Document Type: EA-Administrative Record
Index Field: Environmental Assessment
Project Name: KIF Dewatering
Project Number: 203537

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

Prepared by:
TENNESSEE VALLEY AUTHORITY
Chattanooga, Tennessee

March 2015

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Symbols, Acronyms, and Abbreviations

AADT	Average Annual Daily Traffic
ACS	American Community Survey
APA	Ash Processing Area
APC	Air Pollution Control
APE	Area of Potential Effect
BMP	Best Management Practice
C&D	Construction and Demolition
CAA	Clean Air Act
CCP	Coal Combustion Products
CCR	Coal Combustion Residue
CCW	Condenser Cooling Water
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CRM	Clinch River Mile
CWA	Clean Water Act
dBA	A-weighted decibel
EA	Environmental Assessment
EJ	Environmental Justice
ELG	Effluent Limitation Guidelines
EO	Executive Order
EPA	Environmental Protection Agency
ERM	Emory River Mile
FGD	Flue Gas Desulfurization
GDA	Gypsum Disposal Area
KIF	Kingston Fossil Plant
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MGD	million gallons per day
MSL	Mean Seal Level
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLEB	Northern long-eared bat
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
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
SFC	Submerged Flight Conveyor
SWPPP	Storm Water Pollution Prevention Plan
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
tph	tons per hour
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method
TWQC	Tennessee Water Quality Criteria
TWRA	Tennessee Wildlife Resources Agency
USACE	U.S. Army Corps of Engineers

USAF	U.S. Air Force
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
μg/L	micrograms per liter

CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION

1.1 Introduction and Background

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 2010).

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 state-of-the--art, secure storage system that leads the industry in the management of CCPs. The proposed changes would also allow for the future marketing of ash products that are not currently feasible with the wet ash storage system.

KIF is a 1.7-GW coal-burning power plant with nine generating units located in Harriman, Roane County, Tennessee, on the shore of Watts Bar Lake. TVA proposes to design and erect a new facility at KIF that would dewater the bottom ash/pyrite sluice stream to create dry coal combustion residue (CCR). The dewatering facility would create dry CCR product that would be transported to an on-site landfill.

The location and construction of the 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 installation, erection, commissioning, and startup support necessary to place bottom ash dewatering facilities for TVA's KIF into successful and reliable operation (Figures 1-3 and 1-4).

The bottom ash from the boilers, sluiced in the power plant, would be routed in basalt-lined pipes to the separators of the new dewatering facility. Dewatered bottom ash would be stacked in a 3-day, 80-hour storage pile and would be trucked to the landfill area. Bottom ash sluice water would be discharged to the sluice trench and into the settling pond. Discharge from the settling pond would be to the Clinch River via permitted Outfall 001.

The new dewatering facility would be designed to process a total slurry flow rate of 5,200 gallons per minute. This slurry flow consists of 16.5 tons per hour (tph) of bottom ash (7.2 tph from units 1-4 and 9.3 tph from units 5-9). The slurry flow would also consist of 6.5 tph of pyrites on an intermittent basis (2.84 tph from units 1-4 and 3.66 tph from units 5-9). 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.

Bottom ash and pyrites would be pumped to conveyors in the new dewatering facility, dewatered, and discharged to a concrete pad for removal. From the concrete pad, dry ash and pyrites would be loaded onto trucks and hauled for disposal to the on-site landfill.

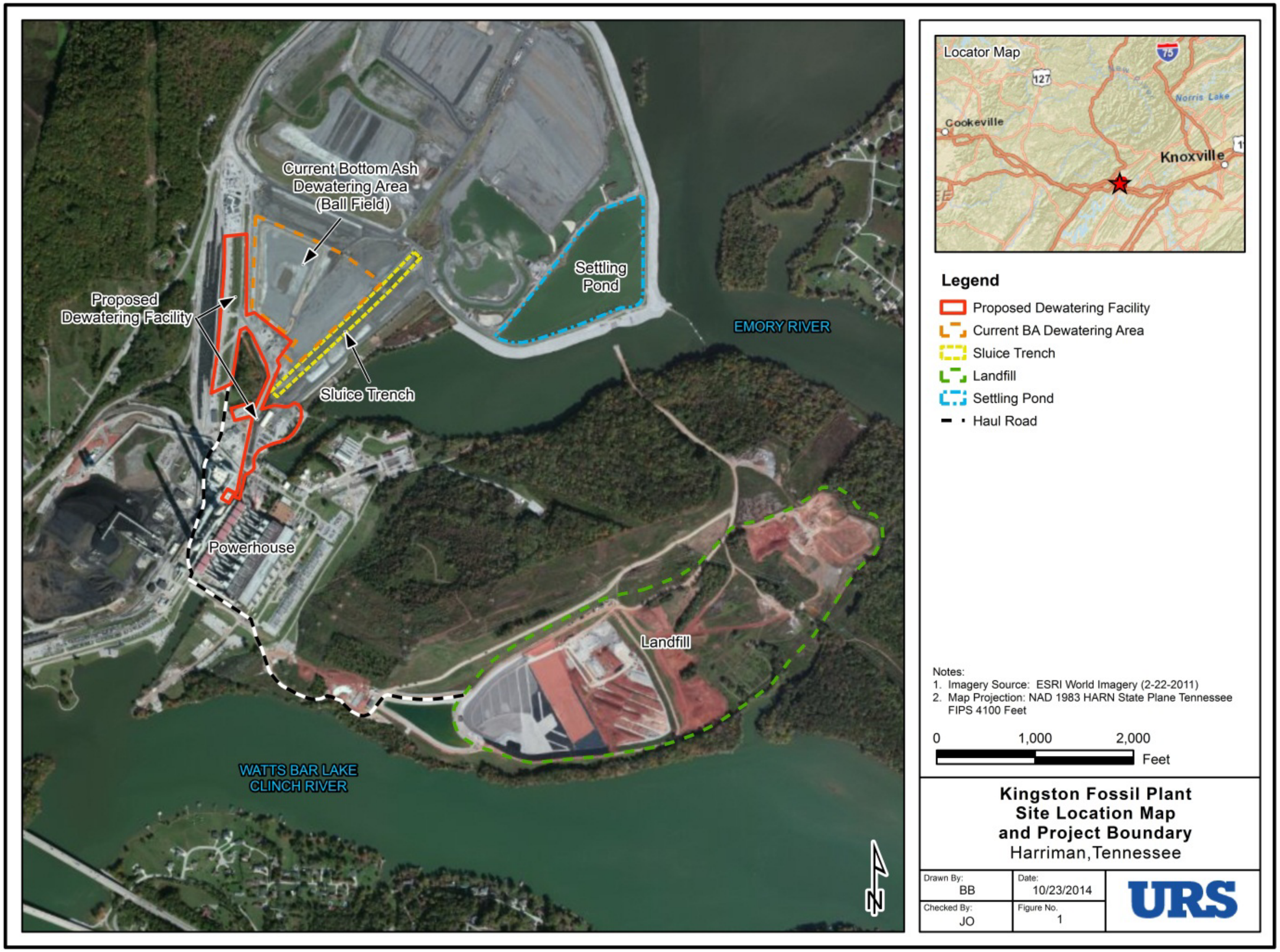

Figure 1-1. Map of Kingston Fossil Plant for the Proposed Action

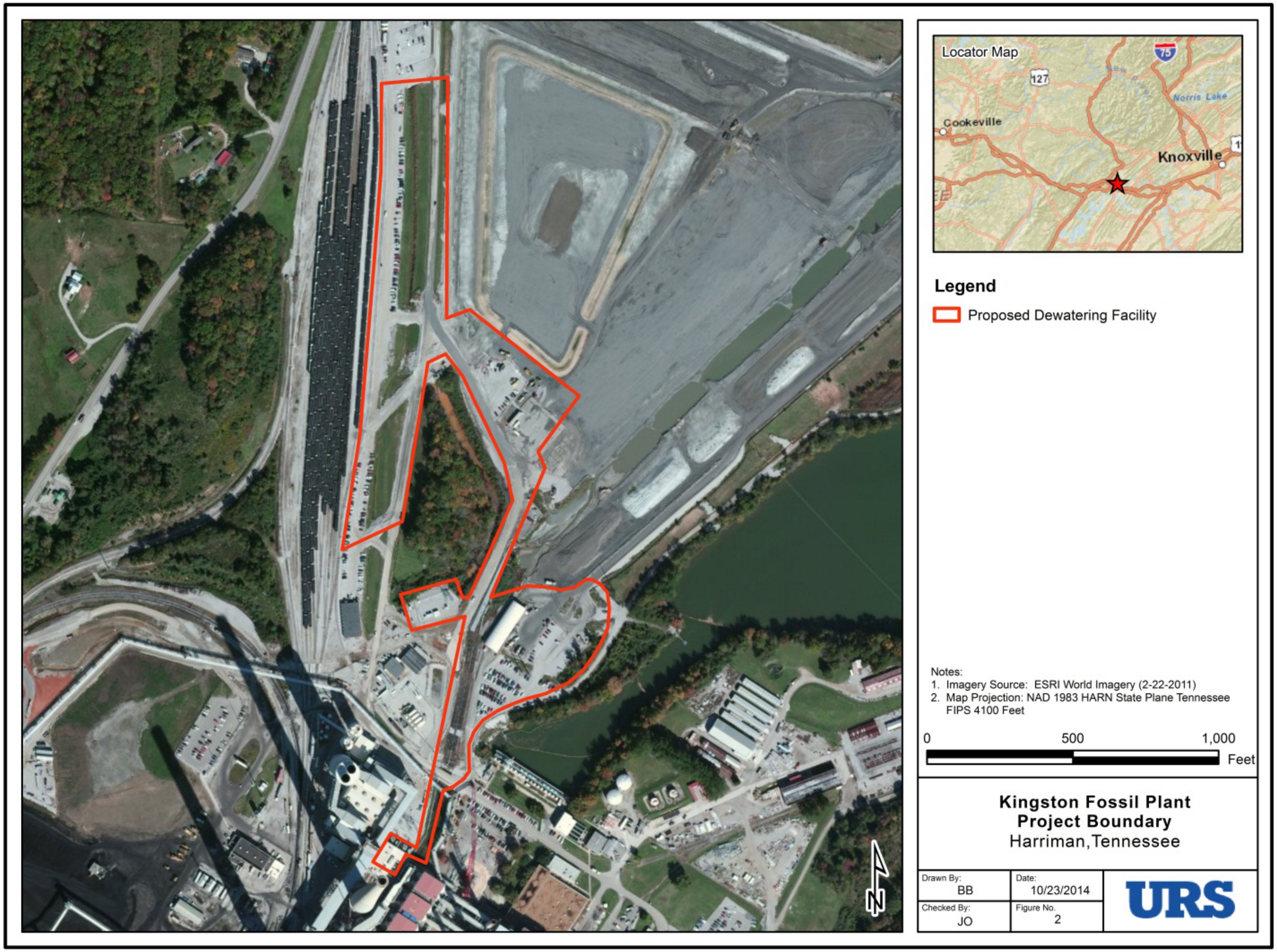

Figure 1-2. KIF Dewatering Project Boundary

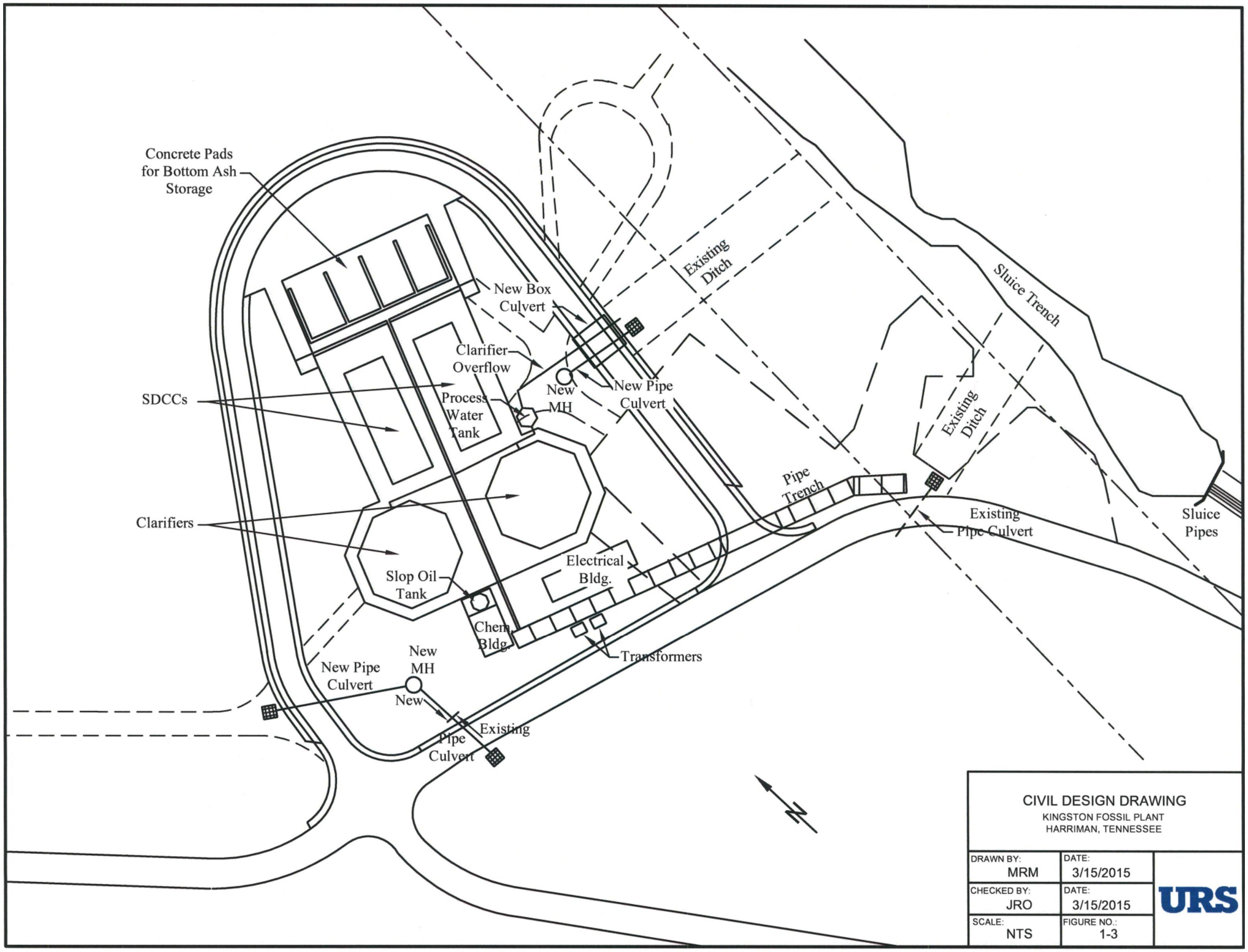

Figure 1-3. Civil Design Drawing

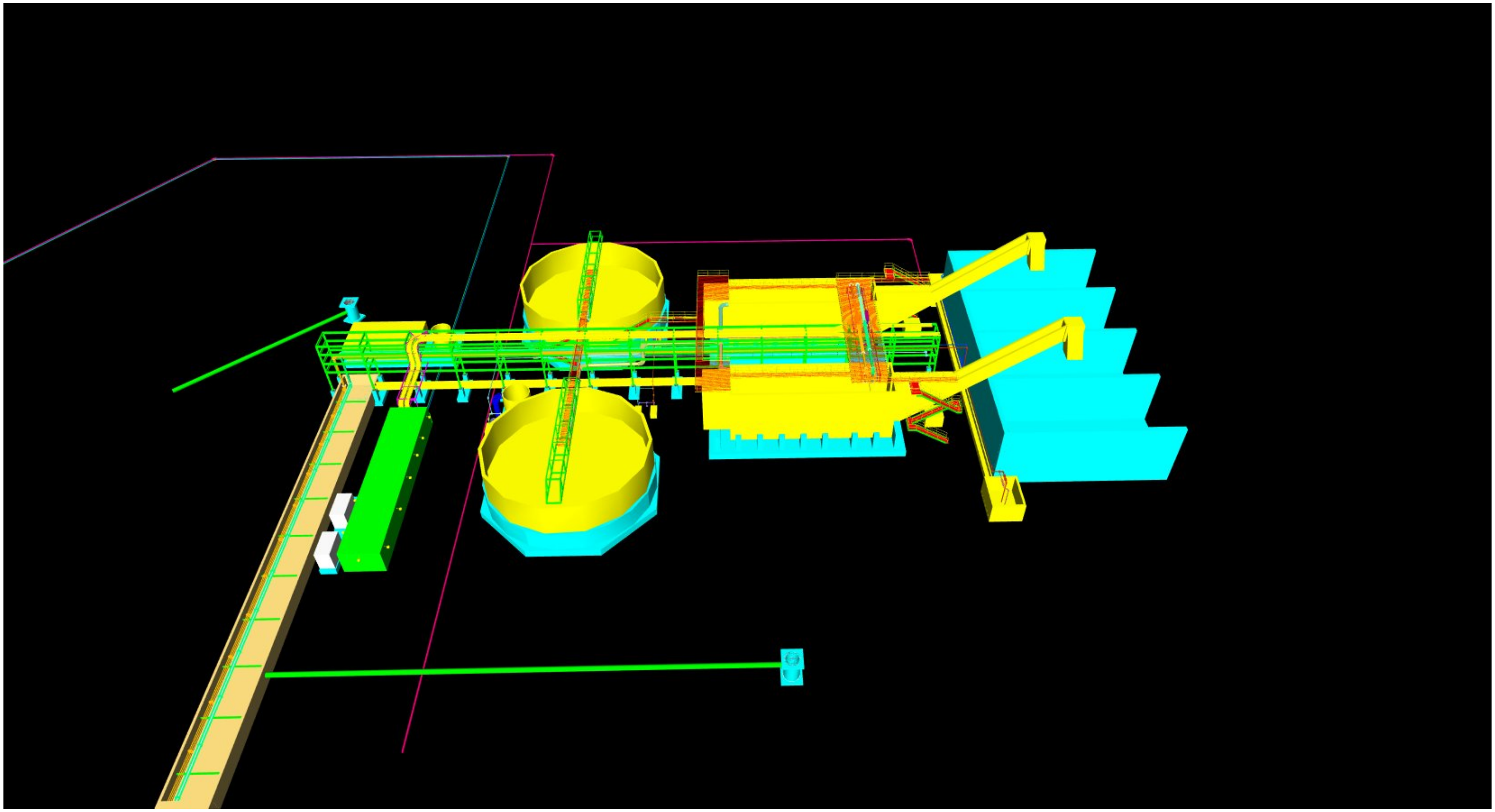

Figure 1-4. Conceptual Layout

Upon completion of design and construction of the new dewatering facility, bottom ash and pyrites from KIF would be sufficiently dewatered to allow for transportation to the dry on-site landfill.

1.2 Purpose and Need

In August 2009, the TVA Board of Directors passed a resolution to phase out wet handling and storage of coal combustion products (CCP). TVA subsequently reviewed its practices for handling and storing CCPs at its generating facilities, including the Kingston Fossil Plant, which resulted in a recommendation to convert the wet bottom ash management system at KIF to a dry system. To enable this wet-to-dry conversion, TVA proposes to install a dewatering facility for bottom ash at KIF. The dewatering facility would enable TVA to achieve the goals of TVA Board's August 2009 resolution. Further, the dewatering facility would foster TVA's compliance with present and future regulatory requirements related to CCP production and management.

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 to design a dewatering facility to provide dry bottom ash for disposal or take no action. TVA is working with the Tennessee Department of Conservation (TDEC), U.S. Fish and Wildlife Service (USFWS), Tennessee Wildlife Resources Agency (TWRA), and Tennessee State Historic Preservation Commission in assessing the impact of its decision.

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, 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 onsite 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; and environmental justice, and prime farmland.
- *Kingston Dry Fly Ash Conversion, Final Environmental Assessment* (TVA 2010). 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.

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:

- Climate change
- Air quality
- Vegetation
- Wildlife
- Aquatic ecology
- Threatened and endangered species
- Surface water and wastewater
- Groundwater
- 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 (CAA) 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 CAA for operations.
- TVA's Solid Waste Permit would require modification to reflect a change in the manner in which the bottom ash is handled and disposed of.
- A Storm Water Permit issued by TDEC, under the Clean Water Act (CWA), 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 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 is one action alternative to meet the purpose and need defined in Chapter 1. This alternative 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 are 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 ponds. The existing associated impoundments shown in Figure 1-1 would continue to be operated as currently permitted. Wet ash is currently discharged to the sluice trench where much of the ash settles out while a portion of the ash flows to the settling pond. The ash is dredged from the trench by track hoe and placed in mounds in a staging area, referred to as the "ball field". Currently, the bottom ash remains in the ball field area. TVA plans to begin disposing of ash from the ball field area in an existing on-site landfill, pending approval of a permit modification request for the landfill. Alternatively, TVA may remove the ash from the ball field area to an appropriate off-site landfill. The environmental effects of continuing to store ash in the on-site landfill 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 14-acre area proposed for the dewatering system. This alternative does not meet the purpose of achieving the overall TVA goal of converting wet bottom ash handling and storage facilities to a dry system. 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

Under Alternative B, TVA would construct a bottom ash mechanical dewatering facility at KIF to create dry products for disposal in an existing on-site landfill. The existing ash ponds and settling basin would remain and receive overflow from the dewatering facility as well as discharges from the power plant. 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. Water generated from the dewatering process would return to the sluice trench and be discharged through a permitted outfall. 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. Approximately 65 full and part-time jobs would be gained during construction with two to three full-time employees required to operate the facility.

Trucks would be used to haul dry bottom ash from the dewatering facility to the on-site landfill at a rate of 8,000 to 57,000 tons per year or approximately 1 to 10 truckloads per day. 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 the removal of existing surface material to approximately three inches below grade, grading the 14 acre area, constructing the turn-around road, dewatering facility and associated utilities and removal of the truck wash facility. Construction is expected to take place over a 12 to 15 month period.

Sluice lines for bottom ash would be routed to the proposed dewatering building. Bottom ash would be dewatered using specialized equipment that would operate continuously while KIF is generating. The dewatered material would be stacked in piles with a maximum height of 45 feet. Any remaining water in the material in the piles would drain by gravity and would be collected in sumps. Dewatered CCPs would be allowed to stand in the pile for a maximum of 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 trains of equipment for dewatering bottom ash. These pairs are designed to run in tandem. The redundant nature of this arrangement would allow dewatering operations to continue if there are mechanical problems with either of the dewatering trains. In the unlikely event that both bottom ash dewatering trains 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.

2.1.2.1 Bottom Ash Dewatering Equipment and Operations

The bottom ash to be dewatered is presently sluiced from the power plant to a sluice trench and then to the settling pond. Currently, 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 co-mingled. The bottom ash and pyrites would go to the dewatering facility and would be dewatered and sent to an existing on-site landfill. The sluice water would then be released to a settling pond and ultimately discharged through 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 gallons per minute. This slurry flow would consist of 16.5 tph of bottom ash (7.2 tph from units 1-4 and 9.3 tph from units 5-9). The slurry flow would also consist of 6.5 tph of pyrites on an intermittent basis (2.84 tph from units 1-4 and 3.66 tph from units 5-9).

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 in the existing ash sluice trench would be tied into two new 10 in. 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 (SFC) (Figure 2-1). Wet bottom ash slurry would fall into the SFC and accumulate in the upper trough. The ash would settle to the bottom of the SFC to a submerged drag chain conveyor (SDCC). The ash would then be transported up an incline by the SDCC, allowing for natural dewatering by gravity, and would be discharged to concrete bunkers. In the second process, overflow water from the SDCCs would be gravity-fed into the clarifiers for further sedimentation. Clarifier underflow pumps would be provided to pump settled ash back to the SFC 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 the settling basin 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 storage prior to removal by TVA. Removal of the dewatered bottom ash would be achieved via truck load-out. Due to the comingled 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 requirements at KIF.

2.1.2.2 Bottom Ash Dewatering Operations

To support the dewatering effort, a 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 SDCCs with clarifiers. KIF bottom ash and Widow's Creek Fossil pyrite were used as source material and represented the worst case in this study (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 issues. 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 (s.u.). This study's results indicate that the waste stream that would be generated by this process would meet the current TDEC pH and metals limits.

Any discharges would initially be sent to an on-site settling pond for co-treatment before being released to surface waters. 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 (TWQC) that are developed to be protective of designated uses. Additionally, associated process storm water would be routed to the settling pond or a water treatment facility for treatment and release.

2.1.2.3 Ash Pond Characterization

The dry ash conversion project would change the dynamics of the settling pond by removing the bottom ash in the transport water that will be treated by the ditch and pond system. Because the majority of the water used to sluice bottom ash would be released and only a small portion recycled, operation of the proposed dewatering facility would not change the dynamics of the settling pond and should provide essentially the same volume of inflow of transport water to the settling pond. Ultimately an on-site water treatment facility will be constructed to take the place of the pond system for compliance of proposed ELGs and the pond would be closed. However, there would be a period of time between when the dewatering/dry processes would be in place and the construction of the water treatment facility would be finalized. Therefore, the functionality of the ash pond would be evaluated prior to the bottom ash and gypsum dewatering installation. Appropriate measures will be taken to ensure that discharges into surface waters comply with NPDES permit limits.

To evaluate and characterize the changes in the settling pond and Outfall 001 once this alteration in receiving waters takes place, a mass balance of the settling pond and the dewatered bottom ash was conducted to thoroughly evaluate the pond loading and chemical characteristics.

Results of the metals mass balance analysis under current operations and for future operations (i.e., following the bottom ash conversion) are presented in Appendix B.

2.1.2.4 GDA Leachate

The dewatered bottom ash would be trucked and stored in the Gypsum Disposal Area (GDA), which has a liner system that consists of a 2 ft compacted clay layer with hydraulic conductivity of less than 1×10^{-7} cm/sec with a 60 mil 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 (FGD) storm water pond and discharges via NPDES Outfall 01A. The addition of the bottom ash/pyrite waste stream to this landfill has the potential to change the characterization of the leachate waste stream, thus the potential to impact surface water. The current leachate waste stream is a low flow waste stream with relatively low levels of solids and metals.

Should dry bottom ash and pyrite products be disposed of in the GDA, these holding tanks would operate to collect waste water in need of treatment for solids and metals. Consequently, potential impacts to surface water under Alternative B would be minor.

2.1.2.5 Ash Processing Area (APA)

The APA flows are precipitation driven and drain to the settling pond. This waste stream would change once the dry bottom stream would be moved to the GDA landfill. The preliminary plan for this 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 will 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.

2.1.2.6 Outage Washes

KIF outage washes detailed in Section 3.7.1.4, include periodic outage washes currently being discharged by the facility to the sluice trench, settling pond, and ultimately discharged out Outfall 001. These releases are usually released through the station sumps or the bottom ash sluice lines. With the implementation of the dewatering system, the ability to discharge these waste streams to the sluice trench will cease. The preliminary plan to treat these discharges would be to re-route these flows to the coal yard run-off pond or to on-site holding tanks for treatment and ultimately to discharge these flows at Outfall 001. 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.

2.1.3 Alternatives Considered but Eliminated From Further Discussion

2.1.3.1 Alternative C – Isolation and Separate Processing of Bottom Ash and Pyrite Streams

Under Alternative C, TVA would construct a separate pyrite (iron and manganese residue) separation system from the bottom ash system. The system would pneumatically convey dry pyrites from the hoppers resulting in separate piles of dry bottom ash and dry pyrite. The bottom ash and pyrite would be segregated in the current landfill or the pyrite would be disposed of at an off-site facility. This would increase the marketability of the bottom ash and help to mitigate surface water quality issues associated with pyrites. This alternative was not selected as it would result in nearly doubling the cost of the dewatering process over the one with both streams combined. While there is a market for the dewatered bottom ash (minus pyrite), the sale of dewatered bottom ash would not outweigh the cost of two dewatering systems and modifications to the power plant to separate the streams. Constructing two systems would also result in a greater use of resources, longer construction period and impacts on air quality, noise and transportation.

2.1.3.2 Alternative D – Zero Liquid Discharge

Under Alternative D, TVA would recycle the dewatering effluent water back into the facility to be reused as sluice water. Current regulations do not, and future regulations such as EPA's ELGs are not expected to, require the use of zero liquid discharge. The future regulatory outlook, the higher cost of zero liquid discharge, and the operational impacts on the power plant from conversion to a recirculating system prompted TVA to eliminate this alternative.

2.1.3.3 Alternative E – Use of Hydrobins

Under Alternative E, use of hydrobins was considered but deemed not to be a suitable alternative for TVA as hydrobins are not capable of removing the small ash particles characteristic of KIF's process. Hydrobin Dewatering Systems separate and dewaters bottom ash from the conveying supply water. Bottom ash disposal with a dewatering (Hydro) bin involves pumping the bottom ash as slurry from the ash hopper to outside the dewatering bin for ash water separation and loading of the dewatered ash into trucks for hauling to the disposal site. Furthermore, leakage and ash spills have been noted in hydrobin setups. Moreover, structural steel erection for hydrobins was estimated to cost approximately 40 percent more than project estimates for SDCC.

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
Climate change	No impact	No significant impact
Air quality	No impact	Minor short-term impacts during construction.
Vegetation	No impact	No significant impact
Wildlife	No impact	No significant impact
Aquatic ecology	No impact	No significant impact
Threatened and endangered species	No impact	No impact
Surface water and wastewater	No impact	No significant impact
Groundwater	No impact	No significant impact
Wetlands	No impact	No significant impact
Floodplains	No impact	No impact
Natural areas, parks and recreation	No impact	No impact
Cultural and historic resources	No impact	No impact
Solid and hazardous waste	No impact	No impact
Land use and prime farmland	No impact	No impact
Roadway transportation	No impact	Minor short-term impact during construction.
Visual resources	No impact	No significant impact
Noise	No impact	Minor short-term impacts during construction.
Socioeconomics and Environmental Justice	Minor impact	Short-term and long-term beneficial impacts
Safety	No impact	Minor short-term impacts 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)
- Erosion controls and BMPs for storm water impacts (for Alternative B)
- Dust control during construction (for Alternative B)

2.3.1 Air Quality

Under Alternative B, the construction contractor would be required to implement dust control measures during construction to prevent the spread of dust, dirt, and debris. These methods include wetting equipment and, covering waste or debris piles, using covered containers to haul waste and debris, and wetting unpaved vehicle access routes 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. During bottom ash loading to open trucks 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 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. 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 involves land disturbance greater than 1 acre of land, which would require an SWPPP and BMPs. The current NPDES permit and Storm Water Multi-Sector Permit may require modification with this alternative. The SWPPP and BMPs would reduce the potential for erosion of soil to reach waters of the State, streams and wetlands and groundwater. The modification of the NPDES and Storm Water Multi-Sector permits would be required as a new process wastewater stream with new characteristics would be added to the KIF discharge. Permit modifications would mitigate any potential release of contaminates to waters of the State.

2.4 Preferred Alternative

TVA’s preferred alternative is Alternative B, construction of the dewatering facility. Alternative A is discussed and analyzed as an alternative to this proposed action.

Alternative B provides long-term benefits, and meets the purpose and need of the project as the project supports TVA's CCP handling approach. Alternative B would also provide a greater level of safety to human health and the environment as wet impoundment of CCR waste would be reduced.

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 $PM_{2.5}$ standard. The proposed dewatering facility would be subject to both federal and State of Tennessee 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 (APC); 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 is not a major modification under state air quality regulations (TDEC APC 1200-03-09-.01(5)(b)(2) [TDEC 2009a]).

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 for gypsum and 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 effects to air quality.

3.1.2.2 Alternative B – Construction of Dewatering Facility

Construction-related Effects

Transient air pollutant emissions would occur during the construction phase. Construction-related air quality impacts are 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 SO_2 during the site preparation and construction period. The total amount of these emissions would be small and would result in minimal effects to air quality.

Air quality effects 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 effects to air quality from construction-related activities for the project would be minor.

Operations-related Effects

The proposed dewatering facility would be in compliance with the State of Tennessee regulations.

Operations of the bottom ash dewatering system are subject to specific State of Tennessee process regulations and fugitive dust regulations. Operations are also subject to review for applicability of the PSD regulations for PM_{10} and total particulate. Because the emissions of PM_{10} and total particulate 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 and the project would be small.

Fugitive Dust Emissions

These 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.

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, methane) and particles. By the end of this century, the 2014 National Climate Assessment concluded a 3°Farenhiet (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 carbon dioxide (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 2013, fossil-fired generation accounted for 51 percent of TVA's total electric generation, and the non-emitting sources of nuclear, hydro, and other renewables accounted for 49 percent. Compared to CO_2 emissions from the entire TVA system in 2005 to those in 2013, TVA has reduced its CO_2 emissions by over 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

Implementing the No Action Alternative would not result in any additional effects.

3.2.2.2 Alternative B – Construction of Dewatering Facility

Dewatering Facility Construction-related Effects

CO_2 emissions would occur during the construction phase. Construction-related CO_2 emissions are 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 insignificant effects.

Operations-related Effects

Operations at the dewatering facility will all be electric powered. No CO_2 emissions are expected to occur.

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 un-vegetated, gravel, or paved lots, but a few very small locations do contain early successional vegetation dominated by non-native weeds. 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 non-native 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 and Operation of Dewatering Facility

Adoption of Alternative B would result in the construction of a dewatering facility on approximately 14 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. Impacts to vegetation, if any, may be permanent but the vegetation found on-site is comprised of non-native weeds and early successional plants that have no conservation value. Adoption of Alternative B would have an insignificant impact on vegetation.

3.4 Wildlife

3.4.1 Affected Environment

The proposed dewatering project at KIF is located at the confluence of the Emory and Clinch rivers. The project footprint includes the existing vehicle decontamination area, parking areas, roads, drainages, drainage pipes, a small transformer station, and an area inside the KIF plant. Terrestrial habitat within this project footprint includes mowed grassy areas along a channel/bush hogged wetlands (in the parking lot area), and a small fragment of upland forest (0.2 acre). The surrounding area includes the shoreline of Watts Barr Reservoir around the north, south and east of the Kingston facility and heavily wooded landscape to the west and across the open water areas of the adjoining reservoir.

Mowed herbaceous fields and bush-hogged wetlands 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 small patches of disturbed forest 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.

Activation of the proposed dewatering facility and reroute of ash slurry away from ash ponds would eventually result in the drying of the ash ponds and settling basin at KIF. In the past, shorebirds such as killdeer, least sandpiper, lesser yellowlegs, pectoral sandpiper, semi-palmated sandpiper, spotted sandpiper, and western sandpiper were found on these ash ponds (Fowler 1983). Most of these birds utilized the ash ponds 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 ponds 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 3 mi 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 3 mi of the proposed project area. Only one of these is still extant and is approximately 1.6 mi away. In addition, 11 osprey nests have been reported within 3 mi of the project; however, only 7 of these are extant. The closest record of an extant osprey nest is approximately 310 ft 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 ponds 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 and Operation of Dewatering Facility

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 on-site landfill. The truck wash facility within the project footprint would be removed, the small acreage of upland forest would be cleared, and grassy areas and small wetlands may be impacted from new construction. Ash ponds 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 water would be discharged to the sluice trench and then the NPDES outfall.

The proposed action would permanently remove the limited amount of wildlife habitat that is currently present in the 14-acre project area. This would 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 similar habitat in the surrounding area, however, it is unlikely that the surrounding areas have reached levels of overpopulation and cannot absorb more individuals. The proposed project would have an insignificant impact on populations of common wildlife species.

Of the seven osprey nests located around the project footprint, the closest nest is approximately 310 ft 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 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. Eventual drying of the ash ponds would not impact foraging osprey as they prefer larger fish found in the adjacent Emory River. The proposed project would have an insignificant impact on osprey that nest at the facility, the heron rookery located 1.6 miles away and other migratory birds.

3.5 Aquatic Ecology

3.5.1 Affected Environment

The Kingston facility is located on Watts Barr Reservoir at the confluence of the Clinch and Emory rivers. The southeast section of 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 will 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 will use the current roadway.

TVA has systematically monitored the ecological conditions of its reservoirs since 1990 as part of the Vital Signs Monitoring Program (http://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 2014c) throughout the 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 affected under Alternative A.

3.5.2.2 Alternative B – Construction and Operation of Dewatering Facility

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 this stream is located in a highly disturbed area and was formed as a resulting of construction of the current parking area. Therefore, impacts to aquatic ecology would be insignificant 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 will not be affected by the project as there will be no direct impact to the river or shoreline and discharges will take place through the permitted outfall.

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 3 mi 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 3 mi 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)

Common Name	Scientific Name	Status [a]	
		Federal	State (Rank) [b]
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; S-CE =Special Concern-Commercially Exploited; NMGT = In Need of Management; PE = Proposed Endangered; 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; SH = Historic in Tennessee; 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*) has been observed at KIF in September 1980.

[d] Federally endangered species known from Roane County, Tennessee, but not within 3 mi 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 TWRA.

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-mi 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 2 federally listed and 10 state-listed plant species are known from within 5 mi 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 non-native 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 5 mi 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 mi 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.

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 mi away from the project site. No caves are known from the project footprint. The nearest recorded cave is approximately 5.3 mi from the project. Small wetlands in the project footprint may offer moderately suitable foraging habitat for gray bat. The ash 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 et al. 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 mi away. The closest known Indiana bat hibernaculum is approximately 24.6 mi 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 mid-story 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 mi 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. TWRA 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 ash 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 and Operation of Dewatering Facility

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 on-site landfill. Some existing structures within the project footprint would be removed, the small acreage of upland forest may be cleared, and grassy areas and small wetlands may be impacted for new construction. The current settling 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 the settling ponds, 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. Conversely, 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 ash 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 they 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 spill, 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 ash ponds or would be impacted by the eventual drying of the ash 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.

3.7 Surface Water

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, when ash production levels are high.

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 2014) because of sediments contaminated with polychlorinated biphenyls (PCBs) and chlordane from industrial point sources. This area has been on the 303d list for these parameters since prior to 2002. The section of the Emory 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 between “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. Additionally, the Clinch River is listed as threatened by loss of native mussel species for unknown reasons. 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 Draft TDEC 2014, 303(d) list due to recovery efforts.

3.7.1.3 Existing Wastewaters and Drainage Areas

There are several existing wastewater streams at KIF permitted to be discharged by the Kingston NPDES permit (Number TN0005452) (TDEC 2003). The primary streams that would potentially be impacted by this proposed project would be the settling pond discharge (Outfall 001), the GDA leachate waste stream (currently discharged through Outfall 01A), and the condenser cooling water (CCW) discharge (Outfall 002). Flows would be released to the Clinch River through the plant discharge channel 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 APA, also known as the “ballfield.”

Settling Pond (Outfall 001)

On average, 15.31 million gallons per day (MGD) of bottom ash sluice water and other constituent flows are discharged from the settling pond via Outfall 001. Current inflow sources to the ash pond and their average annual daily flows are 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 (TSS), and oil and grease. However, the sump discharge pH and alkalinity are usually near that of the KIF intake water.

Table 3-2. Inflow Sources to KIF Outfall 001

Settling Pond (DSN 001)	Inflow to Pond (MGD)
Bottom ash sluice water and groundwater	6.814
Station sump discharge	7.712
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.

<u>FGD Storm Water Discharge (Outfall 01A)</u>
Currently only the FGD wastewater stream and the GDA leachate are permitted to be discharged through Outfall 01A. Solids discharged from ash handling operations are not co-mingled with the gypsum waste stream. However, the solid waste permit is currently in the process of being 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 ponding as a disposal 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 of Dewatering Facility

<u>Construction Impacts</u>
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. 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. Because the site was partially covered with impervious structures, this construction would not significantly impact impervious surface area, but it would increase slightly.
- 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 SWPPP for water-only cleaning and/or NPDES Permit TN 0005452 (TDEC 2003).
- 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) (TDEC 2011).

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

Operational Impacts

Surface Water Withdrawal and Discharge

With the implementation of Alternative B, water would continue to be withdrawn in order to sluice ash from the boilers to the dewatering facility and discharge rates would not change. The remainder of the discharges from the site would remain as it current operates, which includes 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. Other flows would be co-treated as process wastewater in the current pond system before discharge. The primary withdrawal usage plant-wide is for the CCW, 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, 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 Impacts

The wastewater streams that could change under this alternative are:

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

The bottom ash sluice water, stormwater runoff from the project area, APA area and outage washes would all be released to a settling pond and ultimately discharged through Outfall 001. Clarified water would meet current NPDES permit limits. No impact to surface water from these waste streams in anticipated under Alternative B.

The dewatered bottom ash would be trucked and stored in the GDA, which has a liner system that consists of a 2 ft compacted clay layer with hydraulic conductivity of less than 1×10^{-7} cm/sec with a 60 mil 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 FGD storm water pond and discharges via NPDES Outfall 01A. The addition of the bottom ash/pyrite waste stream to this landfill has the potential to change the characterization of the leachate waste stream, thus the potential to impact surface water. The current leachate waste stream is a low flow waste stream with relatively low levels of solids and metals. Should dry bottom ash and pyrite products be disposed of in the GDA, these holding tanks would operate to collect waste water in need of treatment for solids and metals. Consequently, potential impacts to surface water under Alternative B would be minor.

With BMPs in place, operation of the dewatering facility will have no impact on the ephemeral stream located in the parking lot area or the intermittent stream adjacent to the project area.

3.8 Groundwater

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 are 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 [USGS] 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 mi 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, r 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 ballfield area that is currently used as storage for bottom and fly ash), and the GDA. Groundwater monitoring of the Dredge Cell and the Ash Disposal Area is accomplished through a network of six wells, while the GDA monitoring is accomplished through a network of seven wells, and the APA requires the monitoring of three wells.

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 disposal 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 of Dewatering Facility

Construction-related Effects

Excavations associated with the proposed dewatering facility would be shallow (less than about 8 ft deep), and would not be expected to encounter significant 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, impacts to groundwater from the proposed action would be insignificant. Thus, potential construction-related impacts to groundwater resources would be negligible.

Operations-related Effects

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 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 2 ft compacted clay layer with hydraulic conductivity of less than 1×10^{-7} cm/sec with a 60 mil flexible membrane layer 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 FGD 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 should it pose a threat to ground or surface water quality. Consequently, potential impacts to groundwater under Alternative B are expected to be insignificant.

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 (USACE) 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 3-5, Figure 3-1).

Table 3-3. 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

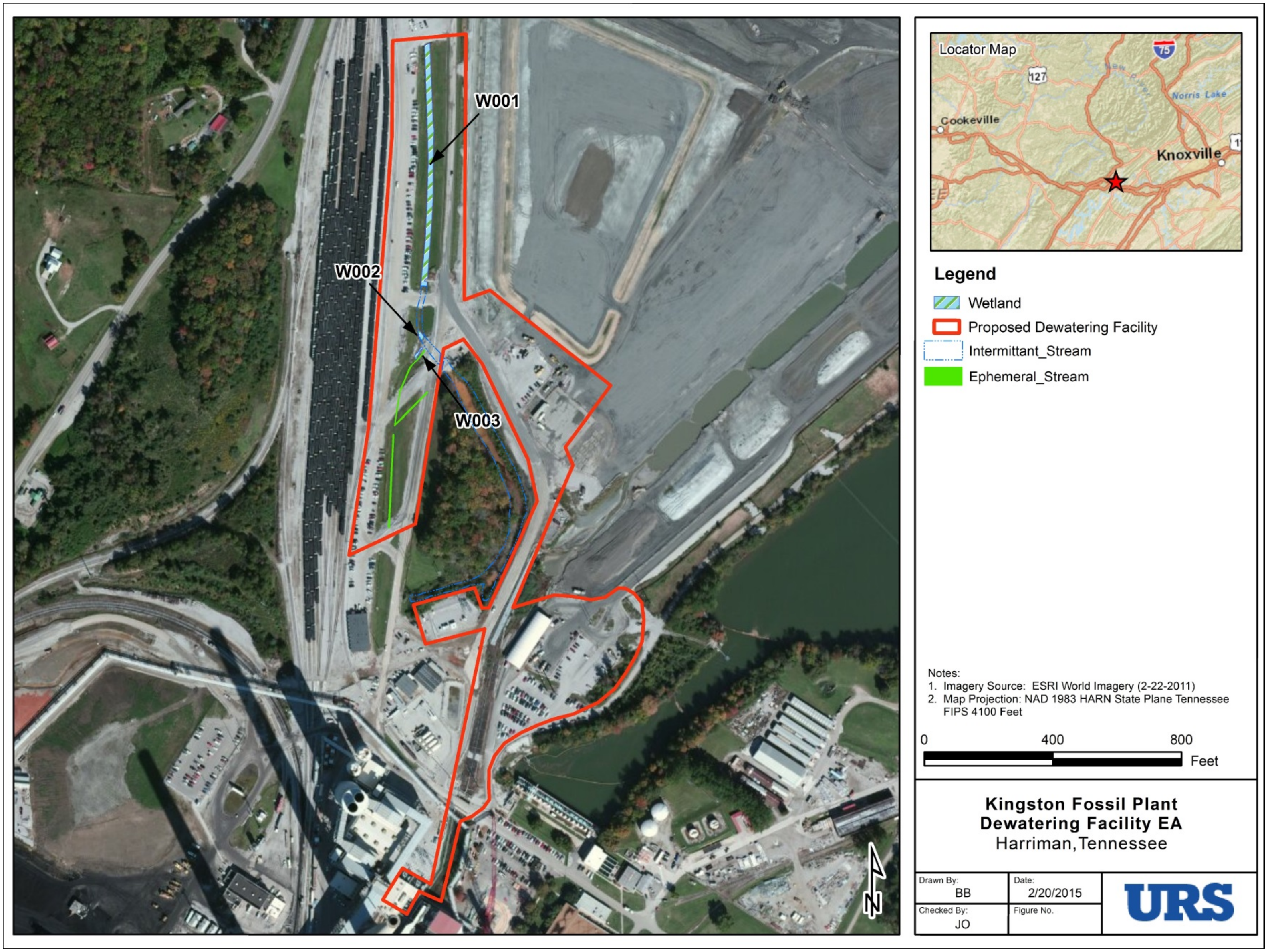

Figure 3-1. Wetlands and Surface Waters

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 ft long by 12 ft 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 in. 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 Corps of Engineers and State of Tennessee.

3.9.2 Environmental Consequences

Activities in wetlands are regulated under Section 401 and 404 of the CWA 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 USACE. 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.

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 and Operation of Dewatering Facility

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 will 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 CWA, EO 11990, and NEPA, TVA has considered all alternatives to avoid and minimize wetland impacts. The proposed dewatering facility is situated within the KIF property to avoid wetland impacts to the extent practicable while allowing for construction of the dewatering facility. There is no practicable alternative to completely avoid impacts to wetlands under Alternative B.

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 would comply with the CWA, adhere to permit requirements as dictated by USACE, 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.

3.10 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 ft above mean seal level (MSL); and the 500-year flood elevation is 750.2 ft MSL. The existing ground elevation of the proposed dewatering facility is about elevation 760 ft MSL.

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 and Operation of Dewatering Facility

Under Alternative B, TVA would design and construct a new bottom ash dewatering facility located at approximate ground elevation 760 ft MSL. 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.

3.11 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 mi 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 1 mi 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 mi 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 and Operation of Dewatering Facility

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.

3.12 Cultural 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 (NHPA) 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 mi) 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). Pending State Historic Preservation Office concurrence, 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.

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 and Operation of Dewatering Facility

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 resources included or eligible for inclusion in the NRHP.

3.13 Solid Waste and Hazardous Waste

3.13.1 Affected Environment

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 removal of 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.

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 3-6. Concrete slabs and foundations to be removed are not listed in Table 3-6, as they do not contain any materials of concern.

Table 3-4. 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.

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 and Operation of Dewatering Facility

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., would be generated from construction equipment, which would be handled by the construction contractor.

During operation of the proposed dewatering facility a significant amount of 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 landfill. Any solids generated during construction of the project due to grading would be disposed 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.

3.14 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 (NRCS) 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 (NRCS 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 and Operation of Dewatering Facility

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 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 US 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 very sparse, with only a few dwellings in the vicinity. KIF is served by highway and railway modes of transportation. US Highway 70 provides truck and automobile access via Steam Plant Road to KIF. Access from I-40 is via SR 66 south to US Highway 70 to Steam Plant Road. Table 3-7 compares existing roadway capacities with current average annual daily traffic (AADT) (Tennessee Department of Transportation [TDOT] 2013, NCDOT 2011).

Table 3-5. Current Average Annual Daily Traffic

Roadway	Typical Section	AADT Capacity	2013 AADT
I-40	Freeway	58,500	34,400
US 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

Traffic volumes on the existing roadway system are currently below capacity.

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 and Operation of Dewatering Facility

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 CCP. The assumption was made that CCP hauling would begin as soon as the proposed dewatering facility is operational. A truck has a 30-ton capacity, and CCP 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 CCP would be hauled. Since CCP 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 nominal impact on the KIF roadways. The proposed action would not affect traffic on public roads.

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 mi from the observer) and middleground (0.5 mi to 4 mi from the observer) (Figure 3-2) viewing distances. Plant employees, visitors, and visitors to the recreational area, located along the Watts Bar Lake 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 Sluice Trench and to the north of the powerhouse building. The facility will include a building for the submerged drag chain conveyors, 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 mi 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. Alternative A poses no significant impacts to existing visual resources.

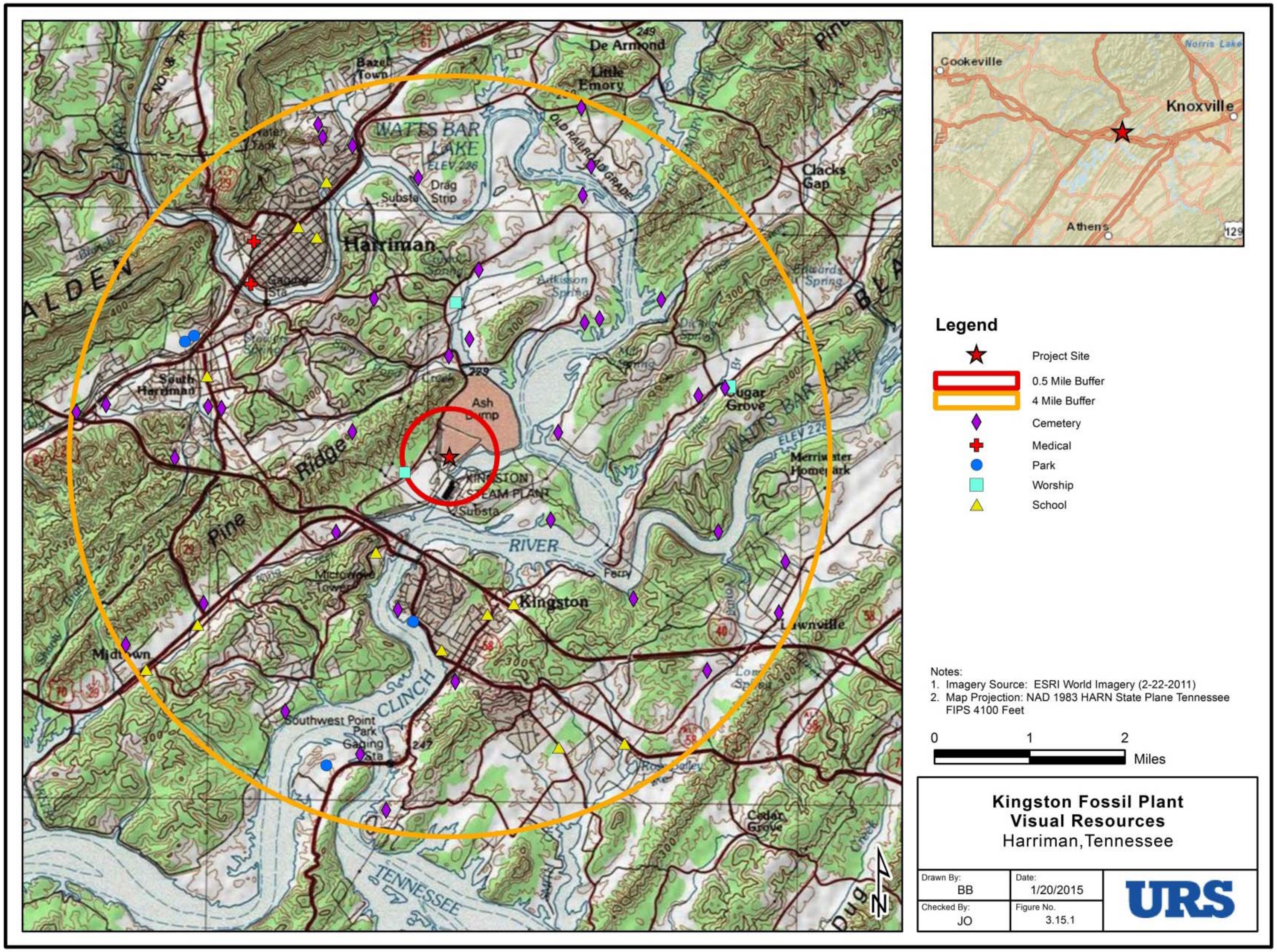

Figure 3-2. Visual Resources Foreground and Middleground

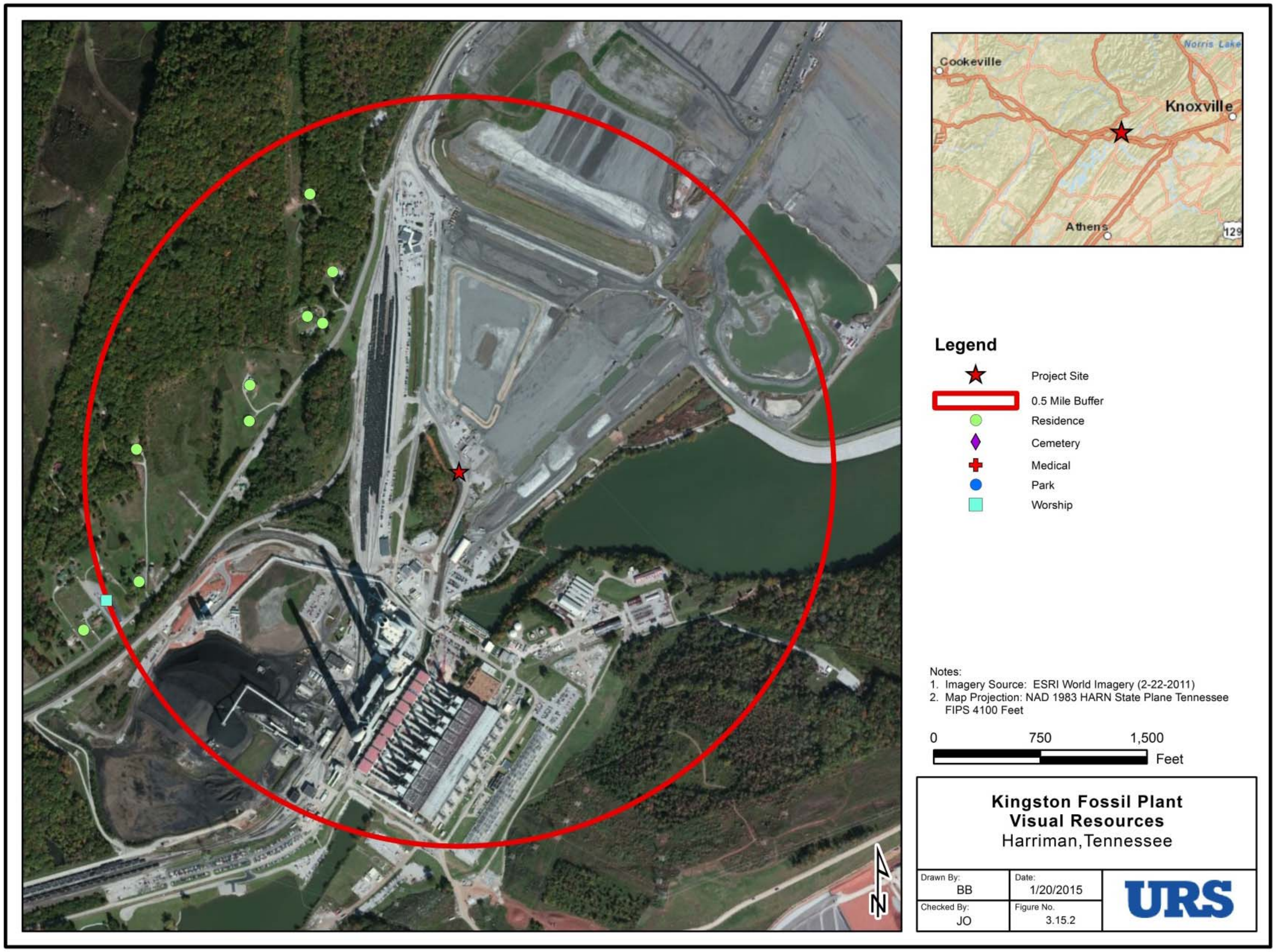

Figure 3-3. Visual Resources Foreground

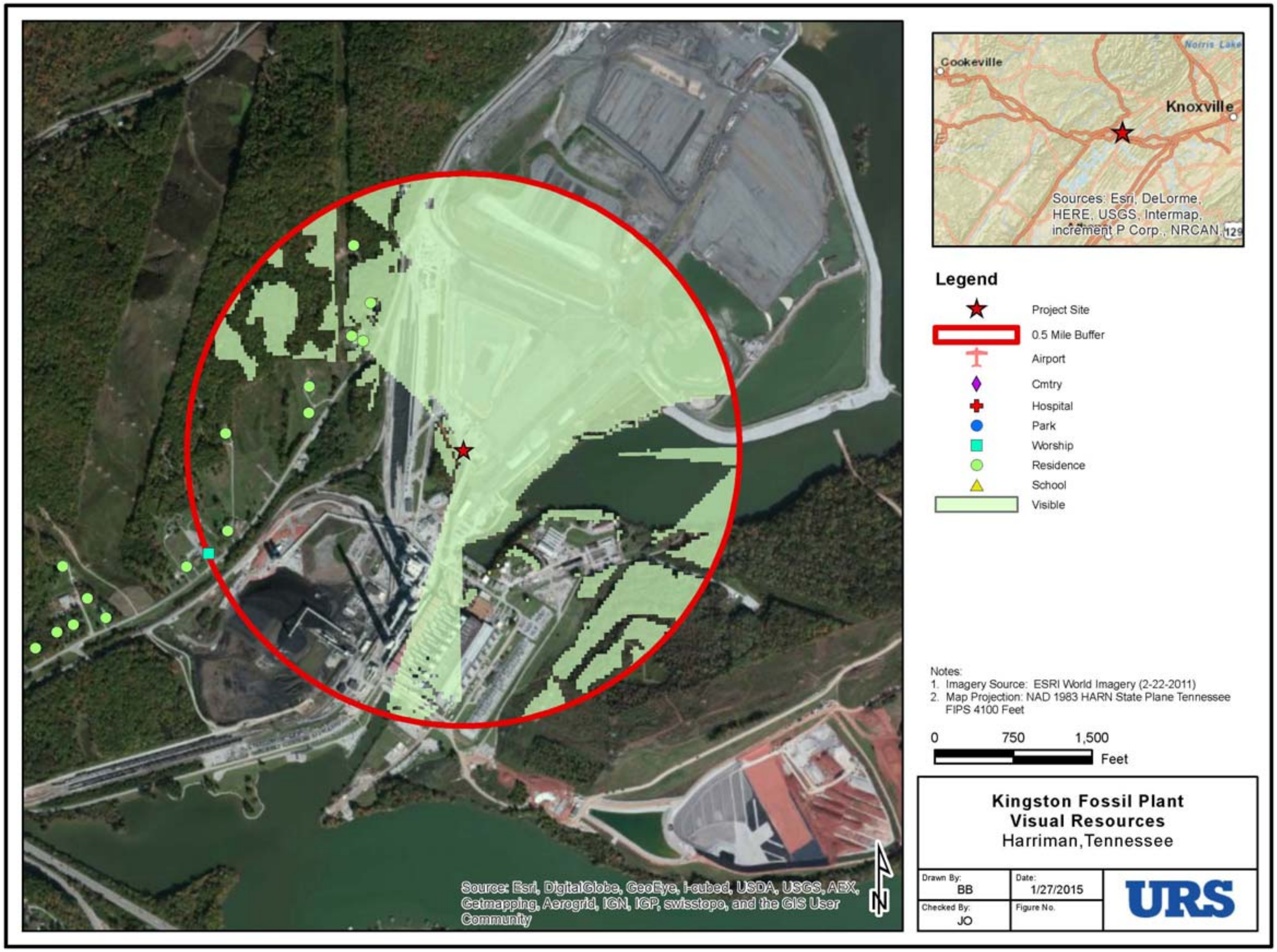

Figure 3-4. Foreground Viewshed

3.16.2.2 Alternative B – Construction and Operation of Dewatering Facility
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 ft 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 ft.

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 not result in significant 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 ft 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 (USAF) has established suggested levels of annoyance experienced by nearby receptors to various background L_{dn} levels (Table 3-8).

Table 3-6. 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: USAF 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 the 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 under this alternative.

3.17.2.2 Alternative B – Construction and Operation of Dewatering Facility

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 mi), noise from construction is expected to cause no significant adverse impacts. Operation of the dewatering facility would result in low noise levels as the SDCC would be contained in a building and would be un-audible to local residence. Operation of the facility is also expected to cause no significant 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 (ACS) population estimates published by the U.S. Census Bureau (http://www.census.gov/acs/www/, accessed November 2014), 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.

Average income levels in Roane County are slightly lower than the state and national levels. According to estimates from 2012 (http://www.bea.gov, accessed November 2014) 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.

The minority population in Roane County is 6 percent of the total, according to ACS 2008-2012 estimates (http://www.census.gov/acs/www, accessed November 2014). 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 of this block is about 2 percent of the total population of the block group.

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 (http://www.census.gov/acs/www, accessed November 2014). 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.

3.18.1.2 Environmental Justice

Environmental Justice (EJ) 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 (EJ), 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 EJ impacts in its environmental reviews.

Overall, poverty levels in the vicinity of KIF are slightly higher than in the larger surrounding areas. The minority population in the area is small. Minority population levels are low compared to county, regional, state, and national levels. 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 . 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. Short-term economic benefits of construction would not occur.

3.18.2.2 Alternative B – Construction and Operation of Dewatering Facility

Activities for the proposed project would be designed on-site and would create temporary construction jobs for 65 full-time construction workers over a period of one and one half years, adding short-term benefits to the economy of the region, while 10 to 12 new jobs would be created to provide long-term benefits. The dewatering facility would be operated through existing employees in the main power plant. Minority and disadvantaged 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; thus, impacts to minority and low-income populations do not appear to be disproportionately high and adverse. Benefits and burdens resulting from the implementation of any of the previously discussed alternatives will be insignificant.

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 US 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 chain link security fence, with the entrance gates guarded. Population in the immediate area (within approximately 0.5 mi 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 KIIF are anticipated under this alternative.

3.19.2.2 Alternative B – Construction and Operation of Dewatering Facility

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.

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 the Kingston Facility include:

1. Complete haul road and leachate collection on Phase 1B Landfill.

The haul road and leachate collection system would enhance hauling capability of dry ash to the on-site landfill. The leachate collection system will provide a more efficient collection of leachate from the landfill such that any additional leachate from the bottom ash disposed in the landfill would be collected and treated in compliance with new CCR rules.

2. Closure of the Interim Ash Staging Area (IASA) (commonly referred to as the "Ballfield Site").

Closure of this area would remove any storage area for the current bottom ash dredged from the sluice trench. Alternative B will not be impacted by the closure of this area as it is not required for this alternative.

3. Drainage and Flow Management Design and Stilling (settling) Pond Closure.

Construction of new drainage system and closure of the stilling pond will not impact the proposed project as the waste water generated by the dewatering facility would be directed along with the plant process water to Coal Yard Runoff Pond and Equalization Basin. Water from the dewatering facility would be discharged through a permitted outfall.

The dewatering facility would change the way ash and sluice water are treated. Currently, bottom ash and pyrites are sluiced to a trench and then to the settling pond. The dewatered effluent from the proposed dewatering facility would also flow through the sluice trench and to the settling pond prior to discharge via the NPDES outfall. No cumulative water quality impacts are anticipated. However, TVA plans to monitor the bottom ash discharges for constituents of concern to ensure the concentrations of these metals and other parameters do not adversely impact water quality of surrounding surface waters. As needed, mitigation measures would be identified and implemented to ensure that the combined discharges from the scrubber operations have only minor impacts on the receiving stream.

For the proposed alternative, no substantive cumulative impacts are expected.

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, and construction of new drainages 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 B would have cumulative but minor visual impacts with the above other projects identified at the Kingston facility. 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.

3.21 Unavoidable Adverse Environmental Impacts

Construction of the proposed dewatering 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 CCPs are expected to generate minor amounts of fugitive dust. Similarly, hauling CCPs 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 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 non-renewable 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 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.

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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

None

5.3 State Agencies

5.4 Individuals and Organizations

CHAPTER 6 - LITERATURE CITED

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Appendix A – Summary of Environmental Permits and Applicable Regulations

- 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 CWA. 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, which 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.

Appendix B – Mass Balance Analysis

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For the current operations analysis, metals data were collected from the Outfall 001 settling pond discharge, the FGD Storm Water Pond 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 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”) stream flow of 155.8 MGD from according to (USGS data for the protection of fish and aquatic life. The input data and assumptions used in the mass balance analysis are given in Tables B-1 and B-2.

Results of the mass balance analysis show that the constituents except thallium 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.

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 TWQC, as shown in Table B-2, 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 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. Consequently, future operations of the proposed dewatering facility would be expected to have minor effects on the receiving stream.

Table B-1. KIF Mass Balance of Current Operations

Element	Current Baseline Conditions		Current Operations							Water Quality Criteria [c] Conc. (mg/L)
	Intake Conc. (mg/L)	Intake Loading (lb/day)	FGD SWP 01a [a] Conc. (mg/L)	FGD SWP 01a [a] Loading (lb/day)	Ash Settling Pond [b] Conc. (mg/L)	Ash Settling Pond [b] Loading (lb/day)	Projected Loading at DSN 002 (lb/day)	Projected Conc. at DSN 002 (mg/L)	Total Discharge Conc. at Clinch River 1Q10 (mg/L)	
Aluminum	0.484	5178.65	2.700	0.12	0.793	103.30	5282.066	0.48831	0.48785	
Antimony	<0.002	10.687	<0.0010	0.00002	<0.002	0.130	10.817	0.00100	0.00100	0.0056
Arsenic	<0.002	10.687	<0.002	0.00004	0.00544	0.708	11.395	0.00105	0.00105	0.01
Barium	0.023	245.798	0.65	0.02873	0.051	60617	252.444	0.02334	0.02330	2.0
Beryllium	<0.002	10.687	<0.001	0.00002	<0.002	0.130	10.817	0.00100	0.00100	0.004
Cadmium	<0.001	5.343	0.0144	0.00064	<0.001	0.065	5.409	0.00050	0.00050	0.002
Chromium	0.00411	43.976	0.013	0.00057	0.0022	0.287	44.263	0.00409	0.00409	0.1
Copper	0.00204	21.801	<0.002	0.00004	.0033	0.432	22.233	0.00206	0.00205	0.013
Iron	0.454	4857.659	0.6	0.02652	1.01	131.563	4989.248	0.46124	0.46046	NA
Lead	<0.002	10.687	<0.002	0.00004	<0.002	0.130	10.817	0.00100	0.00100	0.005
Manganese	0.0334	43.451	0.024	0.00106	0.116	15.110	58.582	0.00541	0.00842	NA
Mercury	0.00000291	0.031	0.000515	0.00002	0.00000448	0.001	0.032	0.000003	0.000003	0.00005
Nickel	<0.002	10.687	0.0427	0.00189	0.00445	0.579	11.268	0.00104	0.00104	0.1
Selenium	<0.002	10.687	0.7336	0.03243	<0.002	0.130	10.849	0.00100	0.00100	0.02
Silver	<0.002	10.687	<0.0005	0.00001	<0.002	0.130	10.817	0.00100	0.00100	0.0032
Thallium	<0.002	5.343	<0.002	0.00002	<0.002	0.065	5.409	0.00050	0.00055	0.00024
Zinc	<0.0250	13.359	0.777	0.03434	0.0259	3.370	16.763	0.00155	0.00272	0.13

lb/day = concentration in mg/L x flow in MGD x 8.34 lb/gal

CCW flow = 1297 MGD (discharge at Outfall 002); 1281.4 MGD (river flow and data from KIF NPDES permit application for intake)

FGD storm water (Outfall 01A) = 0.0053 MGD (Outfall 01A pond flow from Nalco Phase II)

Settling 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 TN0005452, except for Outfall 01A, which was taken from discharge flow data.

Mass discharge and loadings were calculated using one-half the minimum detection limit.

[a] Ash settling pond data were taken during the Phase I Nalco testing event and the highest concentration during that testing was used.

b 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 one-half the RDL for thallium concentrations in the future ash pond discharge concentration because of continuous BDL results.

[c] TDEC Criteria, Rule 1200-4-3-.03.

Table B-2. KIF Mass Balance of Future Operations

Element	Current Baseline Conditions		Current BAS		Estimated Future Operations							Water Quality Criteria [c] Conc. (mg/L)
	Intake Conc. (mg/L)	Intake Loading (lb/day)	Current Bottom Ash Sluice Conc. (mg/L)	Current Bottom Ash Sluice Loading (lb/day)	Dewatered [a] Bottom Ash Sluice Conc. (mg/L)	Dewatered [a] Bottom Ash Sluice Loading (lb/day)	Ash Settling Pond [b] Conc. (mg/L)	Ash Settling Pond [b] Loading (lb/day)	Projected Loading at DSN 002 (lb/day)	Projected Conc. at DSN 002 (mg/L)	Total Discharge Conc. at Clinch River 1Q10	
Aluminum	0.484	5241.70	3.92	223.04	1.70	96.72	0.793	103.30	5218.80	0.48246	0.48263	
Antimony	<0.002	10.817	<0.002	0.06	<0.001	0.03	<0.002	0.130	10.919	0.00101	0.00101	0.0056
Arsenic	<0.002	10.817	0.007	0.42	0.002	0.12	0.00544	0.708	11.223	0.00104	0.00103	0.01
Barium	0.023	248.791	0.422	24.01	0.050	2.84	0.051	6.617	234.271	0.02166	0.02180	2.0
Beryllium	<0.002	10.817	<0.002	0.06	<0.001	0.03	<0.002	0.130	10.919	0.00101	0.00101	0.004
Cadmium	<0.001	5.408	<0.001	0.03	<0.0005	0.01	<0.001	0.065	5.460	0.00050	0.00050	0.002
Chromium	0.00411	44.511	0.007	0.42	<0.001	0.03	0.0022	0.287	44.403	0.00410	0.00411	0.1
Copper	0.00204	22.067	0.009	0.53	0.005	0.30	0.0033	0.432	22.261	0.00206	0.00206	0.013
Iron	0.454	4916.797	<0.001	0.03	1.600	91.04	1.01	131.563	5139.393	0.47512	0.47826	NA
Lead	<0.002	10.817	0.006	0.33	<0.001	0.03	<0.002	0.130	10.650	0.00098	0.00099	0.005
Manganese	0.0334	0.000	0.097	5.54	0.043	2.45	0.116	15.110	12.016	0.00111	0.00457	NA
Mercury	0.00000291	0.032	3.290	187.19	No Data	No Data	0.00000448	0.001	0.032	0.000003	0.00000	0.00005
Nickel	<0.002	10.817	0.006	0.32	0.002	0.13	0.00445	0.579	11.204	0.00104	0.00103	0.1
Selenium	<0.002	10.817	<0.002	0.06	<0.001	0.03	<0.002	0.130	10.951	0.00101	0.00101	0.02
Silver	<0.002	10.817	<0.002	0.06	<0.0005	0.01	<0.002	0.130	10.905	0.00101	0.00101	0.0032
Thallium	<0.002	10.817	<0.002	0.03	<0.001	0.01	<0.002	0.065	10.868	0.00100	0.00095	0.00024
Zinc	<0.0250	13.521	0.055	3.12	<0.010	0.03	0.0259	3.370	13.836	0.00128	0.00248	0.13

lb/day = concentration in mg/L x flow in MGD x 8.34 lb/gal

CCW flow = 1297 MGD; 1281.4 MGD

FGD storm water (Outfall 01A) = 0.0053 MGD

Settling pond flow = 15.6 MGD

1Q10 river flow = 155.8 MGD

BAS flow = 6.814 MGD

Mass discharge and loadings were calculated using one-half the minimum detection limit.

[a] Bottom ash dewatering data were collected during the Bottom Ash Recycle Study and were 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 TN0005452, except for Outfall 01A, which was taken from discharge flow data.

[b] Ash settling pond data were taken during the testing event and background information was used in this evaluation.

[c] TDEC Criteria, Rule 1200-4-3-.03.

Appendix C – TVARAM Scores

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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

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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

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	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

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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

0 (max 6 pts.)	0 (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)]
- [ ] 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

1 (max 14 pts.)	1 (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)

9 (max 30 pts.)	10 (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)
- [ ] 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.)	13 (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

13

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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

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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	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

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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

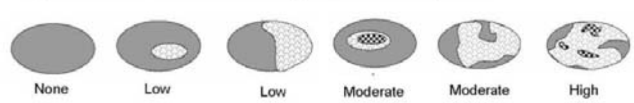
6c. Coverage of invasive plants.
Add or deduct points for coverage.
- ☐ Extensive >75% cover (-5)
- ☐ Moderate 25-75% cover (-3)
- ☐ Sparse 5-25% cover (-1)
- 0 Nearly absent <5% cover (0)
- ☐ Absent (1)

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

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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:

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

Sampling Point: W001

	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
Tree 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%	
	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.

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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.

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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	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:

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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:)	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%	
9.	0	☐ 0.0%	
10.	0	☐ 0.0%	
	0	= Total Cover	

Shrub Stratum (Plot size:)	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
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:)	Absolute % Cover	Dominant Species? Rel.Strat. Cover	Indicator Status
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:)	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%	
	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.

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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 %	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)
- ☑ 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:

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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:

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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.)

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

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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:

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Appendix D – Cultural and Historic Resources Coordination

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