttle, M. D. 1976a. *Population ecology of the gray bat (Myotis grisescens): philopatry, timing, and patterns of movement, weight loss during migration, and seasonal adaptive strategies*. Occasional Papers of the Museum of Natural History, University of Kansas, 54:1-38.

Tuttle, M. D. 1976b. "Population ecology of the gray bat (*Myotis grisescens*): factors influencing growth and survival of newly volant young." *Ecology* 57: 587-595.

Tennessee Valley Authority (TVA). 1983. *Procedures for Compliance with the National Environmental Policy Act: Instruction IX Environmental Review*. Tennessee Valley Authority. http://www.tva.gov/environment/reports/pdf/tvanepa_procedures.pdf.

TVA. 2006. *Installation of Flue Gas Desulfurization System at Kingston Fossil Plant, Final Environmental Assessment*.

TVA. 2009a. *Final Environmental Assessment, Emergency Dredging for the Kingston Fossil Plant Ash Dike Failure, Roane County, Tennessee*. Project No. 2009-14. March 2009.

TVA. 2009b. *Installation of Flue Gas Desulfurization System on John Sevier Fossil Plant Draft Environmental Assessment*.

TVA. 2010a. *Installation of a Mechanical Gypsum Dewatering System at Kingston Fossil Plant Roane County, Tennessee, Final Environmental Assessment.*

TVA. 2010b. *Kingston Dry Fly Ash Conversion, Final Environmental Assessment.*

TVA. 2011a. Regulatory Submittal for Kingston Fossil Plant (March 31, 2011, EPA approval). *TVA Kingston Fossil Fuel Plant Release Site Time-Critical Removal Action, May 11, 2009 through December 2010, Harriman, Roane County, Tennessee*. Document No. EPA-AO-030.

TVA. 2011b. *White Paper on Bottom Ash Sluice Dewatering and Recycle Study*. December 13, 2011. pages 2 and 4.

TVA. 2012a. *Bottom Ash and Gypsum Mechanical Dewatering Facility, Bull Run Fossil Plant, Final Environmental Assessment, Anderson County, Tennessee*. Project No. 2011-24. September 2012.

TVA. 2012b. *Kingston Ash Recovery Project Non-Time Critical Removal Action Surface Water Monitoring Plan*. Document No. EPA-AO-038, Revision 02.

TVA. 2013. *Bull Run Fossil Plant Dewatering Project Environmental Assessment*.

TVA. 2014a. *Biological Monitoring of the Clinch River Near Kingston Fossil Plant Discharge, Autumn 2013*.

TVA. 2014b. *Gypsum Disposal Facility (IDL) 73-0211 Groundwater Assessment Monitoring Report, September 2014 Sampling*. Prepared by Amos L. Smith, PG, October 27, 2014. Chattanooga, Tennessee.

TVA. 2014c. *Kingston Ash Recovery Project Non-Time Critical Removal Action 2014 Data Summary Report for Groundwater and Surface Water*. Document No. EPA-AO-055C.

TVA. 2015. "Reservoir Ratings." Accessed January 2015. www.tva.gov/environment/ecohealth/.

U.S. Water Resources Council. 1978. Fl*oodplain Management Guidelines for Implementing EO 11988*, U.S. Water Resources Council, 43 FR 6030, February 10, 1978.

U.S. Census Bureau. American Community Survey Population Estimates 2008-2012. Accessed November 2014. http://www.census.gov/acs/www/.

United States Department of Agriculture. 1995. *Landscape Aesthetics, A Handbook for Scenery Management*. Handbook No. 701. USDA, United States Forest Service.

U.S. Air Force et al. 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*. Federal Interagency Committee on Noise, August 1992.

U.S. Fish and Wildlife Service (USFWS). 2003. *Recovery Plan for the Great Lakes Piping Plover* (*Charadrus melodus*). FT. Snelling, MN. 151 pp.

USFWS. 2007. *National Bald Eagle Management Guidelines*. Accessed January 21, 2015. http://www.fws.gov/northeast/ecologicalservices/pdf/NationalBaldEagleManagementGuidelines.pdf.

USFWS. 2013. Bald and Golden Eagle Protection Act. Accessed November 7, 2014. http://www.fws.gov/northeast/ecologicalservices/eagleact.html.

USFWS. 2014. *Northern Long-eared Bat Interim Conference and Planning Guidance*. U.S. Fish and Wildlife Service.

U.S. Geological Service and TDEC. 1995. *Water Use in Tennessee*. http://tn.water.usgs.gov/wustates/tn/mapdatagw95.html.

Yokley, P., Jr. 2005. *Freshwater Mussel Survey of Impounded Area of the Clinch River Adjacent to the Power Plant, TVA, Kingston, Tennessee*. A Report Submitted to TVA by Yokley Environmental Consulting Service, Florence, Alabama.

Appendix A – Summary of Environmental Permits and Applicable Regulations

This page intentionally left blank

- Any entity wishing to construct an air contaminant source, or to modify an existing air contaminant source, is required to obtain a construction permit from the Tennessee Division of Air Pollution Control (APC) in accordance with the requirements of APC Rule Chapter 1200-3-9. Modification of the existing Title V Permit must be done in accordance with the requirements of TDEC Rule Chapter 1200-3-9-.02 and .04.
- Modification of the existing NPDES Permit for KIF involves submittal of the proper EPA Application Forms and must be done in accordance with the requirements of TDEC Rule Chapter 0400-40-01, 03, 04 and 05; TCA 69-3-108(b)(1), (2), (3), (4), and (6); and the Clean Water Act.
- Storm water runoff from construction sites is regulated under the NPDES program. Currently, construction projects where 1 acre or more of land will be disturbed require a NPDES Permit. The NPDES has its origin in the Clean Water Act. The program requires permits for the discharge of treated municipal effluent, treated industrial effluent, and storm water. The permits establish the conditions under which the discharge may occur and establish monitoring and reporting requirements. Application for coverage under the Tennessee General NPDES Permit for Discharges of Storm Water Associated with Construction Activities will require preparation of an SWPPP.
- The addition of a storm water pond would require selection and implementation of standard Erosion Prevention and Sediment Control measures in accordance with the TDEC *Erosion and Sediment Control Handbook* (TDEC 2012b).
- Under EO 13186, federal agencies are encouraged to implement conservative measures to avoid or minimize adverse impacts on migratory bird resources when conducting agency actions.

This page intentionally left blank

Appendix B – TVARAM Scores

TENNESSEE VALLEY AUTHOROITY RAPID ASSESSMENT MEHTOD: Assessing Wetland Condition, Functional Capacity, Quality
TVARAM FIELD FORM

Site: W001, Kingston Dewatering EA	Rater(s): Britta Lees	Date: 1/20/2015

1 (max 6 pts) **1** (subtotal)

Metric 1. Wetland Area (size)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [1] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [ ] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS and aerials and NWI

1 (max 14 pts) **2** (subtotal)

Metric 2. Upland Buffers and Surrounding Land Use

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [0] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

14 (max 30 pts) **16** (subtotal)

Metric 3. Hydrology

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [5] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [ ] 100-year floodplain (1)
- [ ] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [3] Regularly inundated/saturated (3) [BR/CM (4)]
- [ ] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [1] Recent or no recovery (1)

Check all disturbances observed
- [ ] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other ____________

3 (max 20 pts) **19** (subtotal)

Metric 4. Habitat Alteration and Development

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [1] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [1] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [ ] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [1] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

19

Last Edited 2010

Page 1 of 6

TENNESSEE VALLEY AUTHOROITY RAPID ASSESSMENT MEHTOD: Assessing Wetland Condition, Functional Capacity, Quality
TVARAM FIELD FORM

Site: W001, Kingston Dewatering EA	Rater(s): Britta Lees	Date: 1/20/2015

19 subtotal previous page

0	19
max 10 pts	subtotal

0 raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- [ ] Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m, sphagnum or other moss (5); muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

0	19
max 20 pts	subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- 0 Emergent
- [ ] Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other ____________

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3)[BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- 0 None (0)

Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rate, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- 0 Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <02 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

19=Category 1	GRAND TOTAL (max 100 pts)

0- 29 = Category 1, low wetland function, condition, quality**
30- 59 = Category 2, good/moderate wetland function, condition, quality**
60-100 = Category 3, superior wetland function, condition, quality**

**Based on ORAM Score Calibration Report for the scoring breakpoints between wetland categories. http://www.epa.state.oh.us/dsw/401/401.html

Last Edited 2010 Page 2 of 6

TENNESSEE VALLEY AUTHOROITY RAPID ASSESSMENT MEHTOD: Assessing Wetland Condition, Functional Capacity, Quality
TVARAM FIELD FORM

Site: W002, Kingston Dewatering EA	Rater(s): Britta Lees	Date: 1/20/2015

Metric 1. Wetland Area (size)

0	0
max 6 pts	subtotal

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.

- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [0] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS and aerials and NWI

Metric 2. Upland Buffers and Surrounding Land Use

1	1
max 14 pts	subtotal

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [0] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

9	10
max 30 pts	subtotal

3a. Sources of water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100-year floodplain (1)
- [ ] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.

- [ ] Semi- to permanently inundated/saturated (4)
- [3] Regularly inundated/saturated (3) [BR/CM (4)]
- [ ] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [1] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other ____________

Metric 4. Habitat Alteration and Development

3	13
max 20 pts	subtotal

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [1] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [1] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [1] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

13

Last Edited 2010

Page 3 of 6

TENNESSEE VALLEY AUTHOROITY RAPID ASSESSMENT MEHTOD: Assessing Wetland Condition, Functional Capacity, Quality
TVARAM FIELD FORM

Site: W002, Kingston Dewatering EA	Rater(s): Britta Lees	Date: 1/20/2015

13
subtotal previous page

0 max 10 pts | **13** subtotal

0 raw score*

Metric 5. Special Wetlands

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- [ ] Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m, sphagnum or other moss (5); muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1*(10), G2*(5), G3*(3) [*use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

0 max 20 pts | **13** subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- 0 Emergent
- [ ] Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen. Other ____________

Vegetation Community Cover Scale

0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3)[BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- 0 None (0)

Narrative Description of Vegetation Quality

low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rate, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- 0 Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <02 ha (0.5 to 5 acre)]
3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

0 = Absent
1 = Present in very small amounts or if more common of marginal quality
2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
3 = Present in moderate or greater amounts and of highest quality

13=Category 1

GRAND TOTAL (max 100 pts)

0- 29 = Category 1, low wetland function, condition, quality**
30- 59 = Category 2, good/moderate wetland function, condition, quality**
60-100 = Category 3, superior wetland function, condition, quality**

**Based on ORAM Score Calibration Report for the scoring breakpoints between wetland categories. http://www.epa.state.oh.us/dsw/401/401.html

Last Edited 2010

Page 4 of 6

TENNESSEE VALLEY AUTHOROITY RAPID ASSESSMENT MEHTOD: Assessing Wetland Condition, Functional Capacity, Quality
TVARAM FIELD FORM

Site: W003, Kingston Dewatering EA	Rater(s): Britta Lees	Date: 1/20/2015

Metric 1. Wetland Area (size)

0 (max 6 pts) | 0 (subtotal)

Notes: BR/CM = adjusted points for Blue Ridge and Cumberland Mountains. If an open water body (excluding aquatic beds and seasonal mudflats) is >20 acres (8 ha), then add only 0.5 acre (0.2 ha) of it to the wetland size for Metric 1.

Select one size class and assign score.
- [ ] >50 acres (>20.2 ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2 ha) (5) [BR/CM (6)]
- [ ] 10 to <25 acres (4 to <10.1 ha) (4) [BR/CM (6)]
- [ ] 3 to <10 acres (1.2 to <4 ha) (3) [BR/CM (5)]
- [ ] 0.3 to <3 acres (0.1 to <1.2 ha) (2) [BR/CM (3)]
- [ ] 0.1 to <0.3 acre (0.04 to <0.1 ha) (1) [BR/CM (2)]
- [0] <0.1 acre (0.04 ha) (0)

Sources/assumptions for size estimate (list):

Field GPS and aerials and NWI

Metric 2. Upland Buffers and Surrounding Land Use

1 (max 14 pts) | 1 (subtotal)

2a. Calculate average buffer width. Select only one and assign score. Do not double check.
- [ ] WIDE. Buffers average 50 m (164 ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25 m to <50 m (82 to <164 ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10 m to <25 m (32 ft to <82 ft) around wetland perimeter (1)
- [0] VERY NARROW. Buffers average <10 m (<32 ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.
- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [ ] LOW. Old field (>10 years), shrubland, young 2nd growth forest (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field (3)
- [1] High. Urban, industrial, open pasture, row cropping, mining, construction (1)

Metric 3. Hydrology

9 (max 30 pts) | 10 (subtotal)

3a. Sources of water. Score all that apply.
- [ ] High pH groundwater (5)
- [ ] Other groundwater (3) [BR/CM (5)]
- [1] Precipitation (1) [unless BR/CM primary source (5)]
- [3] Seasonal/intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.
- [ ] 100-year floodplain (1)
- [ ] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g., forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.
- [ ] >0.7 m (27.6 in.) (3)
- [ ] 0.4 to 0.7 m (16 to 27.6 in.) (2) [BR/CM (3)]
- [1] <0.4 m (<16 in.) (1) [BR/CM 0.15 to 0.4 m (6 to <16 in.) (2)]

3d. Duration inundation/saturation. Score one or dbl. check & avg.
- [ ] Semi- to permanently inundated/saturated (4)
- [3] Regularly inundated/saturated (3) [BR/CM (4)]
- [ ] Seasonally inundated (2) [BR/CM (4)]
- [ ] Seasonally saturated in upper 30 cm (12 in.) (1) [BR/CM (2)]

3e. Modifications to natural hydrologic regime. Score one or double check and average.
- [ ] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [1] Recent or no recovery (1)

Check all disturbances observed
- [ ] ditch
- [ ] tile (including culvert)
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other ____________

Metric 4. Habitat Alteration and Development

3 (max 20 pts) | 13 (subtotal)

4a. Substrate disturbance. Score one or double check and average.
- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [1] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.
- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [1] Poor (1)

4c. Habitat alteration. Score one or double check and average.
- [ ] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [1] Recent or no recovery (1)

Check all disturbances observed
- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] farming
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] woody debris removal
- [ ] sedimentation
- [ ] dredging
- [ ] nutrient enrichment

13

Last Edited 2010

Page 5 of 6

TENNESSEE VALLEY AUTHOROITY RAPID ASSESSMENT MEHTOD: Assessing Wetland Condition, Functional Capacity, Quality
TVARAM FIELD FORM

Site: W002, Kingston Dewatering EA	Rater(s): Britta Lees	Date: 1/20/2015

13 subtotal previous page

0	13
max 10 pts	subtotal

Metric 5. Special Wetlands

0 raw score*

*If the documented raw score for Metric 5 is 30 points or higher, the site is automatically considered a Category 3 wetland.

Select all that apply. Where multiple values apply in row, score row as single feature with highest point value. Provide documentation for each selection (photos, checklists, maps, resource specialist concurrence, data sources, references, etc).

- [ ] Bog, fen, wet prairie (10); acidophilic veg., mossy substrate >10 sq.m, sphagnum or other moss (5); muck, organic soil layer (3)
- [ ] Assoc. forest (wetl. &/or adj. upland) incl. >0.25 acre (0.1 ha); old growth (10); mature >18 in. (45 cm) dbh (5) [exclude pine plantation]
- [ ] Sensitive geologic feature such as spring/seep, sink, losing/underground stream, cave, waterfall, rock outcrop/cliff (5)
- [ ] Vernal pool (5); isolated, perched, or slope wetland (4); headwater wetland [1st order perennial or above] (3)
- [ ] Island wetland >0.1 acre (0.04 ha) in reservoir, river, or perennial water >6 ft (2 m) deep (5)
- [ ] Braided channel or floodplain/terrace depressions (floodplain pool, slough, oxbow, meander scar, etc.) (3)
- [ ] Gross morph. adapt. in >5 trees >10 in. (25 cm) dbh: buttress, multitrunk/stool, stilted, shallow roots/tip-up, or pneumatophores (3)
- [ ] Ecological community with global rank (NatureServe): G1'(10), G2'(5), G3'(3) ['use higher rank where mixed rank or qualifier]
- [ ] Known occurrence state/federal threatened/endangered species (10); other rare species with global rank G1'(10), G2'(5), G3'(3) ['use higher rank where mixed rank or qualifier] [exclude records which are only "historic"]
- [ ] Superior/enhanced habitat/use: migratory songbird/waterfowl (5); in-reservoir buttonbush (4); other fish/wildlife management/designation (3)
- [ ] Cat. 1 (very low quality) : <1 acre (0.4 ha) AND EITHER >80% cover of invasives OR nonvegetated on mined/excavated land (-10)

0	13
max 20 pts	subtotal

Metric 6. Plant Communities, Interspersion, Microtopography

6a. Wetland vegetation communities.
Score all present using 0 to 3 scale.

- [ ] Aquatic bed
- [0] Emergent
- [ ] Shrub
- [ ] Forest
- [ ] Mudflats
- [ ] Open water <20 acres (8 ha)
- [ ] Moss/lichen, Other ________

Vegetation Community Cover Scale

- 0 = Absent or <0.1 ha (0.25 acre) contiguous acre [For BR/CM <0.04 ha (0.1 acre)]
- 1 = Present and either comprises a small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality
- 2 = Present and either comprises a significant part of wetland's vegetation and is of moderate quality, or comprises a small part and is of high quality
- 3 = Present and comprises a significant part or more of wetland's vegetation and is of high quality

6b. Horizontal (plan view) interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high (4) [BR/CM (5)]
- [ ] Moderate (3)[BR/CM (5)]
- [ ] Moderately low (2) [BR/CM (3)]
- [ ] Low (1) [BR/CM (2)]
- [0] None (0)

Narrative Description of Vegetation Quality

- low = Low species diversity &/or dominance of nonnative or disturbance tolerant native species
- mod = Native species are dominant component of the vegetation, although nonnative &/or disturbance tolerant native species can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare, threatened or endangered species
- high = A predominance of native species with nonnative sp &/or disturbance tolerant native sp absent or virtually absent, and high sp diversity and often but not always, the presence of rate, threatened, or endangered species

6c. Coverage of invasive plants.
Add or deduct points for coverage.

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [0] Nearly absent <5% cover (0)
- [ ] Absent (1)

Mudflat and Open Water Class Quality

- 0 = Absent <0.1 ha (0.25 acres) [For BR/CM <0.04 ha (0.1 acre)]
- 1 = Low 0.1 to <1 ha (0.25 to 2.5 acres) [BR/CM 0.04 to <0.2 ha (0.1 to 0.5 acre)]
- 2 = Moderate 1 to <4 ha (2.5 to 9.9 acres) [BR/CM 0.2 to <02 ha (0.5 to 5 acre)]
- 3 = High 4 ha (9.9 acres) or more [BR/CM 2 ha (5 acres) or more]

6d. Microtopography.
Score all present using 0 to 3 scale.

- [ ] Vegetated hummocks/tussocks
- [ ] Coarse woody debris >15 cm (6 in.)
- [ ] Standing dead >25 cm (10 in.) dbh
- [ ] Amphibian breeding pools

Hypothetical Wetland for Estimating Degree of Interspersion

Microtopography Cover Scale

- 0 = Absent
- 1 = Present in very small amounts or if more common of marginal quality
- 2 = Present in moderate amounts, but not of highest quality or in small amounts of highest quality
- 3 = Present in moderate or greater amounts and of highest quality

13=Category 1	GRAND TOTAL (max 100 pts)

0- 29 = Category 1, low wetland function, condition, quality**
30- 59 = Category 2, good/moderate wetland function, condition, quality**
60-100 = Category 3, superior wetland function, condition, quality**

**Based on ORAM Score Calibration Report for the scoring breakpoints between wetland categories. http://www.epa.state.oh.us/dsw/401/401.html

Last Edited 2010

Page 6 of 6

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont Region

Project/Site: Kingston Dewatering EA **City/County:** Roane County, TN **Sampling Date:** 20-Jan-15

Applicant/Owner: TVA **State:** **Sampling Point:** **W001**

Investigator(s): Britta Lees **Section, Township, Range:** S T R

Landform (hillslope, terrace, etc.): Channel (active) **Local relief (concave, convex, none):** concave **Slope:** 0.0% / 0.0 °

Subregion (LRR or MLRA): LRR N **Lat.:** -84.51861 **Long.:** 35.90561 **Datum:** TN StPl

Soil Map Unit Name: **NWI classification:** PEM1E

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) **(If no, explain in Remarks.)**

Are Vegetation ☑ **, Soil** ☑ **, or Hydrology** ☑ **significantly disturbed?** **Are "Normal Circumstances" present?** Yes (●) No ( )

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **naturally problematic?** **(If needed, explain any answers in Remarks.)**

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●) No ( )	**Is the Sampled Area within a Wetland?**	Yes (●) No ( )
Hydric Soil Present?	Yes (●) No ( )		
Wetland Hydrology Present?	Yes (●) No ( )		

Remarks:

Wetland area consists of linear channelized wide (~10') drain on industrial site; exhibits wetland vegetation, wetland hydrology, and disturbed soils contain hydric soil indicators.

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☑ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes (●) No ( )	Depth (inches): 1	
Water Table Present?	Yes (●) No ( )	Depth (inches): 6	**Wetland Hydrology Present?** Yes (●) No ( )
Saturation Present? (includes capillary fringe)	Yes (●) No ( )	Depth (inches): 0	

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

US Army Corps of Engineers

Eastern Mountains and Piedmont - Version 2.0

VEGETATION (Five/Four Strata)- Use scientific names of plants.

Sampling Point: W001

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
	0	= Total Cover	
Sapling-Sapling/Shrub Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
	0	= Total Cover	
Shrub Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
	0	= Total Cover	
Herb Stratum (Plot size:)			
1. Typha latifolia	60	☑ 66.7%	OBL
2. Scirpus cyperinus	5	☐ 5.6%	FACW
3. Juncus effusus	15	☐ 16.7%	FACW
4. Symphyotrichum pilosum	10	☐ 11.1%	FAC
5.		☐ 0.0%	
6.		☐ 0.0%	
7.		☐ 0.0%	
8.		☐ 0.0%	
9.		☐ 0.0%	
10.		☐ 0.0%	
11.		☐ 0.0%	
12.		☐ 0.0%	
	90	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	20	x 2 =	40
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		130 (B)

Prevalence Index = B/A = 1.444

Hydrophytic Vegetation Indicators:

- ☑ Rapid Test for Hydrophytic Vegetation
- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0 [1]
- ☐ Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definition of Vegetation Strata:

Four Vegetation Strata:

Tree stratum – Consists of woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub stratum – Consists of woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb stratum – Consists of all herbaceous (non-woody) plants, regardless of size, and all other plants less than 3.28 ft tall.

Woody vines – Consists of all woody vines greater than 3.28 ft in height.

Five Vegetation Strata:

Tree - Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling stratum – Consists of woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub stratum – Consists of woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb stratum – Consists of all herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody species, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vines – Consists of all woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks: (Include photo numbers here or on a separate sheet.)

[*] Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

US Army Corps of Engineers — Eastern Mountains and Piedmont - Version 2.0

Soil

Sampling Point: W001

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)		Matrix %	Redox Features Color (moist)		Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR	5/1	100						Silt Loam	
4-12	10YR	4/6	40	10YR	5/1	30	D	M	Silty Clay Loam	
4-12				10YR	2/1	10	C	M		Mg/Iron masses
4-12										20% gravel/small rock fill

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2] Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10) (LRR N)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Muck Mineral (S1) (LRR N, MLRA 147, 148)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7)
- ☐ Polyvalue Below Surface (S8) (MLRA 147,148)
- ☐ Thin Dark Surface (S9) (MLRA 147, 148)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☑ Iron-Manganese Masses (F12) (LRR N, MLRA 136)
- ☐ Umbric Surface (F13) (MLRA 136, 122)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 148)
- ☐ Red Parent Material (F21) (MLRA 127, 147)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (MLRA 147)
- ☐ Coast Prairie Redox (A16) (MLRA 147,148)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 136, 147)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks:

Soils disturbed due to channel location on active fossil plant site.

US Army Corps of Engineers

Eastern Mountains and Piedmont - Version 2.0

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont Region

Project/Site: Kingston Dewatering EA **City/County:** Roane County, TN **Sampling Date:** 20-Jan-15

Applicant/Owner: TVA **State:** TN **Sampling Point:** **W002**

Investigator(s): Britta Lees **Section, Township, Range:** S T R

Landform (hillslope, terrace, etc.): Channel (active) **Local relief (concave, convex, none):** concave **Slope:** 0.0% / 0.0 °

Subregion (LRR or MLRA): LRR N **Lat.:** -84.51873 **Long.:** 35.90442 **Datum:** TN StPl

Soil Map Unit Name: **NWI classification:** PEM1E

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) **(If no, explain in Remarks.)**

Are Vegetation ☑ **, Soil** ☑ **, or Hydrology** ☑ **significantly disturbed?** **Are "Normal Circumstances" present?** Yes (●) No ( )

Are Vegetation ☐ **, Soil** ☐ **, or Hydrology** ☐ **naturally problematic?** **(If needed, explain any answers in Remarks.)**

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●) No ( )	Is the Sampled Area within a Wetland? Yes (●) No ( )
Hydric Soil Present?	Yes (●) No ( )	
Wetland Hydrology Present?	Yes (●) No ( )	

Remarks:
ponded water within a drain; wetland vegetation along periphery and central; highly disturbed arae

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☑ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes (●) No ( )	Depth (inches):	12
Water Table Present?	Yes (●) No ( )	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes (●) No ( )	Depth (inches):	0

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

US Army Corps of Engineers Eastern Mountains and Piedmont - Version 2.0

VEGETATION (Five/Four Strata)- Use scientific names of plants.

Sampling Point: W002

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
	0	= Total Cover	
Sapling-Sapling/Shrub Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
	0	= Total Cover	
Shrub Stratum (Plot size:)			
1. Salix nigra	5	☑ 100.0%	OBL
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
	5	= Total Cover	
Herb Stratum (Plot size:)			
1. Juncus effusus	20	☑ 66.7%	FACW
2. Symphyotrichum pilosum	10	☑ 33.3%	FAC
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
7.	0	☐ 0.0%	
8.	0	☐ 0.0%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
11.	0	☐ 0.0%	
12.	0	☐ 0.0%	
	30	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.	0	☐ 0.0%	
2.	0	☐ 0.0%	
3.	0	☐ 0.0%	
4.	0	☐ 0.0%	
5.	0	☐ 0.0%	
6.	0	☐ 0.0%	
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of dominant Species That Are OBL, FACW, or FAC:	100.0%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	20	x 2 =	40
FAC species	10	x 3 =	30
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	35 (A)		75 (B)

Prevalence Index = B/A = 2.143

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0 [1]
- ☐ Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definition of Vegetation Strata:

Four Vegetation Strata:

Tree stratum – Consists of woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub stratum – Consists of woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb stratum – Consists of all herbaceous (non-woody) plants, regardless of size, and all other plants less than 3.28 ft tall.

Woody vines – Consists of all woody vines greater than 3.28 ft in height.

Five Vegetation Strata:

Tree - Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling stratum – Consists of woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub stratum – Consists of woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb stratum – Consists of all herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody species, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vines – Consists of all woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks: (Include photo numbers here or on a separate sheet.)

Remainder of surface area currently (under winter conditions) open water.

*Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

US Army Corps of Engineers

Eastern Mountains and Piedmont - Version 2.0

Soil

Sampling Point: W002

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/2	80	10YR 4/6	20	D	M	Silty Clay Loam	

[1] Type: C=Concentration. D=Depletion. RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2] Location: PL=Pore Lining. M=Matrix

Hydric Soil Indicators:

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5)
- [ ] 2 cm Muck (A10) (LRR N)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Muck Mineral (S1) (LRR N, MLRA 147, 148)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Dark Surface (S7)
- [ ] Polyvalue Below Surface (S8) (MLRA 147,148)
- [ ] Thin Dark Surface (S9) (MLRA 147, 148)
- [ ] Loamy Gleyed Matrix (F2)
- [x] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Iron-Manganese Masses (F12) (LRR N, MLRA 136)
- [ ] Umbric Surface (F13) (MLRA 136, 122)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 148)
- [ ] Red Parent Material (F21) (MLRA 127, 147)

Indicators for Problematic Hydric Soils[3]:

- [ ] 2 cm Muck (A10) (MLRA 147)
- [ ] Coast Prairie Redox (A16) (MLRA 147,148)
- [ ] Piedmont Floodplain Soils (F19) (MLRA 136, 147)
- [ ] Very Shallow Dark Surface (TF12)
- [ ] Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks:

US Army Corps of Engineers

Eastern Mountains and Piedmont - Version 2.0

WETLAND DETERMINATION DATA FORM - Eastern Mountains and Piedmont Region

Project/Site: Kingston Dewatering EA **City/County:** Roane County, TN **Sampling Date:** 20-Jan-15

Applicant/Owner: TVA **State:** TN **Sampling Point:** **W003**

Investigator(s): Britta Lees **Section, Township, Range:** S T R

Landform (hillslope, terrace, etc.): Channel (active) **Local relief (concave, convex, none):** concave **Slope:** 0.0% / 0.0 °

Subregion (LRR or MLRA): LRR N **Lat.:** -84.51885 **Long.:** 35.90442 **Datum:** TN StPl

Soil Map Unit Name: **NWI classification:** PEM1E

Are climatic/hydrologic conditions on the site typical for this time of year? Yes (●) No ○ (If no, explain in Remarks.)

Are Vegetation ☑, Soil ☑, or Hydrology ☑ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ○

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

Summary of Findings - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●) No ○	Is the Sampled Area within a Wetland? Yes (●) No ○
Hydric Soil Present?	Yes (●) No ○	
Wetland Hydrology Present?	Yes (●) No ○	

Remarks:
Site is highly disturbed; located on fossil plant property

Hydrology

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☑ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-neutral Test (D5)

Field Observations:

Surface Water Present?	Yes (●) No ○	Depth (inches): 1	
Water Table Present?	Yes (●) No ○	Depth (inches): 0	Wetland Hydrology Present? Yes (●) No ○
Saturation Present? (includes capillary fringe)	Yes (●) No ○	Depth (inches): 0	

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

US Army Corps of Engineers Eastern Mountains and Piedmont - Version 2.0

VEGETATION (Five/Four Strata)- Use scientific names of plants.

Sampling Point: W003

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
1.	0	0.0%	
2.	0	0.0%	
3.	0	0.0%	
4.	0	0.0%	
5.	0	0.0%	
6.	0	0.0%	
7.	0	0.0%	
8.	0	0.0%	
	0	= Total Cover	
Sapling-Sapling/Shrub Stratum (Plot size:)			
1.	0	0.0%	
2.	0	0.0%	
3.	0	0.0%	
4.	0	0.0%	
5.	0	0.0%	
6.	0	0.0%	
7.	0	0.0%	
8.	0	0.0%	
9.	0	0.0%	
10.	0	0.0%	
	0	= Total Cover	
Shrub Stratum (Plot size:)			
1. Salix nigra	5	☑ 100.0%	OBL
2.	0	0.0%	
3.	0	0.0%	
4.	0	0.0%	
5.	0	0.0%	
6.	0	0.0%	
7.	0	0.0%	
	5	= Total Cover	
Herb Stratum (Plot size:)			
1. Typha latifolia	60	☑ 66.7%	OBL
2. Symphyotrichum pilosum	20	☑ 22.2%	FAC
3. Juncus effusus	10	11.1%	FACW
4.	0	0.0%	
5.	0	0.0%	
6.	0	0.0%	
7.	0	0.0%	
8.	0	0.0%	
9.	0	0.0%	
10.	0	0.0%	
11.	0	0.0%	
12.	0	0.0%	
	90	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.	0	0.0%	
2.	0	0.0%	
3.	0	0.0%	
4.	0	0.0%	
5.	0	0.0%	
6.	0	0.0%	
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	65	x 1 =	65
FACW species	10	x 2 =	20
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	95 (A)		145 (B)

Prevalence Index = B/A = 1.526

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☑ Dominance Test is > 50%
- ☑ Prevalence Index is ≤3.0 [1]
- ☐ Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation [1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definition of Vegetation Strata:

Four Vegetation Strata:

Tree stratum – Consists of woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub stratum – Consists of woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb stratum – Consists of all herbaceous (non-woody) plants, regardless of size, and all other plants less than 3.28 ft tall.

Woody vines – Consists of all woody vines greater than 3.28 ft in height.

Five Vegetation Strata:

Tree - Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling stratum – Consists of woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub stratum – Consists of woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb stratum – Consists of all herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody species, except woody vines, less than approximately 3 ft (1 m) in height.

Woody vines – Consists of all woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks: (Include photo numbers here or on a separate sheet.)

[1] Indicator suffix = National status or professional decision assigned because Regional status not defined by FWS.

US Army Corps of Engineers

Eastern Mountains and Piedmont - Version 2.0

Soil

Sampling Point: W003

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/2	80	10YR 4/6	20	D	M	Silty Clay Loam	
0-12								some large rip/rap/rock underlying soils in places

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2] Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10) (LRR N)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Muck Mineral (S1) (LRR N, MLRA 147, 148)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7)
- ☐ Polyvalue Below Surface (S8) (MLRA 147,148)
- ☐ Thin Dark Surface (S9) (MLRA 147, 148)
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Iron-Manganese Masses (F12) (LRR N, MLRA 136)
- ☐ Umbric Surface (F13) (MLRA 136, 122)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 148)
- ☐ Red Parent Material (F21) (MLRA 127, 147)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) (MLRA 147)
- ☐ Coast Prairie Redox (A16) (MLRA 147,148)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 136, 147)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks:

US Army Corps of Engineers

Eastern Mountains and Piedmont - Version 2.0

This page intentionally left blank

Appendix C – Cultural and Historic Resources Coordination

This page intentionally left blank

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

April 20, 2015

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA) KINGSTON FOSSIL PLANT (KIF), DEWATERING FACILITY, ROANE COUNTY, TENNESSEE

In July 2009, the Tennessee Valley Authority (TVA) Board of Directors passed a resolution to review and address systems, controls, and standards related to coal combustion products (CCPs) (i.e., fly ash, bottom ash, and gypsum), which result from the burning of coal to produce electricity. TVA has subsequently reviewed its practices for handling and storing CCPs at its generating facilities, including its coal-fired Kingston Fossil Plant (KIF). An outcome of that review was to consider the conversion of the wet fly ash handling and storage facilities at KIF to a dry system.

TVA considers the Area of Potential Effects (APE) as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The APE for archaeological resources consists of the proposed dewatering facility for the Coal Combustion Residue (CCR) at KIF. The APE for architectural resources consists of the 0.805-km (0.5 mile) area surrounding the proposed facility, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

Significant ground disturbance associated with the construction of KIF has occurred within the archaeological APE (Figure 1). TVA finds that the undertaking would not affect archaeological resources included or eligible for inclusion in the National Register of Historic Places (NRHP). TVA contracted with Tennessee Valley Archaeological Research (TVAR) to conduct the architectural survey of the APE. Enclosed are two bound copies and two digital copies of the draft report titled, *Phase I Architectural Assessment for the Proposed Construction of a Dewatering Facility at TVA's Kingston Fossil Plant (KIF), Roane County, Tennessee*. On March 2, 2015, the architectural survey was conducted. The survey identified one previously unrecorded architectural resource (HS-1/KIF). The KIF is considered ineligible for inclusion in the NRHP, due to modern alterations and additions that have compromised the physical integrity of the facility. Therefore, TVA finds that no historic properties eligible for listing or listed in the NRHP would be affected by the proposed undertaking.

Mr. E. Patrick McIntyre, Jr.
Page Two
April 20, 2015

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding properties within the proposed proje ct's APE that may be of religious and cultural significance and eligible for the NRHP.

Pursuant to 36 CFR Part 800.4(d)(1), TVA seeks your concurrence with our findings and recommendations that no historic properties would be affected by the proposed undertaking.

If you have any questions or comments, please contact Marianne Shuler at (865) 632-2464 or by email at mmshuler@tva.gov.

Sincerely,

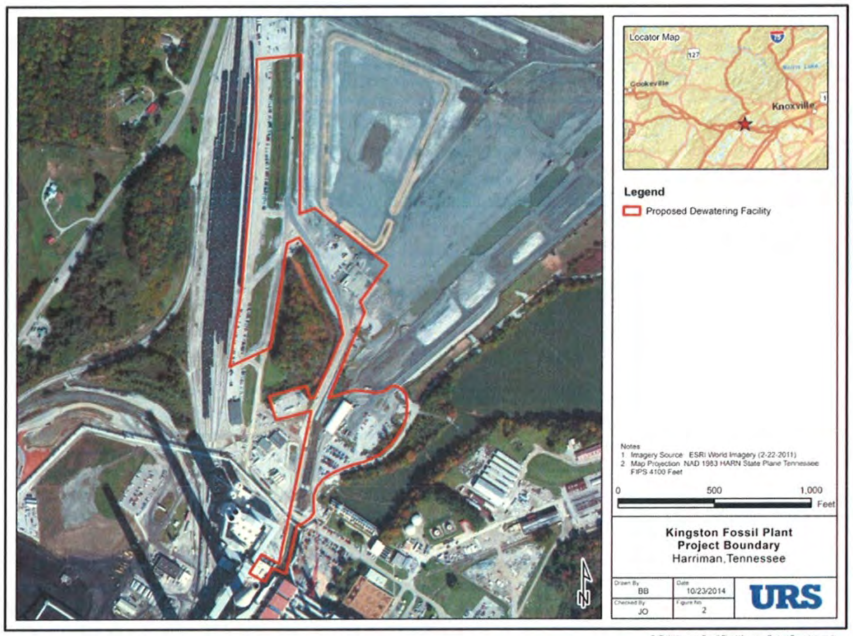
Clinton E. Jones, Manager
Biological and Cultural Compliance
Safety, River Management and Environment

MSH:CSD
Enclosure
cc (Enclosure):
Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cold Bldg. #3
Nashville, Tennessee 37210

INTERNAL COPIES:

Michelle Cagley, KFP 1T-KST
Ashley Farless, BR 4A-C
Susan Jacks, WT11A-K
Skip Markham, BR 4A-C
EDMS, WT CA-K

Figure 1.



G:\TVA\Kingston Fossil Plant\Kingston Project Boundary.mxd

TVA

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

April 21, 2015

To Those Listed:

TENNESSEE VALLEY AUTHORITY (TVA) KINGSTON FOSSIL PLANT (KIF), DEWATERING FACILITY, ROANE COUNTY, TENNESSEE

In July 2009, the TVA Board of Directors passed a resolution to review and address systems, controls, and standards related to coal combustion products (CCPs) (i.e., fly ash, bottom ash, and gypsum), which result from the burning of coal to produce electricity. TVA has subsequently reviewed its practices for handling and storing CCPs at its generating facilities, including its coal-fired Kingston Fossil Plant (KIF). An outcome of that review was to consider the conversion of the wet fly ash handling and storage facilities at KIF to a dry system.

TVA considers the Area of Potential Effects (APE) as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The APE for archaeological resources consists of the proposed dewatering facility for the Coal Combustion Residue (CCR) at KIF. The APE for architectural resources consists of the 0.805-km (0.5 mile) area surrounding the proposed facility, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

Significant ground disturbance associated with the construction of KIF has occurred within the archaeological APE (Figure 1)(84°31'11.266"W 35°54'2.507"N). TVA finds that the undertaking would not affect archaeological resources included or eligible for inclusion in the National Register of Historic Places (NRHP).

TVA contracted with Tennessee Valley Archaeological Research (TVAR) to conduct the architectural survey of the APE. Please find a copy of the draft report titled *Phase I Architectural Assessment for the Proposed Construction of a Dewatering Facility at TVA's Kingston Fossil Plant (KIF), Roane County, Tennessee* online at this link: http://tvaresearch.com/download/1511_TVA_Kingston_Dewatering_DRAFT_3.5.2015.pdf

On March 2, 2015, the architectural survey was conducted. The survey identified one previously unrecorded architectural resource (HS-1/KIF). The KIF is considered ineligible for inclusion in the NRHP, due to modern alterations and additions that have compromised the physical integrity of the facility. Therefore, TVA finds that no historic properties eligible for listing or listed in the NRHP would be affected by the proposed undertaking.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with the following federally recognized Indian tribes regarding properties within the proposed project's APE that may be of religious and

To Those Listed
Page Two
April 21, 2015

cultural significance and eligible for listing in the NRHP: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, Muscogee (Creek) Nation of Oklahoma, Alabama-Coushatta Tribe of Texas, Alabama Quassarte Tribal Town, Kialegee Tribal Town, Thlopthlocco Tribal Town, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, and Shawnee Tribe of Oklahoma.

By this letter, TVA is providing notification of these findings and is seeking your comments regarding this undertaking and any properties that may be of religious and cultural significance and may be eligible for listing in the NRHP pursuant to 36 C.F.R. § 800.2 (c)(2)(ii), 800.3 (f)(2), and 800.4(a)(4)(b).

If you have any questions, please contact me in Knoxville at (865) 632-6461 or by e-mail at pbezzell@tva.gov. If you have any comments on the proposed undertaking, please respond by May 21, 2015.

Sincerely,

Pat Bernard Ezzell

Patricia Bernard Ezzell
Senior Program Manager
Tribal Relations and Corporate History
Public Relations and Corporate Information
Communications, WT 7D-K

MMS:CSD:PBE
Enclosure

IDENTICAL LETTER MAILED TO THE FOLLOWING ON APRIL 21, 2015:

Dr. Richard Allen
Policy Analyst
Cherokee Nation
Post Office Box 948
Tahlequah, Oklahoma 74465

Mr. Joseph Blanchard
Tribal Historic Preservation Officer
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper
Shawnee, Oklahoma 74801

Mr. Ace Buckner
Cultural Resources Director
Kialegee Tribal Town
Post Office Box 332
Wetumka, Oklahoma 74883

cc: Ms. Kara Gann
Assistant Cultural Resources Director
Kialegee Tribal Town
Post Office Box 332
Wetumka, Oklahoma 74883

Mr. Bryant Celestine
Tribal Historic Preservation Officer
Alabama-Coushatta Tribe of Texas
571 State Park Rd. 56
Livingston, Texas 77351

Mr. Charles Coleman
NAGPRA Representative
Thlopthlocco Tribal Town
Route 1, Box 190-A
Weleetka, Oklahoma 74880

Ms. Robin DuShane
Tribal Historic Preservation Officer
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

Ms. Dee Gardner
NAGPRA/Cell Tower Coordinator
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

Mr. Tyler Howe
Historic Preservation Specialist
Eastern Band of Cherokee Indians
Post Office Box 45
Cherokee, North Carolina 28719

cc: Mr. Russell Townsend
Tribal Historic Preservation Office
Eastern Band of Cherokee Indians
Post Office Box 455
Cherokee, North Carolina 28719

Ms. Miranda Panther
NAGPRA Coordinator
Eastern Band of Cherokee Indians
Post Office Box 455
Cherokee, North Carolina 28719

Ms. Johnnie Jacobs
Manager
Cultural Preservation Department
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

cc: Mr. Jeff Fife
Secretary of Department of Interior Affairs
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

Ms. Odette Freeman
Assistant Manager
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

Ms. Johnnie Wesley
Secretary
Cultural Preservation Department
Muscogee (Creek) Nation
Post Office Box 580
Okmulgee, Oklahoma 74447

Mr. David Proctor
Traditional Cultural Advisor
Cultural Preservation Department
Muscogee (Creek) Nation
Post Office Box 580
Okmulgee, Oklahoma 74447

Ms. Lee Anne Wendt
Tribal Archaeologist
Cultural Preservation Department
Muscogee (Creek) Nation
Post Office Box 580
Okmulgee, Oklahoma 74447

Mr. Tim Thompson
Traditional Cultural Advisor
Cultural Preservation Department
Muscogee (Creek) Nation
Post Office Box 580
Okmulgee, Oklahoma 74447

Ms. Kim Jumper
Tribal Historic Preservation Officer
Shawnee Tribe
Post Office Box 189
Miami, Oklahoma 74355

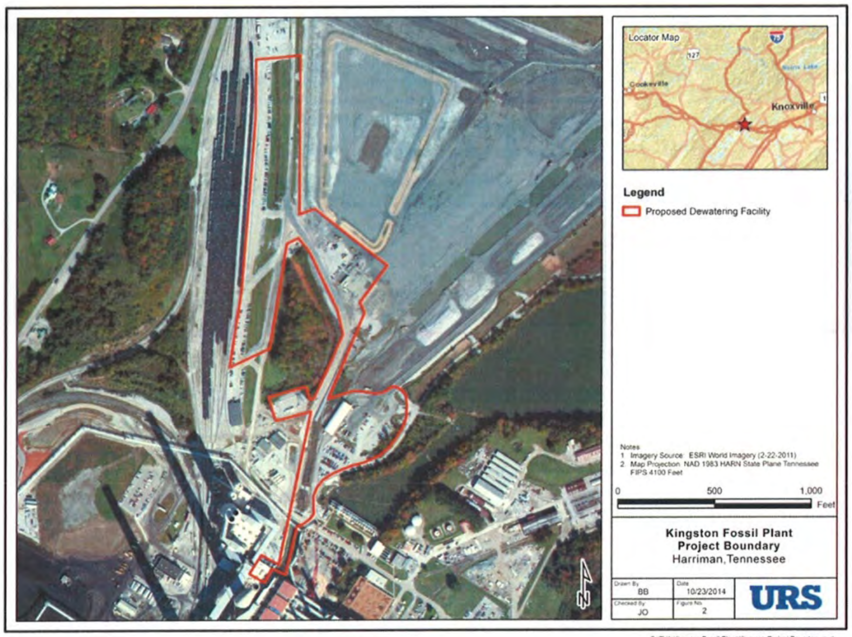
cc: Jodi Hayes
NAGPRA Representative
Shawnee Tribe
PO Box 189
Miami, OK 74355

Mr. Steven Landsberry
Administrative Assistant
Alabama Quassarte Tribal Town
Post Office Box 187
Wetumka, Oklahoma 74883

Mrs. Lisa C. LaRue-Baker
Acting Tribal Historic Preservation Officer
United Keetoowah Band
of Cherokee Indians in Oklahoma
Post Office Box 746
Tahlequah, Oklahoma 74464

Mr. Emman Spain
Tribal Historic Preservation Officer
Cultural Preservation Department
Muscogee (Creek) Nation
Post Office Box 580
Okmulgee, Oklahoma 74447

Figure 1.


Locator Map
127
Cookeville
Knoxville
Legend
Proposed Dewatering Facility
Notes
1 Imagery Source: ESRI World Imagery (2-22-2011)
2 Map Projection: NAD 1983 HARN State Plane Tennessee FIPS 4100 Feet
0
500
1,000
Feet
Kingston Fossil Plant
Project Boundary
Harriman, Tennessee
Drawn By
BB
Date
10/23/2014
Checked By
JO
Figure No.
2
URS
G:\TVA\Kingston Fossil Plant\Kingston Project Boundary.mxd

Orr, Jim

From: Ezzell, Patricia Bernard <pbezzell@tva.gov>
Sent: Thursday, April 30, 2015 3:05 PM
To: Dudley, Cynthia S; Gallman, Geraldine O; Shuler, Marianne M
Subject: FW: TVA, KINGSTON FOSSIL PLANT (KIF), DEWATERING FACILITY, ROANE COUNTY, TENNESSEE

Comments from UKB re: subject project. Thanks.--Pat

From: Lisa LaRue-Baker - UKB THPO [mailto:ukbthpo-larue@yahoo.com]
Sent: Thursday, April 30, 2015 10:42 AM
To: Ezzell, Patricia Bernard
Cc: Holly Noe
Subject: Re: TVA, KINGSTON FOSSIL PLANT (KIF), DEWATERING FACILITY, ROANE COUNTY, TENNESSEE

TVA External Message. Please use caution when opening.

The United Keetoowah Band of Cherokee Indians in Oklahoma has reviewed your project under Section 106 of the NHPA, and at this time, have no comments or objections. However, if any human remains are inadvertently discovered, please cease all work and contact us immediately.
The UKB reserves the right to re-enter consultation at any time regarding this project.

Thank you,

Lisa C. Baker
Acting THPO
United Keetoowah Band of Cherokee Indians in Oklahoma
PO Box 746
Tahlequah, OK 74465

c 918.822.1952
ukbthpo-larue@yahoo.com

On Monday, April 27, 2015 7:41 AM, "Ezzell, Patricia Bernard" <pbezzell@tva.gov> wrote:

1

Good Morning,
I sent the email below about the subject project last week. I just received a revised project boundary for this undertaking. There will be no change to the report referenced below. The only change is the figure which was attached to the end of the letter. Please use the attachment to this email when looking at the boundary.

I apologize for any inconvenience.

Thanks!

Pat

Pat Bernard Ezzell
Senior Program Manager
Tribal Relations and Corporate History
Tennessee Valley Authority
400 W. Summit Hill Drive
460 WT 7D-K
Knoxville, Tennessee 37902
Office Phone: (865) 632-6461
Cell phone: 865-304-9251
E-mail: pbezzell@tva.gov

From: Ezzell, Patricia Bernard
Sent: Tuesday, April 21, 2015 3:14 PM
To: 'rallen@cherokee.org'; 'Tyler B. Howe (tylehowe@nc-cherokee.com)'; 'Miranda Panther (mirapant@nc-cherokee.com)'; 'ukbthpo-larue@yahoo.com'; 'Emman Spain (ESpain@muscogeenation-nsn.gov)'; 'jjacobs@mcn-nsn.gov'; 'celestine.bryant@actribe.org'; 'slandsberry@alabama-quassarte.org'; 'kara.gann@kialegeetribe.net'; 'Charles Coleman (chascoleman75@yahoo.com)'; ''joseph.blanchard@astribe.com' (joseph.blanchard@astribe.com)'; 'Robin Dushane (RDushane@estoo.net)'; 'Dee Gardner (dgardner@estoo.net)'; 'Kim Jumper (kim.jumper@shawnee-tribe.com)'; 'cecil.wilson@astribe.com'
Cc: 'Russell Townsend (RussellT@nc-cherokee.com)'; 'jfife@muscogeenation-nsn.gov'; 'odette_freeman@muscogeenation-nsn.gov'; 'David Proctor (Davidp@mcn-nsn.gov)'; 'tthompson@mcn-nsn.gov'; 'Johnnie Wesley (jswesley@mcn-nsn.gov)'; 'lwendt@mcn-nsn.gov'
Subject: TVA, KINGSTON FOSSIL PLANT (KIF), DEWATERING FACILITY, ROANE COUNTY, TENNESSEE

Good Afternoon,
I hope this email message finds you well. By this email, I am transmitting the attached letter regarding TVA's review of its practices for handling and storing coal combustion products which result from the burning of coal to produce electricity. TVA is considering the conversion of the wet fly ash handling and storage facilities at KIF to a dry system.

The referenced report may be found at this link: http://tvaresearch.com/download/1511_TVA_Kingston_Dewatering_DRAFT_3.5.2015.pdf

2

As always, please do not hesitate to contact me if you have any questions. Please respond by May 21 if you have any comments on the proposed undertaking.

Thank you.

Sincerely,

Pat
Pat Bernard Ezzell
Senior Program Manager
Tribal Relations and Corporate History
Tennessee Valley Authority
400 W. Summit Hill Drive
460 WT 7D-K
Knoxville, Tennessee 37902
Office Phone: (865) 632-6461
Cell phone: 865-304-9251
E-mail: pbezzell@tva.gov

Orr, Jim

From:	Shuler, Marianne M <mmshuler@tva.gov>
Sent:	Monday, April 27, 2015 7:53 AM
To:	'Joseph Garrison'; 'Jennifer Barnett'
Cc:	Jones, Clinton E
Subject:	RE: TVA, KIF Dewatering Facility, Roane County, Tennessee mailed on April 20th, 2015
Attachments:	KIF-Modified Env Boundary_04-22-2015.pdf

Joe/Jennifer
Please see the revised Figure for the KIF Dewatering Facility Letter. Please let me know if you have any questions.
Thanks
Marianne

From: Joseph Garrison [mailto:Joseph.Garrison@tn.gov]
Sent: Monday, April 27, 2015 8:42 AM
To: Shuler, Marianne M; Jennifer Barnett
Cc: Jones, Clinton E
Subject: RE: TVA, KIF Dewatering Facility, Roane County, Tennessee mailed on April 20th, 2015

TVA External Message. Please use caution when opening.

Marianne,

It's okay with me if you send the revised figure by email.

Joe

Joseph Y. Garrison, PhD
Review and Compliance Coordinator
Tennessee State Historic Preservation Office
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Joseph.Garrison@tn.gov

(615)770-1092

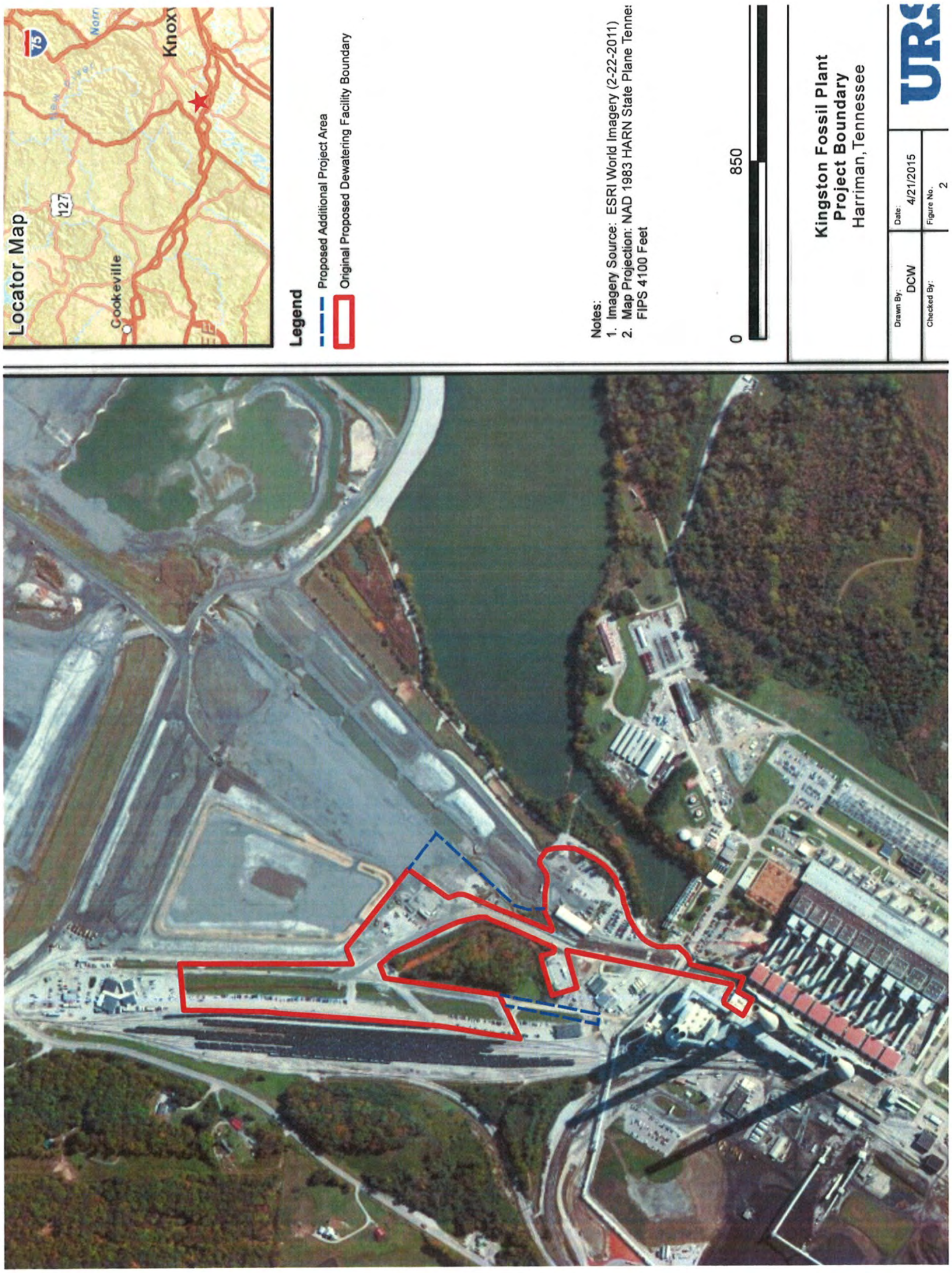
"I can explain it to you, but I can't understand it for you"

From: Shuler, Marianne M [mmshuler@tva.gov]
Sent: Friday, April 24, 2015 12:04 PM
To: Joseph Garrison; Jennifer Barnett
Cc: Jones, Clinton E
Subject: TVA, KIF Dewatering Facility, Roane County, Tennessee mailed on April 20th, 2015

Joe/Jennifer
Our office mailed you all a letter for the Kingston Fossil Plant Dewatering Facility on Monday April 20th, 2015. Today I received a revised project boundary for this undertaking. There will be no change to the report that was enclosed with the letter. The only change will be the figure which was attached to the end of the letter. Please let me know if I can send this revised figure by email or if you would prefer I send a new consultation letter.
Thanks
Marianne

Marianne Shuler
Archaeologist
TVA -Biological & Cultural Compliance
865-632-2464

2


Locator Map
Cookeville
127
75
Knox
Legend
Proposed Additional Project Area
Original Proposed Dewatering Facility Boundary
Notes:
1. Imagery Source: ESRI World Imagery (2-22-2011)
2. Map Projection: NAD 1983 HARN State Plane Tenne
FIPS 4100 Feet
0
850
Kingston Fossil Plant
Project Boundary
Harriman, Tennessee
Drawn By:
DCW
Date:
4/21/2015
Checked By:
Figure No.
2

Received
5/29/15

TENNESSEE HISTORICAL COMMISSION
STATE HISTORIC PRESERVATION OFFICE
2941 LEBANON ROAD
NASHVILLE, TENNESSEE 37214
OFFICE: (615) 532-1550
www.tnhistoricalcommission.org

May 20, 2015

Mr. Clinton E. Jones
Tennessee Valley Authority
400 W. Summet Hill Dr.
Knoxville, Tennessee, 37902-1499

RE: TVA, CULTURAL RESOURCES SURVEY REPORT, KINGSTON FOSSIL PLANT/DEWATERING FACILITY, UNINCORPORATED, ROANE COUNTY

Dear Mr. Jones:

Pursuant to your request, received on Saturday, May 23, 2015, this office has reviewed documentation concerning the above-referenced undertaking. This review is a requirement of Section 106 of the National Historic Preservation Act for compliance by the participating federal agency or applicant for federal assistance. Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739)

Considering the information provided, we find that the area of potential effects for this undertaking contains no historic properties eligible for listing in the National Register of Historic Places. You should notify interested persons and make the documentation associated with this finding available to the public.

If your agency proposes any modifications in current project plans or discovers any archaeological remains during the ground disturbance or construction phase, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

This office appreciates your cooperation.

E. Patrick McIntyre, Jr.

E. Patrick McIntyre
Executive Director and
State Historic Preservation Officer

EPM/jyg

Appendix D – Comments and Responses for Public Comment
April 2, 2015 to May 5, 2015
January 5, 2016 to February 3, 2016

INTRODUCTION – Public Comments and Responses April 2 – May 5, 2015

A Draft Environmental Assessment (EA) was released for comment on April 2, 2015. The comment period closed on May 5, 2015. The Draft EA was transmitted to state, federal, and local agencies and federally recognized tribes. It was also posted on Tennessee Valley Authority's (TVA's) public National Environmental Policy Act (NEPA) review website. A notice of availability including a request for comments on the Draft EA was published in newspapers serving the Kingston area. Comments were accepted through May 5, 2015, via TVA's website, mail, and e-mail. In response to a number of comments regarding recirculation and reduction of water discharge, TVA revised the Draft EA to include assessment of recirculation as a preferred alternative (Alternative C) in the Final EA. Responses to comments raised during the comment period are provided below.

Comments were received in two documents. One was a document jointly submitted by the Southern Alliance for Clean Energy (SACE), Southern Environmental Law Center, Tennessee Clean Water Network, Statewide Organizing for Community eMpowerment, Earthjustice, Environmental Integrity Project, and the Sierra Club ("SACE Comments"). This joint document incorporated a technical report prepared by Global Environmental, LLC. In addition, a proposal to turn fly ash into marketable metals and return carbon to the TVA plants was received from Billy Evans, owner of Whaley and Sons. Since the proposed dewatering facility is for treating bottom ash, the proposal from Whaley and Sons was not given further consideration in this review.

The SACE Comments and the technical report prepared by Global Environmental, LLC are included at the end of this appendix. TVA's responses to comments raised in these documents are provided below.

Comment 1:

Although the waste stream will change once the dry bottom stream is moved to the Gypsum Disposal Area, TVA has not included any analysis of the necessary changes needed for the Ash Processing Area as a result of the actions taken under the Draft EA.

Response: A revised permit application for the disposal of bottom ash at the on-site landfill was submitted to Tennessee Department of Environment and Conservation (TDEC) for review. This permit application was approved September 29, 2015. Section 3.13.2.2 of the EA has been modified to indicate that the revised permit application was approved by TDEC, and to describe the modifications made to the landfill in order to accept bottom ash.

Comment 2:

TVA also excluded impact analysis for changes to their outage washes from the Draft EA, despite acknowledgement that the ability to discharge these waste streams to the sluice trench will cease upon implementation of the dewatering system.

Response: The rerouting of the outage washes is an activity that would be undertaken in preparation for meeting requirements under the CCR regulations in the future. The plan for the rerouting of these outage washes is currently under development and would be evaluated in a future NEPA document once this plan has been fully developed. The reason these outage washes were mentioned in this Draft EA was to acknowledge that routing and/or treatment of these waste streams may be altered in the future to comply with the CCR rule. Section 3.7.2.2 of the Draft EA was revised to provide clarification that rerouting of the outage washes is a separate, independent project. Rerouting of outage washes will be evaluated in the future at the time the rerouting project is proposed. The cumulative impacts of that project are addressed in Section 3.20 as a reasonably foreseeable future action.

Comment 3:

Likewise, TVA does not include impacts from changes to its surface impoundment management and treatment operations in this Draft EA.

Response: Changes to surface impoundments is not a direct action that is related to the bottom ash dewatering project, but an activity that would be undertaken in preparation for meeting the requirements of the CCR regulations in the future. The bottom ash dewatering project would facilitate changes made to surface impoundments in the future to comply with the CCR regulations. The dewatering project has independent utility as it achieves the separation of the bottom ash (and pyrites) and enables its storage in the landfill as a dry product. The impacts of changes made to surface impoundment to comply with the CCR regulations would be evaluated in a future NEPA review once those plans have been further developed. Changes to the surface impoundments are addressed in the cumulative impacts section (Section 3.20.3) since this is a reasonably foreseeable future action.

Comment 4:

And perhaps most egregious of all, TVA does not include analysis of impacts caused by its current, under-construction and unpermitted Class II landfill as it relates to the project in this EA.

Response: A permit modification to the KIF Class II Gypsum Disposal Area (GDA) was approved by the TDEC, Division of Solid Waste September 29, 2015 and was addressed in the NEPA document for that project as well as extensive responses to comments. The original permit was limited to the disposal of gypsum in the landfill. The permit modification would allow disposal of all CCR wastes produced at Kingston Facility (KIF), which was analyzed in the Final EA for Installation of a Mechanical Gypsum Dewatering System at Kingston Fossil Plant Roane County, Tennessee, (TVA 2010). As part of this modification, TVA has included a more enhanced liner and leachate collection system in the facility design for protection of groundwater. The design of this containment system exceeds TDEC Class II rules and would be consistent with the requirements of the recently promulgated CCR regulations. To address potential subgrade issues, a robust subgrade construction quality assurance plan and an enhanced mitigation work plan has been developed. These measures significantly reduce the potential for wastes produced at KIF to contaminate groundwater. A discussion of impacts of the disposal of the bottom ash (and pyrites) in the GDA landfill has been included in the EA, Section 3.13.2.2.

Comment 5:

The EA acknowledges that Alternative A-No Action does not meet the stated purpose and need of phasing out the wet handling and storage of coal combustion products, but is discussed in the EA “to provide a benchmark against which to compare the impacts of the action alternative.” Thus, the EA effectively considers only one alternative: Alternative B – Construction and Operation of Dewatering Facility. Without question, this consideration of only one alternative violates NEPA. While NEPA does not dictate the range of alternatives that an agency must consider, it does dictate that alternatives be considered.

Response: The EA has been revised to clarify TVA's commitment to convert ash storage to a dry method, and thereby to eliminate wet ponding. The revised EA selects Alterative C, construction of the dewatering facility followed by a second phase of construction to include the recirculation of sluice water to comply with effluent limitation guidelines.

Multiple options were considered for converting bottom ash storage from a wet to dry system and are discussed in the EA. The goal of this dewatering project is to separate the bottom ash (and pyrites) from the wet-sluiced material, allowing for the storage of the bottom ash (and pyrites) in dry form and thereby eliminating the wet-ponding of this material. To accomplish this goal, TVA investigated options to convert the current bottom ash systems at its fossil units. The following options were considered for bottom ash handling conversions:

1. Dry Boiler Bottom Conversion (pneumatic conveying (PAX), DRYCON, and Vibrating ash conveying (VAX)); (Commercial systems for the above technologies such as UCC, ASH, Magaldi, or other equivalent were reviewed.)

Each of the dry bottom conversion technologies listed above were evaluated for use at KIF, and several are addressed in Section 2 of the EA. However, each was found to be infeasible for the technical reasons outlined below. Therefore, these systems were removed from detailed analysis in the Draft EA. Boiler bottoms at the majority of TVA coal plants are in basements in close proximity to the powerhouse floor, but there is not enough physical clearance to accommodate the required dry ash conveyance equipment in the proximity of the boiler bottoms. This restriction applied to numerous TVA coal-fired facilities including Allen, Bull Run Facility (BRF), Kingston, Gallatin, Shawnee, Widows Creek, and Paradise.

In addition to clearance necessary for equipment in the basement at KIF, there is not enough space to accommodate the supporting and auxiliary equipment in near proximity to boiler bottoms. There is no access for installation of a drag chain conveyor under the boiler bottom or a path for material removal in a conventional system.

Cost of Dry Boiler Bottom Conversion systems was found to be at least an order of magnitude higher than the wet-to-dry system discussed under Alternative B of the EA.

For the above reasons, the use of Dry Boiler Bottom Conversion was eliminated from consideration at KIF.

2. Wet to Dry Ash Handling Conversions

Bottom Ash sluiced to a facility to dewater (wet to dry ash handling conversions):

- Dewatering Bins (Hydrobins®);

- Submerged drag chain conveyor system (included in Alternative B) with recirculation of sluice water (Alternative C).

- Submerged drag chain conveyor system(s) supplied by ASH, UCC, and Clyde Bergmann, were reviewed.

TVA's engineering team investigated currently available and proven industry methods, including Hydrobins and submerged drag chain conveyors for dewatering bottom ash slurry streams with and without recirculation. Technical performance and environmental impacts were evaluated in order to determine the most appropriate method for use at KIF.

A number of issues were identified with hydrobins. For example, Hydrobins require an additional 80 ft to 100 ft of vertical lift which exceeds the capacity of existing bottom ash systems. In addition, decanting screens (effective for 2000 microns and larger ash) in Hydrobins would not be effective in ash removal from KIF as over 93% of the ash at KIF is smaller than 2,000 microns. With this decreased effectiveness of primary dewatering, extensive additional finishing would be required. High total suspended solids (TSS) entering the clarifier would require use of a solid contacts clarifier to reduce fines, thus adding to cost. A larger diameter clarifier would also impact the cost of the project and would require larger foundation sizes and facility footprint. This increase would result in a 50-75% cost increase over a standard clarifier. Extensive maintenance demands are required to address wear and pluggage in decanting screens from a Hydrobin system. Leakage and ash spills were noted at every location where TVA engineers observed Hydrobins in operation resulting in potential impacts to the environment. Thus, hydrobins were eliminated from further consideration.

Submerged drag chain conveyors with recirculation of the sluice water (Alternative C) adds much more cost to the system and did not eliminate the need for water use in the system but may allow for compliance with ELGs. While this process did reduce water use by up to 66%, water is still needed for make-up and outage, which accounts for approximately 1/3 of the water used by this system. Make-up water and outage water would be kept and used on-site, thereby eliminated discharge of bottom ash dewatering water.

The multiple options discussed above for converting bottom ash handling from a wet to dry system will be incorporated into the Final EA as alternatives considered.

Comment 6:

Moreover, as noted in attached Global Environmental, LLC Report, there are a number of state-of-the-art, field proven technologies that would accomplish the stated purpose and need of phasing out the wet handling and storage of coal ash. Mr. Quarles identifies four different technologies that TVA failed to analyze in the EA:

1. Zero liquid discharge (ZLD), recirculating system. Recirculates slurry water to eliminate the use of surface impoundments and eliminates wastewater discharges. Results in a dry ash for disposal.

2. Continuous dewatering and recirculating (CDR) system. System is incorporated into existing hoppers, results in minimal outage time, and eliminates the use of surface impoundments and any need for a wastewater discharge. Results in a dry ash.

3. Dry pneumatic conveying (PAX) hopper collection, dry transport, and dry disposal of bottom ash wastes. No water is needed. Belt-conveyed or gravity loaded onto a truck for disposal or reuse.

4. Vibrating ash conveying (VAX) uses a vibrating deck to move dry ash from the boiler for transport to a secure landfill or reuse.

Response:

TVA evaluated these alternatives for KIF. The dry systems, such as PAX and VAX, were found to be infeasible for the reasons provided in the response to Comment 5.

A ZLD system in the boiler area of KIF was considered. KIF is a facility where the physical constraints of the boiler area will not allow for the construction of individual dewatering systems for each unit. The comment state that ZLD was utilized at BRF. However, BRF does not have a ZLD system. Rather, it has a recirculating system that reduces the amount of water required to approximately 1/3 of the amount required to operate a wet sluice system. A recirculation system constructed at the dewater facility, not at the power plant was considered and is now evaluated as the preferred alternative (Alternative C), see Section 2.1.3. A recirculating component of the dewatering system would require more study and design in order to implement a recirculation system that would enable this waste water discharge to comply with new ELG regulations. A recirculation system of some type will be futher evaluated and phased in at a later time if needed.

TVA acknowledges the comment, and will add Alternative C, see Section 2.1.3.

Comment 7:

According to the EA, the ZLD system, which TVA uses at its Bull Run facility, was considered but eliminated because current and future expected regulations would not require it, as well as because it has a higher cost. However, as noted by TVA when it implemented this system at Bull Run, a ZLD would terminate all wet coal combustion product handling and disposal operations, provide a revenue source from the future sales of re-useable wastes and reduce the demand for native raw materials, and foster compliance with present and future regulatory requirements. The failure to analyze this and other state of the art and technologically feasible alternatives violates the “heart” of NEPA and renders the EA legally insufficient.

Response: See Comment 6; the recirculating system used at BRF is not ZLD. The system at BRF is a recirculating system that reduced water use from 18 million gallons per day (MGD) to 8 MGD. While a ZLD system at this site was considered impractical for use at KIF, the KIF EA has been revised to include an evaluation of a recirculation of the sluice water waste stream alternative (Alternative C, Section 2.1.3) constructed at the dewatering facility rather than at the power plant. This recirculating system would reduce water use similar to the system at BRF, but unlike a ZLD system would have a blowdown stream and possibly some outage wash wastestreams which will be held and used on-site. The EA has been revised to consider this alternative (Alternative C, Section 2.1.3). A recirculating component of the dewatering system would require more study and design in order to implement, however this future addition would enable this waste water discharge to comply with new ELG regulations. A recirculation system of some type would be further evaluated and phased in at a later time.

Comment 8:

Although TVA briefly discusses the option of isolating and separating dry bottom ash and dry pyrite, it dismisses this option as a viable possibility due to its assertion that this process would require an unspecified “greater use of resources” and result in increased, but unquantified, impacts on air quality, noise and transportation. Industry practices; however, has found that more modern, dry handling techniques can lead to increased thermal efficiency, reduction of unburned carbon and an improvement in ash quality.

Response: Two methods for pyrite separation were extensively studied. One method was to mechanically isolate the existing sluice stream and divert flows, resulting in two separate dewatering systems, one for bottom ash and the other for pyrite. The second method was to convert to dry pyrite removal. Dry pyrite removal would require separation of pyrite at the boiler of each unit. This option would not be feasible for the same reasons given in response to Comment 6 (i.e., there are physical constraints to constructing nine separation units at KIF). These alternatives were evaluated and eliminated from further consideration due to economic and environmental evaluations that indicated that construction of both a pyrite separator and bottom ash separator would require two systems with similar footprints and costs. The economic impact would be approximately double that of the proposed alternative. Likewise, the environmental impact would increase with the construction of two systems versus one, doubling the construction footprint, increasing construction time, use of resources and other factors such as dust and noise generation, as well as transportation of materials.

In addition, the marketability of the bottom ash and return on investment did not warrant additional measures. Currently the marketability of bottom ash is highly variable and depends on construction needs in the region. During times when bottom ash is not marketable, it would need to be stockpiled for later potential sale resulting in handling the material more than one time, potential stormwater runoff issues and space limitations. Even if bottom ash could be marketed, pyrite would still need to be disposed of. With the bottom ash removed from the pyrite, the natural buffering capacity of the combined waste would be eliminated and the metals in the pyrite would be more available to potentially leach out, resulting in greater environmental liability and cost. The impacts to air quality, noise, and transportation as a result of constructing two separation units for pyrite removal would be greater than the impacts for a system that does not separate the ash from the pyrites.

The Final EA will be revised to add additional details of the impacts of this alternative (i.e., estimated increases of environmental and cost impacts, that were considered but dismissed).

Comment 9:

TVA states that it eliminated a zero-water alternative from analysis in the Draft EA because 1) current regulations do not require zero liquid discharge; 2) future regulations, like EPA's Effluent Limitation Guidelines (ELG), may not require zero liquid discharge; 3) unspecified higher cost of a zero liquid discharge system; and 4) unspecified impacts on the plant itself. Due to the lack of information on the specifics of TVA's decision to remove a zero liquid discharge, Commenters remain unclear on what costs and impacts TVA is identifying. In part because of this lack of clarity, TVA demonstrably failed to adequately analyze the benefits of a zero liquid discharge system.

Response: See response to Comments 6, 7, and 8. The recirculating system used at BRF was considered at KIF. The system at BRF is a recirculating system that reduced water use from 18 MGD to 8 MGD. In the revised EA, TVA did consider a recirculation system located at the dewatering facility. A recirculating component of the dewatering system would require more study and design in order to implement a recirculation system that would enable this waste water discharge to comply with new ELG regulations. A recirculation system of some type will be further evaluated and phased in at a later time.

Comment 10:

A zero liquid discharge dry bottom ash system, like DRYCON system, uses zero water, reduces the need for maintenance, completely eliminates the needs for ponds on-site, increases gains in boiler efficiency and can reduce power consumption. Using water, rather than air, as a cooling agent for bottom ash incurs additional costs. Water treatment, corrosion damage, higher disposal costs and environmental impacts must all be analyzed when deciding between a wet and dry bottom ash handling, along with the impacts due to increased cost of operation and maintenance. By returning thermal energy to the boiler, this type of system can lower coal usage, leading to fewer emissions to produce the same amount of electric power.

Response: See response to Comment 5 and 9 with regard to feasibility of dry bottom systems as applied to the unique circumstances at KIF. DRYCON is another dry bottom system that would be impractical at KIF.

Comment 11:

The failure to analyze technologically feasible alternatives such as the zero liquid discharge system and others identified by Mr. Quarles also results in a proposed action that may not even meet the purpose and need of the project. In 2009, following the disastrous failure at the TVA Kingston facility and the release of more than 1 billion gallons of coal waste, the TVA Board of Directors passed a resolution to phase out wet handling and storage of coal combustion products. Complying with this resolution is the stated purpose and need of this project. However, the proposed construction and operation of a dewatering plant fails to accomplish this goal of phasing out wet handling and storage of coal ash.

Response: In its 2009 resolution, the TVA Board of Directors directed TVA to review and address systems and controls related to CCRs. An outcome of that review was to consider the conversion of wet ash storage at KIF to dry storage. The proposed construction and operation of a bottom ash and pyrite dewatering plant would eliminate the wet storage and reduce the duration of wet handling of CCRs. Current operations include sluicing of CCRs with water to the stilling pond. In the proposed action, the water that is discharged from the dewatering facility would not discharge CCR products for wet storage to a pond. The dewatering plant would eliminate this wet storage process and result in disposal of CCR as a solid in a landfill. Accordingly, the proposed alternative meets the goal of phasing out wet handling and storage of coal ash.

Comment 12:

The proposed action does not eliminate the wet handling of coal ash. To the contrary, it relies on water to transport the bottom ash and results in no reduction at all in the volume of wastewater. It proposed to withdraw millions of gallons of water each day from the river to wet the dry bottom ash and transport that now wet ash 1000 feet to be “dewatered.” The wastewater from the “dewatering” process—approximately 7.5 million gallons each day—will be disposed of in an unlined earthen pit containing decades of coal ash, pyrite, metal cleaning wastes, and other wastes from the plant.

Response: The proposed action would eliminate the wet storage of CCRs and establish the use of dry storage in either an approved on-site or off-site landfill. The duration of wet handling would be greatly reduced. Water would transport the CCRs to the dewatering facility where bottom ash and pyrite would be removed by the dewatering system, thus eliminating the need for storing coal ash in the stilling pond. The “unlined earthen pit” commonly referred to as the stilling pond is regulated under the CCR rule. Changes to surface impoundments is not an action that is related to the bottom ash dewatering project but an activity that would be undertaken in preparation for meeting the CCR regulations in the future. The bottom ash dewatering project would facilitate changes that need to be made to surface impoundments in the future to comply with the CCR regulations. The dewatering project has independent utility as it achieves the separation of the bottom ash (and pyrites) and enables its storage in the landfill as a dry product. TVA has also evaluated the use of a recirculation system which would reduce but not eliminate the discharge of wastewater, (see response to Comment 7). The impacts of changes made to surface impoundment to comply with the CCR regulations would be evaluated in a future NEPA review once those plans have been further developed. Future impoundment changes are discussed in the cumulative impacts section of this EA.

Comment 13:

The proposed action certainly does not result in a “state-of-the art, secure storage system that leads the industry in the management” of coal ash, as the EA claims. Rather, with this proposal, TVA continues to use an antiquated, wasteful, and environmentally detrimental method of handling its coal ash. With this proposal, TVA is not leading the industry in the management of coal ash, as it claims, nor is it complying with its Board’s directive to phase out the wet handling and storage of coal ash.

Response: The proposed action would eliminate wet storage of bottom ash and pyrites by the most efficient and effective technology available and applicable to KIF. See response to Comment 11 for more details.

Comment 14:

Coal ash handling and disposal operations at Kingston have contaminated surface water and groundwater, continue to do so, and will continue to do so after implementation of TVA’s preferred alternative. In fact, ongoing environmental impacts will be virtually identical before and after TVA builds the dewatering facility. In contrast, Alternative D, Zero Liquid Discharge, would eliminate the liquid waste stream associated with bottom ash, dramatically reducing environmental impacts. TVA must evaluate Alternative D as thoroughly as it evaluated Alternative B in order to provide an accurate range of the environmental impacts associated with practicable alternatives.

Response: As indicated in Sections 3.7.2.2 , 3.7.2.3, and 3.8.2.2 of the EA, project evaluation showed that no adverse impacts to surface water or groundwater would be expected from this proposed project and that waste stream concentrations would be “virtually identical” if not reduced compared to current discharge concentrations. Overall, the nature of the water would change with the removal of the bottom ash and pyrites from the waste stream. Metals loading have the potential to increase with the dissolution of pyrite. With the dewatering of these CCR byproducts the mechanism to increase acidity and increase metals in the waste water stream would be greatly reduced. Additionally, reactions of the pyritic solid with storm water in the landfill would be buffered by the unreacted lime in the gypsum and the medium in the leachate collection system, thus reducing the potential of a concentrated acid leachate stream. These discharges have in the past and would continue to meet all NPDES permit limits for Outfalls 001 and 002, TDEC Water Quality criteria, including drinking water standards, and the biomonitoirng requirements mentioned in Comments 15 and 16. Additionally, an evaluation of the recirculation of the sluice stream showed that the overall concentration in the receiving stream would be only slightly reduced from the Alternative A and B alternatives, further reinforcing the position that the impacts from this waste stream would be significant.

The name of this alternative (previously Alternative D), as used in the Draft EA, has been revised in the Final EA from a ZLD system to a recirculating system and is now evaluated as another alternative (Alternative C). A recirculating bottom ash waste stream component to the bottom ash dewatering system, similar to the one at BRF, was evaluated as an option. In this option, a recirculating system would tie into each unit to recycle and reuse water; however, since there would be a blowdown waste stream and possible outage discharges associated with this process stream and the need for additional make-up water, the system would not qualify as a ZLD system. A recirculating component of the dewatering system would require more study and design in order to implement a recirculation system that would enable this waste water discharge to comply with new ELG regulations. A recirculation system of some type will be futher evaluated and phased in at a later time. Please see response to Comments 6, 7, and 9 for more details on the recirculating option.

INTRODUCTION to Public Comments and Responses January 11 to February 3, 2016

A Draft Environmental Assessment (EA) of the proposed Kingston Dewatering Project was first released for comment on April 2, 2015. The comment period closed on May 5, 2015. The Draft EA was transmitted to various agencies and federally recognized tribes. It was also posted on Tennessee Valley Authority's (TVA's) public National Environmental Policy Act (NEPA) review website. A notice of availability including a request for comments on the Draft EA was published in newspapers serving the Kingston area. Comments were accepted through May 5, 2015, via TVA's website, mail, and e-mail.

In response to a number of comments regarding recirculation and reduction of water discharge, TVA revised the Draft EA to include assessment of recirculation as a preferred alternative (Alternative C) in the Revised Draft EA. The Revised Draft EA was released for public comment on January 13, 2016. The comment period closed February 3, 2016. Responses to comments raised during the 2016 comment period are provided below.

Comments on the Revised Draft EA were received in one document from the Tennessee Department of Environment and Conservation (TDEC). TDEC circulated the EA among all pertinent Divisions of TDEC combined the comments from the Division of Air Pollution Control (APC), Tennessee Geological Survey (TGS), Division of Natural Areas (DNA), Tennessee State Parks and Real Property Management, Division of Water Resources (DWR) and Division of Solid Waste Management (DSWM), and provided TVA a consolidated response.

The TDEC Comments are included at the end of this appendix. TVA's responses to comments raised in this document are provided below.

TDEC (APC) Comment 1:

APC comments that the project, as presented, will likely require a TDEC APC issued permit or permit modification.

Response: Section 1.6 of the EA already provides that the project would likely require revisions to TVA's Title V Permit under the Clean Air Act for operations. Accordingly o revisions to the EA are necessary.

TDEC (APC) Comment 2:

APC comments that the procedures outlined for fugitive dust control appear to be adequate, but recommends that TVA include in the Final EA that the use of additional road cleaning sweepers or water wash trucks may be required if it is determined that amounts of fugitive dust are being tracked out either in an on or off-site storage/disposal solution.

Response: Section 2.3.1 of the Final EA is edited to include: These measures include wetting equipment and covering waste or debris piles, using covered containers to haul waste and debris, road sweepers on paved roads and wetting unpaved vehicle access routes with water wash trucks,

TDEC (APC) Comment 3:

APC recommends that TVA include a plan to address possible on site air monitoring should fugitive dust be observed that cannot be corrected through on site wetting or sweeping activities in the Final EA.

Response: The following sentence is added to the first paragraph of Section 2.3.1: "In the event that fugitive dust at the property line, after implementation of the above measures, does not meet the visible emission standard prescribed in Tenn. Reg. 1200-3-8, TVA would conduct appropriate on-site air monitoring after consulting with TDEC."

TDEC (DNA) Comment 4:

Based on the information in the rare species database and the habitat within the project area, DNA does not anticipate adverse impacts to rare, threatened or endangered plant species.

Response: Comment noted, no changes to the EA.

TDEC (DNA) Comment 5:

DNA supports the selection of Alternative C (Preferred Alternative), provided that erosion controls and best practices for storm water impacts are used during the project.

Response: The first sentence of the first paragraph of section 2.3.2 will be edited as follows: Alternative B and C would involve land disturbance greater than 1 acre requiring a TDEC Construction Storm Water permit, which would include a SWPPP and BMP Plans.

TDEC (DWR) Comment 6:

Under Section 3.7.1.2 "Water Quality (KIF Dike Recovery, 2009 - Present)," DWR recommends TVA remove the wording "Additionally, the Clinch River is listed as threatened by loss of native mussel species for unknown reasons" from the Final EA as this wording relates to the ongoing effects on the Clinch River above Norris Lake and the water quality impacts are geographically irrelevant to this project.

Response: This wording will be removed in the Final EA

TDEC (DWR) Comment 7:

Under Section 3.7.1.3 “Existing Wastewaters and Drainage Areas,” DWR comments that Outfall 01A, representing the discharge from Gypsum Disposal Area (GDA), is currently listed under NPDES Permit Number TN0080870 and not Permit Number TN0005452.

Response: Section 3.7.1.3 is edited as follows: Several existing wastewater streams at KIF are permitted to be discharged by the Kingston NPDES permits (No. TN0080870 covers Outfall 01A and No. TN0005452 covers all other NPDES Outfalls) (TDEC 2003 and 2009a).

TDEC (DWR) Comment 8:

With regards to Section 3.7.2 “Environmental Consequences,” DWR has reviewed the proposed project in relation to the existing water quality conditions found in the receiving stream and finds that the proposed impacts to receiving stream water quality for both Alternative B and C to be minimal.

Response: Comment noted.

TDEC (DSWM) Comment 9:

In Section 3.13 “Solid and Hazardous Waste,” TVA states that the generation of hazardous waste is not anticipated; however, limited amounts of used oil, paint, welding material, etc., may be generated from construction equipment. DSWM notes that the Draft EA indicates that disposal of such materials will be handled by the construction contractor. DSWM recommends that any wastes, such as paint waste or used oil, generated or spilled during the actual construction project, be characterized for the appropriate disposal option or recycled.

Response: Section 3.13.2.2 is edited to include the following sentence: Any wastes, such as paint waste or used oil, generated or spilled during the actual construction project, would be characterized for the appropriate disposal option or recycled.

TDEC (DSWM) Comment 10:

In Section 3.13 “Solid and Hazardous Waste,” TVA states that construction debris generated from the project would be disposed of on-site. DSWM comments that the current industrial landfill permit for this site does not authorize disposal of construction debris. In the Final EA, DSWM recommends that TVA clarify that construction debris other than excavated ash or soil will be required to be disposed of at an approved off-site facility or that a modification to the current on-site permit will be required prior to disposal of those materials.

Response: The second sentence of Section 3.13.2.2 reads: “...a limited amount of construction debris would be generated, which would be placed in roll-offs and disposed of as construction waste in an off-site C&D landfill.” This addresses TDEC’s comment regarding the disposal of C&D waste an off-site landfill. No changes to the EA are anticipated. In the last sentence of Section 3.13.2.3 “construction debris” will be removed.

TDEC (General Comment) Comment 11:

TDEC recommends that TVA include a discussion of how the proposed action will intersect and comply with the August 7, 2015 Commissioner’s Order issued from TDEC to TVA directing the investigation, assessment, and remediation of all coal ash disposal sites across Tennessee in the Final EA.

Response: The proposed dewatering project is an integral part of the compliance efforts that TVA is undertaking to comply with the CCR rule, ELG regulations and the TDEC Commissioners Order. A discussion of the compliance with these rules and the Commissioner's Order is identified in Section 1 of the EA with the addition of the following text:

On August 7, 2015 the Commissioner of the Tennessee Department of Environment and Conservation (TDEC) issued a Commissioners Order to TVA in order to:

1. 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 plant in Tennessee; and

2. To establish the process whereby TDEC 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 (TDEC 2015).