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SHAWNEE FOSSIL PLANT BOTTOM ASH PROCESS DEWATERING FACILITY
FINAL ENVIRONMENTAL ASSESSMENT
McCracken County, Kentucky

Prepared by:
TENNESSEE VALLEY AUTHORITY
Chattanooga, TN

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Symbols, Acronyms, and Abbreviations

AADT	Average Annual Daily Traffic
APE	Area of Potential Effect
BMP	Best Management Practices
Btu	BritishThermal Unit
CAA	Clean Air Act
CCR	Coal Combustion Residuals
CCW	Condenser Cooling Water
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CWA	Clean Water Act of 1972
dB	Decibels
dBA	A-Weighted Decibel
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
ELG	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ESA	Endangered Species Act of 1973
FGD	Flue Gas Desulfurization
gpm	Gallons Per Minute
HABS	Historic American Building Survey
HUD	U.S. Department of Housing and Urban Development
Hz	Hertz
KPDES	Kentucky Pollutant Discharge Elimination System
KSNPC	Kentucky State Nature Preserves Commission
Ldn	Day-Night Sound
Leq	Equivalent Sound Level
MGD	Million Gallons per Day
MGY	Million Gallons per Year
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
ORM	Ohio River Mile
OSA	Office of State Archaeology
ORSANCO	Ohio River Valley Water Sanitation Commission
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PGDP	Paducah Gaseous Diffusion Plant
PRB	Powder River Basin
RCRA	Resource Conservation and Recovery Act of 1976
RGA	Regional Gravel Aquifer
SCR	Selective Catalytic Reduction

SDCC	Submerged Drag Chain Conveyor
SHF	Shawnee Fossil Plant
SHPO	State Historic Preservation Officer
SWPPP	Storm Water Pollution Prevention Plan
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	U.S. Census Bureau
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VPD	Vehicles Per Day
WKWMA	West Kentucky Wildlife Management Area

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction and Background

In July 2009, the Tennessee Valley Authority (TVA) Board of Directors passed a resolution that called for the development of a Fossil Remediation Plan that addressed all coal combustion residual (CCR) impoundments at TVA's fossil plants. TVA subsequently reviewed its practices for handling and storing CCRs at its generating facilities, including, Shawnee Fossil Plant (SHF). An outcome of that review was to a consideration to end wet storage of coal ash and gypsum and convert to dry storage.

On April 17, 2015, the U.S. Environmental Protection Agency (EPA) published the final Disposal of Coal Combustion Residuals from Electric Utilities rule (CCR Rule) in the Federal Register. Under the CCR Rule, impoundments are potentially subject to a closure deadline of five years, with the possibility of an extension of the closure time period under certain circumstances.

In September 30, 2015, EPA finalized its Effluent Limitation Guidelines and Standards for the Steam Electric Power Generating Point Source Category (ELGs). The final rule sets new or additional requirements for wastewater streams from fossil-fueled power plants, including waste streams from fly ash and bottom ash operations..

1.2 Purpose and Need

SHF is located on 1,696 acres (ac) adjacent to the Ohio River about 10 miles (mi) northwest of Paducah, Kentucky (Figure 1-1). Construction of SHF began in 1951 and was completed in 1957. The nine active coal-fired generating units at SHF have a summer net capability of 1,206 megawatts and can generate about 8 billion kilowatt-hours of electricity per year, which is enough to supply 540,000 homes. SHF consumes approximately 9,600 tons of coal a day which is 100 percent Powder River Basin (PRB) coal. CCRs, primarily ash, that are produced during power generation are managed on-site with "wet" impoundments and a "dry" landfill.

The purpose of the proposed action is to help TVA convert CCR storage from wet to dry, complement compliance with the CCR rule and enhance compliance with the ELG rule.

1.3 Decision to be Made

This environmental assessment (EA) is being prepared to inform TVA decision makers and the public about the environmental consequences of the proposed action. The decision TVA must make is whether or not to construct a process dewatering facility for the conversion of wet bottom ash generated at SHF to a dry CCR product. TVA will use this EA to support the decision-making process and to determine whether an Environmental Impact Statement (EIS) should be prepared or whether a Finding of No Significant Impact may be issued.

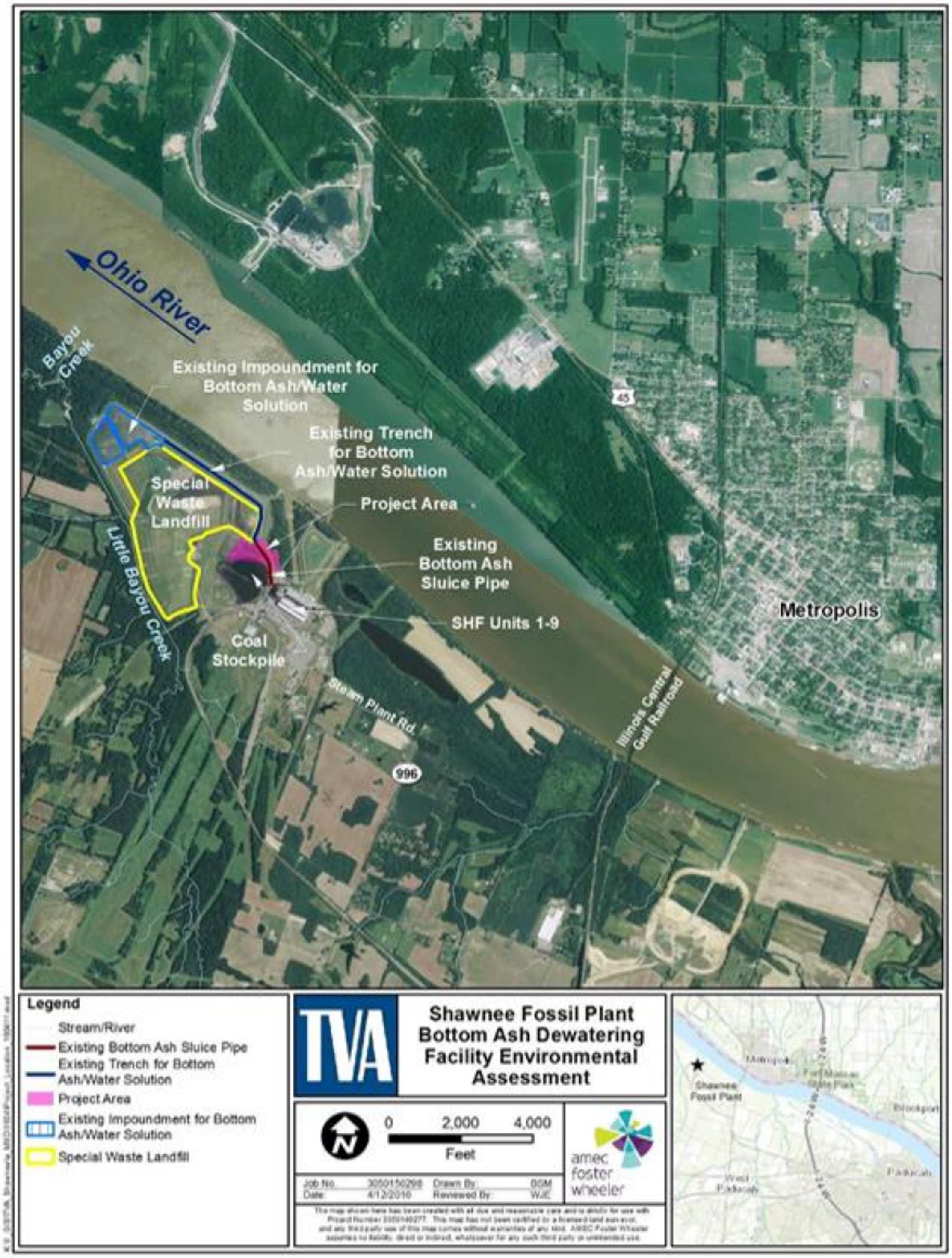

Figure 1-1. Project Location

1.4 Summary of Proposed Action

SHF produces electricity using nine active coal-fired units which heat water in a boiler to produce steam. Under extremely high pressure, the steam flows into a turbine that spins a generator to make electricity. The coal that is burned in the nine boilers produces lighter by-products that are removed by the flue gas waste stream called fly ash and economizer ash and the heaver more coarse by-product called bottom ash, which must be removed from the bottom of the boilers. When the bottom ash is removed from the boilers, it is extremely hot and must be cooled or quenched. To cool the bottom ash, TVA sluices the hot bottom ash into water. The term “wet sluicing” is used to describe the process of dousing the hot bottom ash in water and transporting the resulting wet solution in pipes to the receiving ash impoundment.

The current bottom ash storage process at SHF is considered “wet storage” because the cooled bottom ash/water solution is discharged to a sluice trench where the majority of the ash settles out while the waste water flows continue on to the stilling basin. The bottom ash settles out of the bottom ash/water solution, ash is dug up out of the trench and allowed to dry in piles on the ground next to the trench. After further dewatering and drying, the bottom ash is eventually relocated to the on-site special waste landfill (see Figure 1-1).

Under the proposed project, the bottom ash/water solution would be wet sluiced to a process dewatering facility that would eliminate the intermediate steps of settling in the impoundment and drying on the ground. The dry ash produced by the dewatering facility would be transported directly to the special waste landfill; however, water that would discharge from the dewatering process must be managed when it leaves the dewatering facility. TVA’s plans for this water would be handled in two phases.

In Phase 1, TVA would take excess water from the dewatering process and would route it into the existing wet trench and stilling basin and bottom ash impoundment where it would be discharged according to TVA’s current permit requirements. This particular wastewater stream at SHF would be discharged from a Kentucky Pollutant Discharge Elimination System (KPDES) permitted outfall (Outfall 001) into the condenser cooling water (CCW) channel, and would be ultimately released to the Ohio River through Outfall 002. In Phase 2, excess water from the dewatering process would be recirculated back into the intake side of the bottom ash sluice pumps at the powerhouse where it could be reused. Details of the dewatering process are provided in Chapter 2.

1.5 Related Environmental Reviews and Consultation Requirements

Several environmental reviews have been prepared for actions related to the operation of SHF as well as dewatering projects at other TVA sites. The contents of these documents help describe the SHF project area and the process for dewatering of CCRs, and are incorporated by reference.

> *Kingston Fossil Plant Bottom Ash Dewatering Facility Revised Draft Environmental Assessment* (TVA 2016b). The potential environmental effects of converting from wet bottom ash storage to a dry collection system by mechanically dewatering at the Kingston Fossil Plant are evaluated and documented in this environmental review. The system is identical to the one proposed for SHF.

Bull Run Fossil Plant Dewatering Project Final Environmental Assessment (TVA 2012). The potential environmental effects of converting from wet bottom ash storage to a dry collection system by mechanical dewatering at the Bull Run Fossil Plant are evaluated and documented in this environmental review. The system is similar to the one proposed for SHF.

Shawnee Fossil Plant Units 1 and 4 Final Environmental Assessment (TVA 2014). This EA assesses the impacts of installing and operating selective catalytic reduction (SCR) and flue gas desulfurization (FGD) systems on SHF Units 1 and 4. The proposed dewatering facility is located near the area evaluated in this EA.

Ash Impoundment Closure Part I Programmatic NEPA Review, Environmental Impact Statement (TVA 2016a). TVA prepared a Programmatic Environmental Impact Statement (PEIS) to address the closure of CCR impoundments at its coal-fired power plants. Construction of the process dewatering facility will enable closure of the CCR impoundments at SHF and that action will tier off of the PEIS.

TVA's Integrated Resource Plan (TVA 2015a). The Integrated Resource Plan describes how TVA will meet the energy needs of the Tennessee Valley Region for the next 20 years. The document includes plans for TVA fossil plants including SHF.

The description of the affected environment and the assessment of impacts contained in the documents listed above were used in support of this analysis, and are incorporated, as appropriate, into analyses for each environmental resource in Chapter 3.

1.6 Scope of the Environmental Assessment

TVA prepared this EA to comply with the National Environmental Policy Act (NEPA), regulations promulgated by the Council on Environmental Quality (CEQ), and TVA's procedures for implementing NEPA. 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 potential impacts on these resources in detail in this EA.

- Air Quality
- Climate Change
- Land Use
- Groundwater
- Surface Water
- Floodplains
- Vegetation
- Wildlife
- Threatened and Endangered Species
- Aquatic Ecology
- Solid and Hazardous Waste
- Socioeconomics and Environmental Justice
- Natural Areas, Parks and Recreation
- Transportation
- Visual Resources
- Cultural and Historic Resources
- Noise
- Public Health and Safety

Given the nature of the project, the following resources are not found in the study area or would not be impacted by any of the project alternatives. These include:

- **Wetlands.** A review of the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory maps and a site visit conducted in March 2016 have determined that there are no wetland resources within the project area, and no activities are planned that would disturb any existing wetlands outside the SHF boundaries. Therefore, there would be no wetland impacts associated with the No Action Alternative or Action Alternatives.

- **Prime Farmland.** The proposed project site is located in a previously disturbed area which supports industrial land uses. There are no prime farmland soils mapped within the proposed temporary and permanent use areas. Therefore, there would be no impacts to prime farmland soils associated with the No Action Alternative or Action Alternatives.

TVA's action would satisfy the requirements of EO 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), EO 13112 (Invasive Species) and EO 13653 (Preparing the United States for the Impacts of Climate Change); and applicable laws including the National Historic Preservation Act (NHPA), Endangered Species Act (ESA), Clean Water Act (CWA), Clean Air Act (CAA) and Resource Conservation and Recovery Act (RCRA).

1.7 Public and Agency Involvement

A draft of the EA was released for public review and comment on June 15, 2016. The Draft EA was transmitted to state, federal, and local agencies. Federally recognized tribes were notified of the availability of the EA and asked to review and comment. A list of agencies, tribes and other interested parties notified of the availability of the Draft EA is provided in Chapter 6. The EA was also posted on TVA's Web site. A notice of availability including a request for comments on the Draft EA was published in the Paducah Sun, the newspaper that serves the McCracken County area. Comments were accepted through July 15, 2016, via TVA's Web site, mail, and e-mail.

TVA received one email comment from a member of the public. The remaining comments received on the Draft EA were from the Kentucky Department of Environmental Protection/ Solid Waste Branch (KYDEP) and from a document jointly submitted by the Sierra Club and Southern Alliance for Clean Energy. In addition the EA was reviewed by the appropriate state agencies in the Kentucky State e-Clearinghouse. All comments were carefully reviewed and the text of the EA was edited as appropriate. Appendix B contains the comments on the Draft EA and TVA's responses to those comments.

1.8 Necessary Permits and Licenses

The proposed action may be subject to the following environmental permit requirements and regulations:

- Notice of Intent and Storm Water Pollution Prevention Plan (SWPPP) for the Construction Permit. Because more than one acre will be disturbed during the construction activities, a storm water Notice of Intent to discharge runoff associated with construction activities will be submitted to Kentucky Department of Water. A site-specific SWPPP must be developed and submitted as required by the Notice of Intent, or the site BMP plan can be updated as per the on-site NPDES.

CHAPTER 2 – ALTERNATIVES

2.1 Description of Alternatives

This chapter describes the alternatives TVA evaluated in this review. Alternatives evaluated in detail include:

- Alternative A – No Action Alternative.
- Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or “Once Through” System.
- Alternative C – Process Dewatering System with a Recirculated Bottom Ash Sluice Stream.

This chapter also discusses the alternatives that TVA considered, but rejected from detailed analysis because they did not meet the Purpose and Need of TVA’s proposed action or were otherwise unreasonable.

2.1.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct the dewatering facility. Of the nine units currently in operation, SHF units each produce on average 36,000 tons of fly ash and 4,000 tons of bottom ash per year. The fly ash is currently piped using air pressure to the dry ash stacking system, and the bottom ash is wet-sluiced to the ash impoundment.

SHF withdraws an average of 543,019 million gallons per year (MGY) for use as condenser cooling water (CCW) and plant process water (i.e., sluice water, fire protection, boiler feed water, safety eye wash and showers, and miscellaneous wash water). This equates to approximately 1487.72 million gallons a day (MGD). Approximately 98 percent of the water withdrawal is used for cooling, while approximately 2 percent is used for process water. The CCR handling system at SHF includes the ash impoundment (Outfall 001), and the dry ash stack area, which drains via storm water to the ash impoundment.

The bottom ash collects in the bottom of the boiler and is washed from the boiler bottoms and is discharged to a sluice trench where the majority of the ash settles out while the waste water flows continue on to the stilling basin and bottom ash impoundment. Bottom ash is dug up out of the trench and allowed to dry in piles on the ground next to the trench. After further dewatering and drying, the bottom ash is eventually relocated to the on-site special waste landfill. Based on current KPDES permit rates, the bottom ash sluice water is discharged to the ash impoundment intermittently (30 minutes to an hour twice per day per unit) at a rate of approximately 19.44 MGD (flow includes both daily cycles of sluice flow and raw water flow). During periods in which bottom ash is not sluiced, flow to the ash impoundment consists of otherwise continuous raw water.

Under the No Action Alternative, TVA would not construct the proposed dewatering facility and the bottom ash sluice would continue to be handled as described in current operations and in accordance with the KPDES permit. This alternative does not meet the purpose and need of the proposed action, as described in Section 1.2. The No Action Alternative provides a benchmark against which to compare the environmental effects of the proposed action alternatives.

2.1.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

Under Alternative B, TVA would construct a bottom ash mechanical dewatering facility at SHF to create dry CCR for disposal in the existing on-site special waste landfill. The dewatering equipment would be constructed on a 6.1 ac site just west of SHF units 1-9. An additional 10.9 ac would be used for temporary equipment laydown and mobilization during construction (Figure 2-1). Construction at this site would require demolition of an existing coal yard runoff pond pump substation. Construction of the dewatering facility is expected to take place over a 12- to 14-month period. The proposed dewatering facility would be designed to process a total slurry flow rate of 6,200 gallons per minute (gpm).

Sluice lines for the bottom ash would be routed to the proposed dewatering facility. To allow the dewatering facility to operate in the most efficient once-through mode, two of the existing pumps are being permanently abandoned in place, variable frequency drives are being installed on the remaining three pumps, and two of the five existing ash sluice lines are being eliminated. The new system configuration would reduce the amount of water used in the system from 19.44 MGD to 8.93 MGD (equates to a reduction of 10.51 MGD).

The dewatered material would be stacked in piles with a maximum height of 45 feet (ft). Any remaining water in the material would evaporate or would drain by gravity and be collected in sumps which would drain to the ash impoundment. Under normal operating conditions dewatered CCR would be allowed to stand in the pile for approximately 80 hours. The dry ash would be transported directly to the on-site special waste landfill.

Bottom ash would be dewatered using specialized equipment which would be installed in pairs, which means there would be two sets of operating equipment for dewatering bottom ash that would operate continuously while SHF is generating. The redundant nature of this arrangement would allow dewatering operations to continue in the event of mechanical problems with either set of dewatering equipment. In the unlikely event that both sets of dewatering equipment become inoperative, necessary measures, including a forced outage of the plant would be implemented to meet the water quality limits under the SHF KPDES permit. During an outage, flows to the bottom ash dewatering units would cease.

The specialized equipment mentioned above that would be used for dewatering involves two basic processes. In the first process, bottom ash sluice water would be pumped from the powerhouse in a 12-inch pipeline to the top of a submerged drag chain conveyor inside a tank (SDCC) (Figure 2-2). Within the SDCC, the ash settles out and would then be transported up an incline allowing for natural dewatering by gravity. At the top of the incline, the ash would be discharged to concrete pads ("bunkers") to begin the storage process.

In the second process, overflow water collected from the SDCC would be sent to a clarifier to facilitate settling of the remaining fine ash solids. Wastewater treatment chemicals would be used to facilitate settling of the solids in the clarifiers. These chemicals have not been chosen, but would be evaluated to ensure they are safe for aquatic organisms and are not detrimental to water quality. Fine ash solids from the clarifier would be pumped back to the SDCC for further dewatering. Clarified water would be conveyed to a process water tank which would supply water for use in the dewatering system. Water from the process water tank (approximately 8.93 MGD) would be released to the wet trench and bottom ash impoundment/stilling basin where it would be discharged according to TVA's current permitting requirements. Clarified water from the dewatering facility would meet current KPDES permit limits.

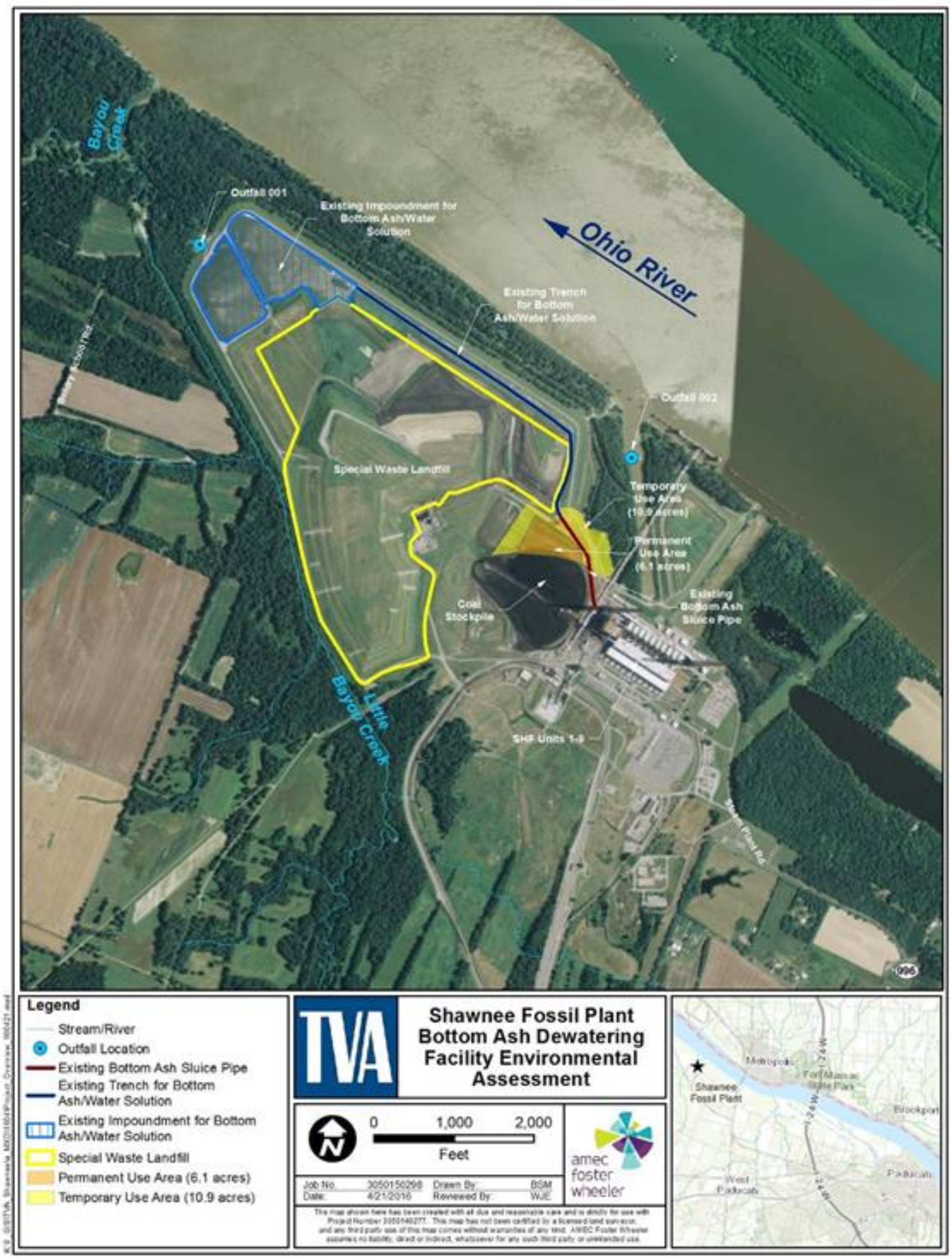

Figure 2-1. Site Utilization Areas for the Dewatering Project

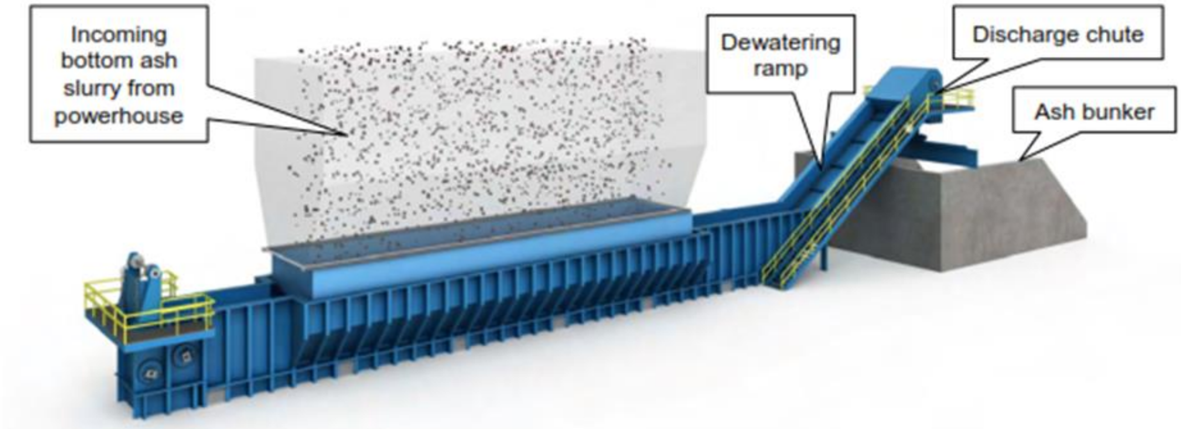

Figure 2-2. Conceptual View of Submerged Drag Chain Conveyor System

(Source: United Conveyor Corporation, http://unitedconveyor.com/sfc-systems/)

The general arrangement and conceptual layout of the proposed dewatering facility is shown in Figures 2-3 and 2-4.

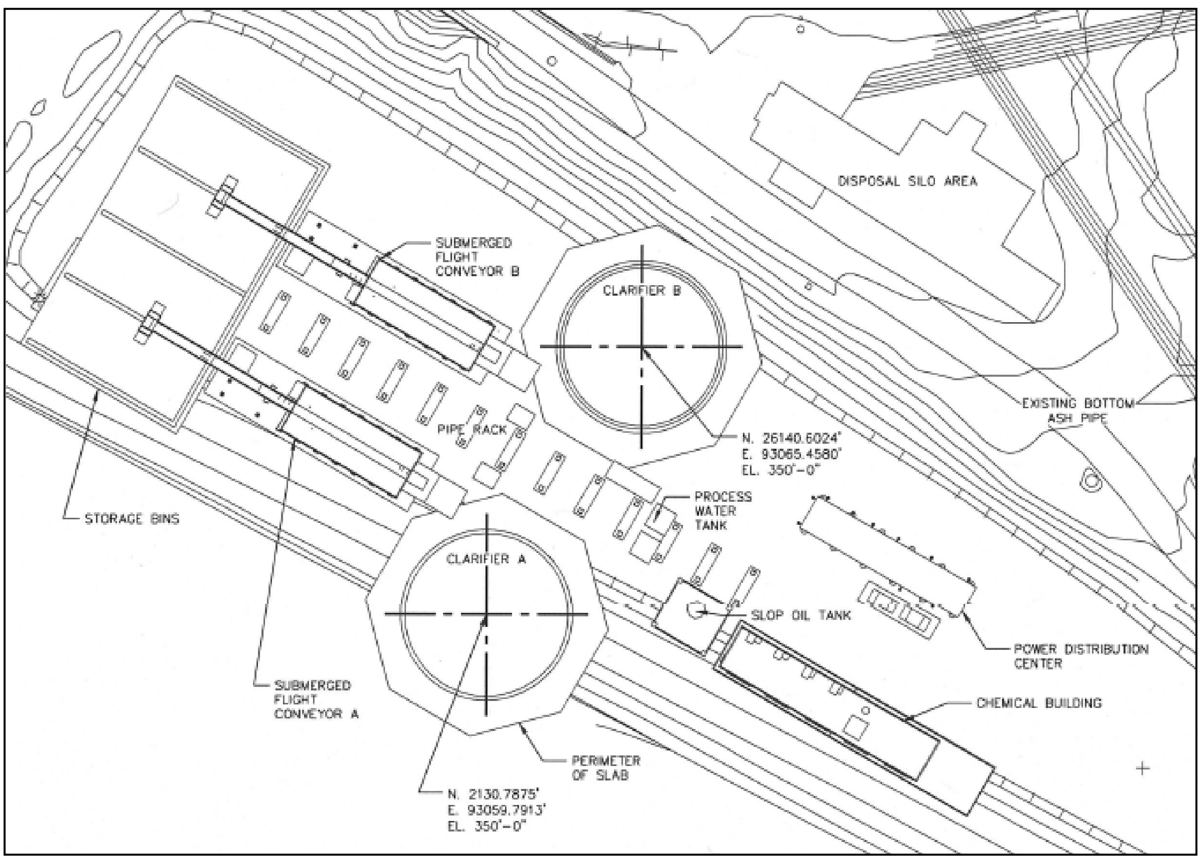

Figure 2-3. General Arrangement of Process Dewatering Facility

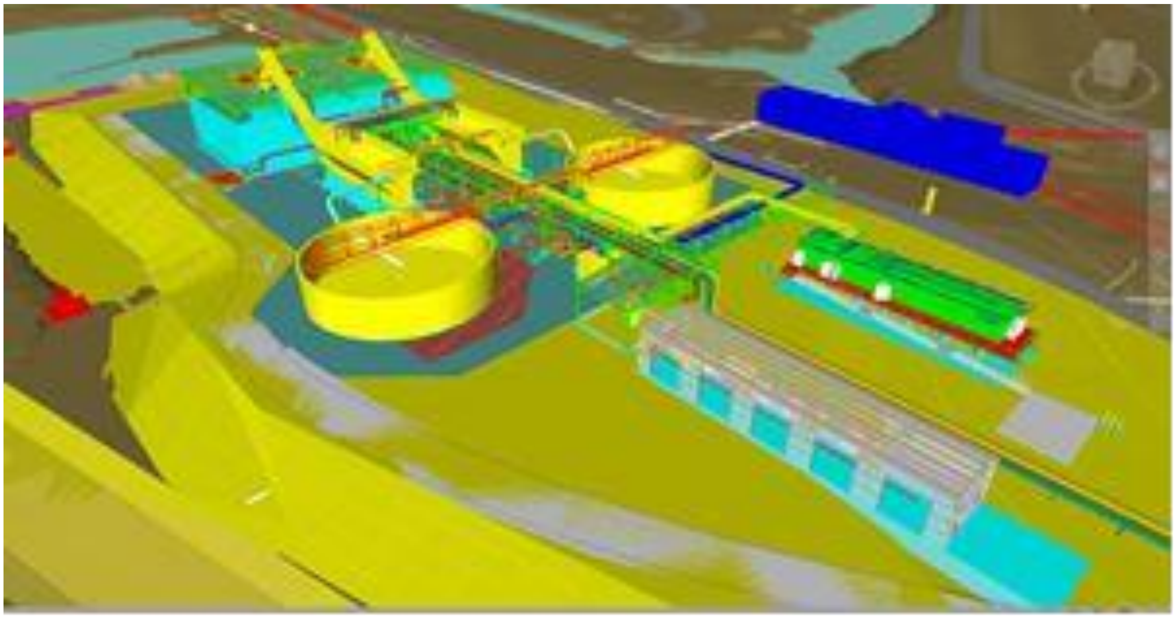

Figure 2-4. Proposed Dewatering Conceptual Layout

The proposed process dewatering facility would be designed to remain operational during a 24-hour rainfall event with a recurrence interval of 25 years. 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 the dewatering system storage or throughput capacity is exceeded, process and contact water streams would be discharged to the impoundment system and ultimately discharged to a SHF KPDES permitted outfall.

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

Under Alternative C, TVA would construct the same dewatering facility as described under Alternative B (Phase 1), but would construct a recirculation system in a subsequent phase (Phase 2). Instead of discharging water that is left over from the dewatering process out of the existing KPDES permitted outfall (Phase 1), the water would be rerouted back into the plant for future sluicing operations. The recirculation system would be contained within the 6.1-ac permanent use area identified in Alternative B (see Table 2-1) and construction is expected to take place over an 8- to 10-month period.

Withdrawal and discharge rates would be altered with the implementation of Alternative C. This alternative would reduce overall plant withdrawals to 8.93 MGD (equates to a reduction of 10.51 MGD), like Alternative B, however it would require additional make-up/recirculation water streams consisting of approximately 300 to 600 gpm to replace water evaporated or otherwise lost from the recirculation system and to help to balance the pH and other chemical constituents in the recirculating system. This would result in decreasing the overall withdrawals for the plant by approximately 9.65 MGD. Additionally, between 3 and 20 gpm of potable water would be used intermittently for safety showers, eye washes and restrooms.

What is "blowdown"?

Blowdown is water that is intentionally wasted to avoid the concentration of impurities. For example, cooling systems rely on water evaporation to garner the cooling effect (latent heat of evaporation). As the water evaporates, the mineral content (calcium carbonate, magnesium, sodium, salts, etc.) of the remaining water increases in concentration of minerals. If left undiluted, these minerals will cause scaling on equipment surfaces; possibly damaging the system.

It is assumed that a blowdown waste stream would be required in order to maintain a balance in the recirculating system. Theoretically, approximately 2 to 3 MGD of blowdown water would be contained and managed on site. No bottom ash sluice transport water would be discharged from Outfall 001, thus reducing the discharge from Outfall 001 by 19.44 MGD. During outages the waste stream from the system could range between 0.2 to 0.5 MGD to purge the system. The use of this blowdown waste stream is still under development, but it would be managed on site in accordance with the Effluent Limitations Guidelines (ELGs) and CCR regulations..

The recirculation system would include additional recirculating pumps, sluice line, additional power from the electrical room and a water containment facility. The containment facility would hold previously dewatered sluice water for recirculation in the dewatering process and would make it readily available when needed for sluicing operations. Water recovered in the bottom ash dewatering process would be recirculated to the intake side of the bottom ash sluice pumps at the powerhouse. This recirculated sluice stream would require a blow-down stream, make-up stream and outage waste stream. The conceptual layout of the recirculating system is depicted in Figure 2-5.

Further study and design would be necessary in order to incorporate the proper treatment and disposal options for this alternative to comply with the ELG. TVA estimates that the costs could range between $8 to $15 million more for the recirculation system, but could vary depending on the results of further evaluation and design studies. Accordingly, Alternative C would be implemented in a phased manner, with the dewatering facility constructed in the first phase and the recirculating system in a subsequent phase.

A summary of the primary characteristics of the proposed combined dewatering facility under both alternatives are provided in Table 2-1.

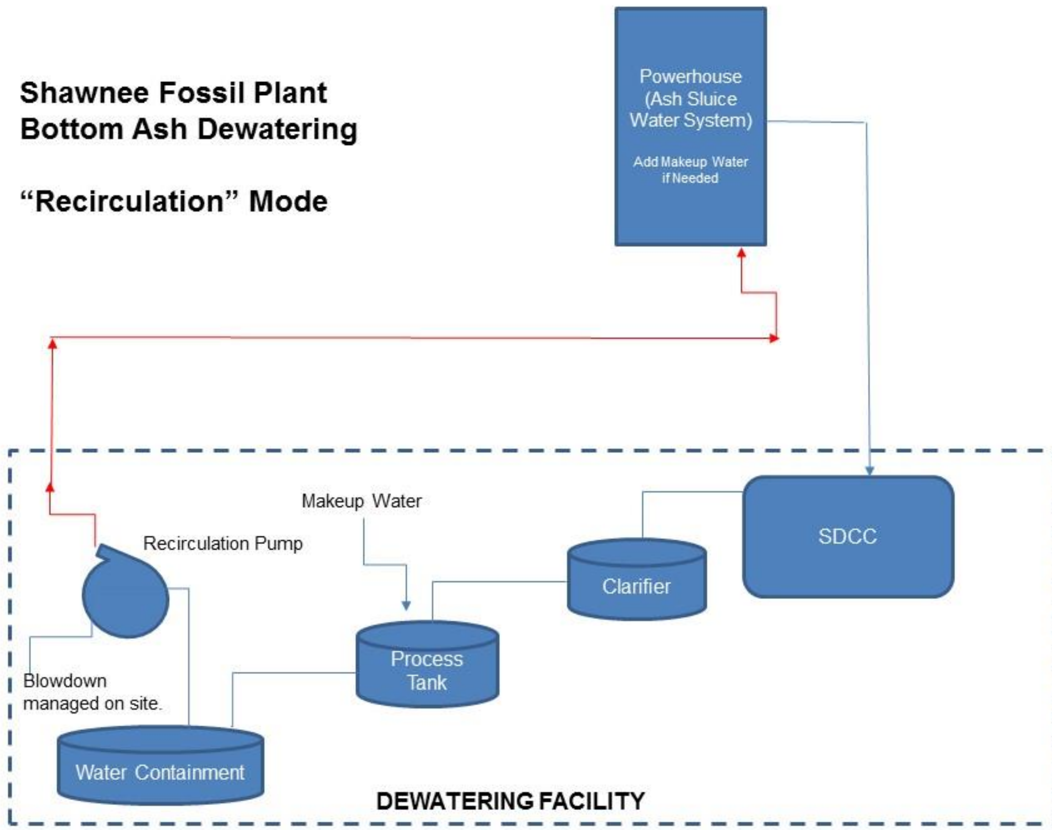

Figure 2-5. Concept of Recirculation System as Part of Alternative C

Table 2-1. Primary Characteristics of the Proposed Mechanical Process Dewatering Facility

Project Feature	Characteristic	Alternative B – Construction/ Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System	Alternative C – Process Dewatering System with a Recirculated Bottom Ash Sluice Stream
Plant Area	Operation-permanent land use	6.1 ac	6.1 ac
	Construction-temporary land use	10.9 ac	10.9 ac
Height	Maximum height of dewatering facility	45 ft	45 ft
Employment Workforce	Construction	100 to 125	100 to 125 plus an additional 75 workers to construct the recirculation facility
	Operation	Approximately 2 to 4 workers	Approximately 2 to 4 workers
Surface Water Withdrawal Rate	Total plant withdrawal rate	Reduced by 10.51 MGD	Reduced by 9.65 MGD
Process Water Discharge Rate	Current discharge rate is 19.44 MGD	8.93 MGD (reduced by 10.51 MGD)	0 MGD (Any discharge would be managed on site in accordance with ELG and CCR guidelines)
Depth of Excavation	Dewatering facility	Piles to bedrock (up to 55 ft). Concrete foundation less than 8 ft	Piles to bedrock (up to 55 ft). Concrete foundation less than 8 ft

2.2 Alternatives Considered But Eliminated From Further Discussion

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

For some coal-fired generation facilities at TVA, conversion of the ash storage system from wet to dry may warrant a consideration of discrete pyrite [ferrous sulfides (FeS2)] management systems. The separation of bottom ash and pyrites can be beneficial, because bottom ash without pyrites can sometimes be marketed and used by outside industries. Special systems must be designed to separate bottom ash and pyrites at coal plants.

SHF is not a candidate for this process, because coal burned at SHF is 100 percent PRB subbituminous coal. When this type of coal is burned, it produces few (if any) pyrite materials. Therefore, Alternative D is not considered for SHF.

2.2.2 Alternative E – Dry Boiler Bottom Conversion

Conversion from wet boiler bottoms to dry bottoms and removing bottom ash in a dry state using methods that do not use water to cool the ash such as pneumatic conveying, DRYCON™, and vibrating ash conveying were considered. Commercial systems that use these technologies were evaluated for use at SHF. However, each was found to be infeasible for the technical reasons outlined below.

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

2.3 Comparison of Alternatives

The environmental impacts of potentially affected resources associated with Alternatives A, B and C are analyzed in detail in this EA and are summarized in Table 2-2. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

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

Resource	Alternative A – No Action	Alternative B – Construction/ Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System	Alternative C – Process Dewatering System with a Recirculated Bottom Ash Sluice Stream
Air Quality	No change in existing condition	Temporary minimal impacts during construction from fugitive dust and emissions from equipment and vehicles.	Temporary minimal impacts during construction from fugitive dust and emissions from equipment and vehicles. Although still short-term and minimal, this impact would be incrementally larger than Alternative B because these construction related impacts would occur in two separate construction phases.
Climate Change	No impact.	No impact.	No impact.
Land Use	No impact.	No impact-no change in land use.	No impact-no change in land use.
Groundwater and Geology	No change in existing condition	Minor temporary impacts during construction that would be minimized through the use of best management practices (BMPs). Minor beneficial impacts during operation related to reduction in potential interaction between surface water systems and groundwater due to reduction in water used for sluicing.	Minor temporary impacts during construction that would be minimized through the use of BMPs. Minor beneficial impacts during operation related to reduction in potential interaction between surface water systems and groundwater due to elimination of bottom ash sluice water to Outfall 001; the beneficial impacts although minor would be larger than those from Alternative B.
Surface Water	No change in volume of surface water released via KPDES Outfall 001 Continued compliance with KPDES permit limits.	Minor temporary impacts during construction that would be minimized through the use of BMPs. Reduced volume of bottom ash sluice water would reduce the discharge amount via KPDES Outfall 001.	Minor temporary impacts during construction that would be minimized through the use of BMPs. Elimination of bottom ash sluice water to Outfall 001 which would reduce the discharge amount via KPDES Outfall 001 and 002. Potential minor benefit to water quality as compared to Alternative B.
Floodplains	No impact.	Temporary minor impact during construction.	Temporary minor impact during construction.
Vegetation	No impact.	Temporary minor impact during construction.	Temporary minor impact during construction.
Wildlife	No impact.	Minor impact due to loss of limited wildlife habitat.	Minor impact due to loss of limited wildlife habitat.
Aquatic Ecology	No impact.	Minor temporary impacts during construction that would be minimized through the use of erosion control BMPs. No impact from operation as discharge would be compliant with KPDES requirements.	Construction-related impact would be the same as Alternative B. Existing flows associated with bottom ash sluicing operations would be eliminated. Consequently, the discharges from Outfalls 001 and 002 would correspondingly be reduced, which would have an incrementally beneficial impact on aquatic life in the Ohio River.
Threatened and Endangered Species	No impact.	No impact.	No impact.

Table 2-2. Summary and Comparison of Alternatives by Resource Area (cont.)

Resource	Alternative A – No Action	Alternative B – Construction/ Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System	Alternative C – Process Dewatering System with a Recirculated Bottom Ash Sluice Stream
Solid and Hazardous Waste	No impact.	Minor impact during construction and operation.	Similar impact during construction and operation as Alternative B. However, the impact would be incrementally larger than Alternative B due to additional debris generated during the construction of Phase 2.
Socioeconomics and Environmental Justice	No impact.	Short-term positive economic impact associated with construction activities. No disproportionate impacts to low income or minority populations.	Short-term positive economic impact associated with construction activities. Slight increase in the beneficial secondary impacts to the economy associated with the workforce employment and multiplier effects of construction activities associated with Phase 2. No disproportionate impacts to low income or minority populations.
Natural Areas, Parks and Recreation	No impact.	No impact.	No impact.
Transportation	No impact.	Minor temporary impact during construction.	Minor temporary impact during both construction phases.
Visual Resources	No impact.	Minor temporary impact due to change in visual landscape during construction. Negligible long-term impact	Minor temporary impact due to change in visual landscape during construction. Negligible long-term impact.
Cultural and Historic Resources	No impact.	Adverse visual impact to historic power plant.	Adverse visual impact to historic power plant.
Noise	No impact.	Minor indirect short-term impact during construction due to increased vehicles on surrounding roadways. No impact during operation.	Minor indirect short-term impact during construction due to increased vehicles on surrounding roadways. No impact during operation.
Public Health and Safety	No impact.	No impact.	No impact.
Cumulative Impact	No impact.	No impact.	No impact.

2.4 Identification of Mitigation Measures

Mitigation measures identified in Chapter 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. TVA's analysis of selected alternatives includes mitigation, as required, to assure no adverse effects. Project-specific BMPs are also identified.

- CAA Title V operating permit conditions applicable to Alternative B would be implemented.
- Fugitive dust emissions from site preparation and construction would be controlled by wet suppression and BMPs.
- Project specific BMPs would be developed as required, to ensure that all surface and ground waters are protected from construction and operational impacts.
- Waste streams would be characterized to ensure permit limits would be met, as required.
- To comply with EO 13112 (Invasive Species), disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- BMPs would be used during construction activities to minimize and restore areas disturbed during construction.
- Erosion controls and BMPs for storm water impacts would be implemented.

2.5 The Preferred Alternative

TVA's preferred alternative is Alternative C, construction of the process dewatering facility and the recirculation system to recycle sluice water back into the powerhouse for future sluicing operations. Alternatives B and C both provide long-term benefits, and meet the purpose and need of the project as these alternatives both would move the plant to dry storage of CCRs. While Alternative C is more costly than Alternative B (because of the addition of a recirculation system), TVA prefers Alternative C because of the benefits of water reuse that facilitates TVA's future compliance with the ELG through the reduction of discharge from the KPDES permitted outfalls. TVA would implement its preferred alternative (i.e., Alternative C) in a phased manner, starting with the construction of the dewatering facility in the first phase and then adding the recirculating system at a later time.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the baseline environmental conditions (affected environment) of environmental resources in the project area and the anticipated environmental consequences that would occur from implementation of the alternatives identified for further study as described in Chapter 2. TVA considered all appropriate environmental factors potentially influenced by the proposed project as part of this analysis.

3.1 Air Quality

3.1.1 Affected Environment

The CAA regulates the emission of air pollutants and EPA in its implementing regulations established National Ambient Air Quality Standards (NAAQS) for several “criteria” pollutants that are designed to protect the public health and welfare with an ample margin of safety. The criteria pollutants are ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead.

There are two types of NAAQS: primary standards (set to protect public health) and secondary standards (set to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings). Specified geographic areas are designated as attainment, nonattainment or unclassifiable for specific NAAQS. Areas with ambient concentrations of criteria pollutants exceeding the NAAQS are designated as nonattainment areas, and new emissions sources to be located in or near these areas are subject to more stringent air permitting requirements.

The air quality in McCracken County meets applicable federal and state air quality standards. McCracken County and the surrounding counties (Ballard, Marshall and Livingston in Kentucky as well as Massac and Pulaski in Illinois) are all in attainment with applicable NAAQS (EPA 2016) and ambient air quality standards referenced in the Kentucky Administrative Regulations, Title 401 Chapters 51 and 53 (KAR 2016). The proposed dewatering facility would be subject to both federal and state (Kentucky Division of 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 are included in the Kentucky Administrative Regulations, Fugitive Emissions; Chapter 63:010.

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would continue its current practice of disposal of bottom ash. Therefore, there would be no change in air quality conditions.

3.1.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or “Once Through” System

3.1.2.2.1 Construction Impacts

Transient air pollutant emissions would occur during the construction phase (12 to 14 months). Construction-related air quality impacts would be primarily related to site preparation and the operation of internal combustion engines.

Site preparation and vehicular traffic over paved and unpaved roads at the construction site would result in the emission of fugitive dust during active construction periods. Based on analyses presented for similar dewatering facilities proposed at Kingston (TVA 2016b) and Bull Run (TVA 2012), it is expected that the largest fraction (greater than 95 percent by weight) of fugitive dust emissions would be deposited within the construction site boundaries. All TVA power plants have fugitive dust control plans as required under existing Title V permits, and TVA requires all contractors to keep construction equipment properly maintained and to use BMPs (such as covered loads and wet suppression) to minimize dust, if necessary.

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

Air quality impacts from construction activities would be temporary, 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 and other factors. However, even under unusually adverse conditions, these emissions would have, at most, a minor transient impact on off-site air quality and would be well below the applicable ambient air quality standard. Overall, the potential impacts to air quality from construction-related activities for the project would be minor.

3.1.2.2.2 Operation Impacts

Operation of the bottom ash dewatering system is subject to specific state process regulations and fugitive dust regulations. The proposed dewatering facility would be in compliance with state regulations.

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

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

3.1.2.3.1 Construction Impacts

Activities described in Alternative B would also occur under Alternative C in the construction phase. The primary difference under Alternative C is that a recirculation system would be constructed during a second phase, lasting an additional 8 to 10 months, and therefore, the installation of this additional equipment would result in an increase in construction-related emissions. As with Alternative B, air emissions overall would be short-term and relatively minor.

3.1.2.3.2 Operation Impact

Operation of Alternative C would not create substantially more air pollutants than Alternative B given that the project footprint and the majority of the processes are the same. Implementation of Alternative C would require the use of a recirculation system. This system would be served by the existing power infrastructure and contribute a negligible increase in air pollution at the power plant given its small power requirements.

3.2 Climate Change

3.2.1 Affected Environment

The 2014 National Climate Assessment concluded that global climate is projected to continue to change over this century and beyond. The amount of warming projected beyond the next few decades, by these studies, is directly linked to the cumulative global emissions of greenhouse gasses (e.g., carbon dioxide [CO_2], methane) and particulates. By the end of this century, the 2014 National Climate Assessment concluded a 3°F to 5°F rise can be projected under a lower emissions scenario and a 5°F to 10°F rise for a higher emissions scenario (Melillo et al. 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 et al. 2014).

As identified by Kunkel (Kunkel et al. 2013), the southeastern United States is one of the few regions globally that does not exhibit an overall warming trend in surface temperature over the 20th 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 20th century, then decreased rapidly during the middle of the 20th 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.

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

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action Alternative

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

3.2.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or “Once Through” System

3.2.2.2.1 Construction Impacts

CO_2 emissions would occur during the construction phase. Construction-related CO_2 emissions would be primarily related to the combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.). The total amount of these emissions would be small and would not adversely affect regional greenhouse gas levels. Therefore, this alternative would not result in impacts on climate change.

3.2.2.2.2 Operation Impacts

Operations at the dewatering facility would require the use of electricity provided by ongoing operations at SHF. The additional energy required to operate the dewatering facility would not require enough of an increase in the amount of fossil fuel burned at SHF to have a noticeable impact on climate change. Operation of equipment associated with the dewatering facility would result in emissions that would be small and would not adversely affect regional greenhouse gas levels. Therefore, this alternative would not result in impacts on climate change.

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

3.2.2.3.1 Construction Impacts

Implementing Alternative C would have the same impacts as Alternative B for the first construction phase (Phase 1) and additional construction-related CO_2 emissions for incorporating the recirculation system as part of Phase 2. Because emissions from Phases 1 and 2 would be minor and would not contribute to substantially greater regional greenhouse gas levels, the CO_2 emissions from energy required for the construction of dewatering facility and recirculation system would not cause significant impacts to climate change.

3.2.2.3.2 Operation Impacts

As with Alternative B, operation of equipment associated with the dewatering facility would result in emissions that would be small and would not adversely affect regional greenhouse gas levels. Therefore, this alternative would not result in impacts on climate change.

3.3 Groundwater and Geology

3.3.1 Affected Environment

SHF lies at the northwestern limit of the Mississippi Embayment and within the Gulf Coastal Plain Physiographic Province. The predominant natural physiographic features of the site, most evident prior to plant construction, are the floodplain of the Ohio River and the low upland terrace developed on loess deposits (Kellberg 1951). The floodplain along the south bank of the river averages about 2,000 ft in width and generally lies at or above approximately 320 ft above mean sea level. The floodplain is characterized by a natural levee immediately adjacent to the river and a lower, locally swampy area extending south of the levee to the base of the upland terrace. At the southern margin of the floodplain, the topography rises some 20 to 30 ft to a relatively flat upland terrace bench. Most of the plant facilities are situated on this terrace (TVA 2005).

The plant site is underlain by more than 300 ft of unconsolidated deposits of clay, silt, sand, and gravel, ranging from Cretaceous to Holocene in age. These deposits include, in descending stratigraphic order, Holocene alluvium within the floodplains of the Ohio River, Little Bayou, and Bayou Creeks; Pleistocene loess occupying the upland terrace region; Plio-Pleistocene alluvial terrace deposits; the McNairy formation (Upper Cretaceous); and the Tuscaloosa formation (Upper Cretaceous). Bedrock at the site consists of the Warsaw limestone (Mississippian) and lies at approximate elevation 6 ft mean sea level (Kellberg 1951). Bedrock surface dips to the southwest toward the axis of the Mississippi Embayment (Davis et al. 1973).

Because the dry ash stacking facility (special waste landfill) area is the primary focus of groundwater quality impacts presented later in the section, the remainder of the site description focuses on the hydrogeologic conditions in the dry ash stacking facility (special waste landfill) area of the plant site.

Plio-Pleistocene-age alluvial terrace deposits lie directly below the ash and fill deposits over a large portion of the site, including the special waste landfill which includes the dry ash stacking facility. Most if not all of the loess originally present above the terrace deposits is believed to have been removed during construction of the former ash pond. The upper portion of the terrace deposits are characteristically fine-grained and lenticular, consisting of variable mixtures of clay, silt, and fine sand. Thickness of the upper terrace sediments ranges from 4 to 25 ft and averages 9 ft in the landfill area. These sediments are distinct from the lower part of the terrace deposit, which is composed predominantly of rounded quartz (chert) gravel with sand and very minor amounts of clay and silt. Occasional sand lenses occur within the gravel unit, and fairly continuous micaceous sand was encountered below the gravel layer at most borings. The lower gravel unit and associated sand layers are commonly referred to as the Regional Gravel Aquifer (RGA), the principal aquifer in the site region. Historic borings in the landfill area indicate RGA thicknesses of 30 to 65 ft, with an average thickness of 47 ft. Regionally, the RGA is thinnest near the Ohio River, with thickness increasing with distance from the river (Boggs and Lindquist 2000).

The current facility solid waste permit (permit number: SW07300041) requires both groundwater sampling and surface water sampling twice per year (KDEP 2005). The sampling parameters required by this permit for groundwater are boron, total organic carbon, chemical oxygen demand, chloride, dissolved copper, fluoride, groundwater elevation, molybdenum, total dissolved solids, specific conductance, sulfate, temperature, vanadium, and pH. Copper and fluoride are the only two constituents that have upper limits while all other constituents must meet statistical limits or are reported only. Additional parameters are sampled semi-annually for groundwater assessment. These parameters include total alpha, aluminum, arsenic, barium, beryllium, total beta, bicarbonate alkalinity, cadmium, calcium, cobalt, iron, lead, magnesium, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, strontium, thallium, thorium, titanium, uranium and zinc. The sampling parameters required for surface water are boron, calcium, chloride, total suspended solids, sulfate, and pH. These samples are to be collected at four separate locations in the Little Bayou Creek and Ohio River.

SHF's dry stack was placed in Groundwater Assessment status in February 2011 by the Kentucky Division of Waste Management. This action resulted from statistical exceedances for several constituents in 2010; however no constituents have exceeded maximum contaminant levels, except for gross beta, since 2011. The gross beta is attributed to historical contamination of the RGA from a plume of technetium-99 and trichloroethylene originating up-gradient of the TVA reservation from the former U.S. Department of Energy (DOE) Paducah Gaseous Diffusion Plant (DOE PGDP) facility. The most recent monitoring report had statistical exceedances for boron, calcium, chemical oxygen demand, total organic carbon, cobalt, iron, magnesium, manganese, molybdenum, nickel, pH, potassium, specific conductance, strontium, sulfate, and total dissolved solids (TVA 2015). An alternate source demonstration to identify the source of these contaminants has not been conducted, however some of the metals that have statistical exceedances could be attributed to CCRs.

The groundwater quality does not exceed the Kentucky Department for Environmental Protection or Environmental Protection Agency maximum contaminant levels for drinking water down gradient of the Special Waste Landfill. Additionally, the entire TVA SHF reservation is within the DOE Water Policy Boundary, restricting use of groundwater due to the adjacent DOE activities that have occurred over the past 50 years.

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct and operate the proposed dewatering facility. Project-related environmental conditions in the project area with respect to groundwater are not expected to change. Thus, continued operations at SHF under the No Action Alternative would not be expected to cause any additional direct or indirect effects to local groundwater resources; therefore there would be no change in existing conditions.

3.3.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

3.3.2.2.1 Construction

The majority of excavations associated with the proposed dewatering facility would be shallow (less than about 8 ft deep) and would not be expected to encounter groundwater. Pilings which would be installed to support the dewatering facility would be drilled deeper, at approximately 55 ft in depth. The pilings are constructed of reinforced concrete and would be in the groundwater zone. A concrete pad would be installed as the foundation of the dewatering facility to prevent any interaction between surface activities and constituents related to ash management and 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. Those BMPs would be used to control sediment infiltration from storm water runoff during construction phases of the project. With the use of BMPs, impacts to groundwater would be minor and temporary.

3.3.2.2.2 Operations

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

Under current operations, the bottom ash is wet sluiced to the ash impoundment where it is removed with the use of heavy machinery and transported to the special waste landfill. With the implementation of the bottom ash dewatering system, the ash would no longer need to be removed from the impoundment. It would be conveyed to the covered storage facility after being dewatered, then transported to the permitted special waste landfill. The amount of ash that would be stored in the on-site landfill should be approximately equal to the ash that is currently stored from through the existing wet sluicing process Under this alternative the volume of water used for sluicing would be reduced relative to the No Action alternative. This reduction in water use would result in a corresponding reduction in the potential for movement of constituents from surface water systems (sluice trench, bottom ash impoundment) to groundwater. Therefore, impact of this alternative on groundwater are considered to be beneficial and minor.

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

The impacts to groundwater from this alternative would be identical to those of Alternative B. However, the recirculation system would eliminate the discharge of bottom ash sluice water to Outfall 001, which would reduce the potential for movement of constituents from surface water systems (sluice trench, bottom ash impoundment) to groundwater. Therefore, impact of this alternative on groundwater are considered to be minor and even more beneficial than Alternative B.

3.4 Surface Water

3.4.1 Affected Environment

The SHF site is located on the Ohio River, 35 mi upstream of its confluence with the Mississippi River (Ohio River Mile [ORM] 946). The plant is bordered by the Ohio River and Little Bayou Creek, which are both classified as warm water aquatic habitat (Figure 3-1). The 7Q10 flow (lowest stream flow for seven consecutive days that would be expected to occur once in 10 years) at the SHF discharge points on the Ohio River is 46,300 cubic feet per second (cfs), and on the Little Bayou Creek is 0 cfs (KDEP 2005).

The TVA SHF facility discharge is located between Lock and Dam 52 at Ohio River Mile (ORM) 938.9 and Lock and Dam 53 at ORM 962.6. These two locks and dams are under the control of and are operated by the United States Army Corps of Engineers (USACE), and are being replaced by the Olmstead Locks and Dam at ORM 964.4. Work on the new Olmstead locks is complete and work on the new dam is ongoing. Olmstead Dam does not currently provide any regulation of the river and in recent years there have been large swings in river elevations (USACE 2014). The average monthly stream flow is approximately 267,700 cfs. Generally, the Ohio River average depth is 24 ft and at its widest point is 1 mi across at Smithland Dam, about 27 mi upstream of SHF (ORSANCO 2014).

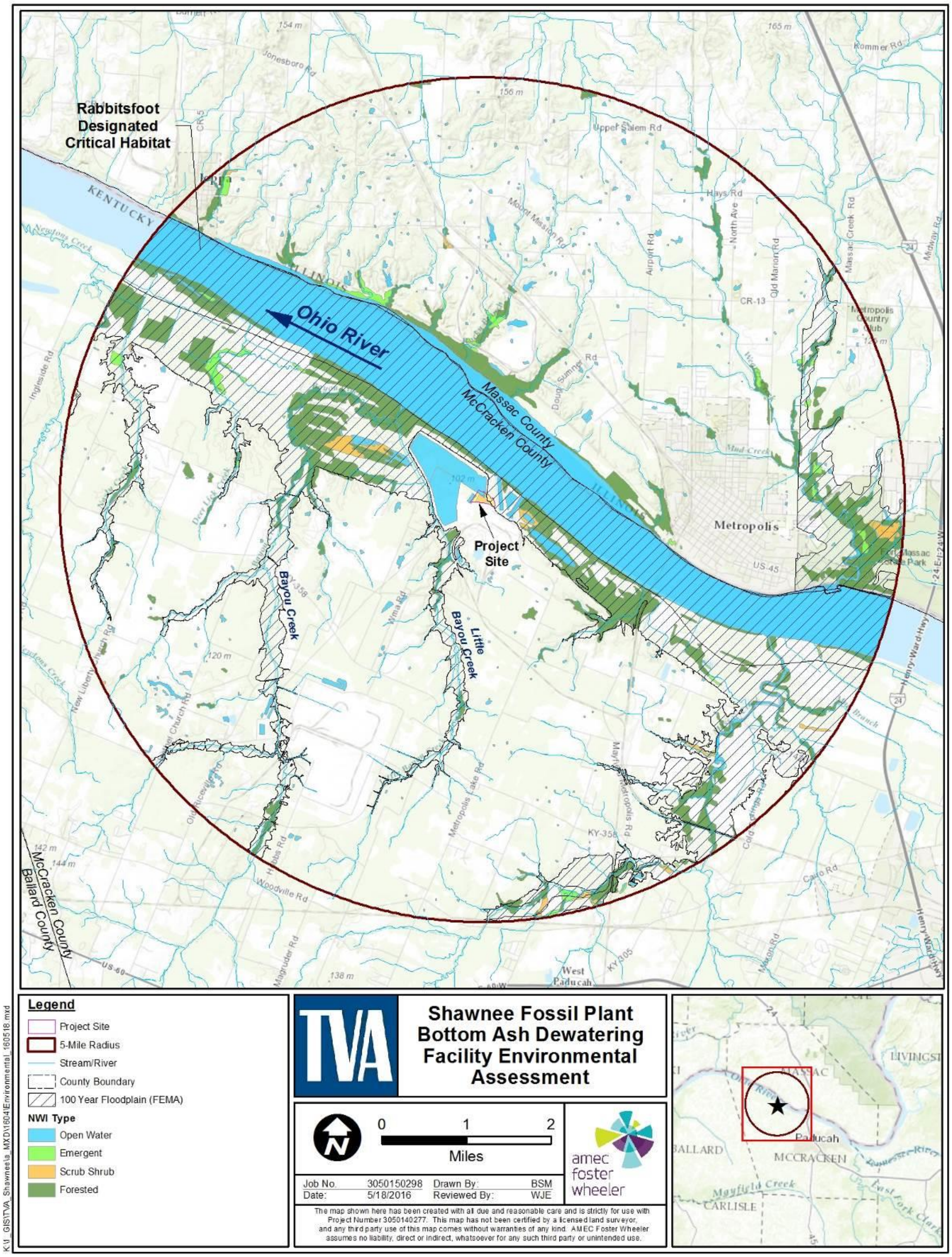

Figure 3-1. Environmental Features within 5 Miles of the Project Site

All of the Ohio River bordering Kentucky supports aquatic life use and drinking water use. Primary contact recreation is impaired for nearly 350 stream mi, or about 53 percent of the river in Kentucky. The pollutant causing this impairment is the pathogen indicator, *E. coli*. No reaches of the Ohio River fully support all assessed uses. This limited support is often a result of combined sewer overflows during and immediately following rainfall events along the riverfront and downstream of urban areas. All of the Ohio River only partially supports the fish consumption use because of polychlorinated biphenyls and dioxin, while methylmercury residue in fish tissue is a cause of less than full support in many of the river mi. The Ohio River segment associated with mercury-related impairment is the reach from just below Louisville to approximately 0.5-mi upstream of the Wabash River mouth (ORM 772.35-843.1), or approximately 11 percent of the 664 ORM (KDEP 2013). This stretch is well upstream of SHF.

Besides the State of Kentucky's statewide fish consumption advisory for mercury, long-standing fish consumption advisories remain in effect for the 7.2 mi of Little Bayou Creek. Little Bayou Creek is identified as not supporting warm water aquatic habitat due to pollutants including metals and radiation (KDEP 2013). The suspected sources of the pollutants are industrial point sources and waste disposal from the former PGDP. A total maximum daily loading limit (TMDL) was put in place for polychlorinated biphenyls (PCBs) for this stream segment in 2001 (KDEP 2001).

SHF operates a surface water intake structure that withdraws an average of 543,019 MGY (approximately 1487.72 MGD) from the Ohio River for use as CCW and plant process water (i.e., sluice water, fire protection, boiler feed water, safety eye wash and showers, and miscellaneous wash water). Approximately 98 percent of the water withdrawal is used for cooling, while approximately 2 percent is used for process water. Essentially, the majority of the withdrawn water is returned to the river after appropriate treatment in compliance with SHF's KPDES permit.

There are several existing wastewater streams at SHF permitted under KPDES Permit Number KY0004219 (KDEP 2005): Outfall 002 (storm water, wet weather conveyances, and CCW); Outfall 004 (formerly for chemical treatment impoundment discharges, but inactive and slated to be closed prior to this project); and Outfall 001 (process and storm water discharges from the ash impoundment system). Potentially impacted onsite wastewater streams include the dry stack (special waste landfill) storm water discharge, CCW discharge channel, and ash impoundment discharge.

Because the ash impoundment discharge (Outfall 001) and the CCW discharge channel (Outfall 002) are the primary discharge points potentially affected by the proposed action, they are the main focus of discussion. About 25.75 MGD are discharged on average from the ash impoundment through Outfall 001. Outfall 001 discharges into the CCW discharge channel. The ash impoundment currently receives wastewater from a number of sources, as listed in Table 3-1. The pH of the ash impoundment discharge generally ranges from 6.91 to 8.96. The current SHF KPDES permit requires TVA to meet the ash impoundment effluent limits presented in Table 3-2. Existing KPDES permit limitations on the ash impoundment discharge are established for pH, oil and grease, total suspended solids, and acute toxicity. This permit also requires monitoring for hardness and reporting of 13 metals: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

Table 3-1. Sources and Quantities of Inflows to Ash Impoundment

Source	Average Annual Daily Inflow to Ash Impoundment (MGD)
Bottom Ash sluice water	19.44
Coal yard drainage basin (receives effluent from the chemical treatment impoundment and station sumps)	5.7105
Inactive and active ash disposal areas, dry ash stacking areas, coal/ash dredge cell	0.4101
Limestone storage area and sump	0.0084
Air preheater washing wastes	0.0040
Pressure washing waste, water treatment plant waste	0.1501
Portable hand wash stations	0.0001
Precipitation	0.1709
Ash impoundment seepage discharged to effluent ditch	- 0.017
Evaporation	- 0.1226
Total	**25.7545**

Table 3-2. Outfall 001 Discharge Limitations and Requirements

	Effluent Limitations				Monitoring Requirements	
	Monthly Average		Daily Maximum			
Effluent Characteristics	Average Concentration (mg/L)	Average Amount (lb/day)	Average Concentration (mg/L)	Average Amount (lb/day)	Measurement Frequency	Sample Type
Flow	Report (MGD)		Report (MGD)		1/Week	Weir
pH	Range 6.0 – 9.0 (s.u.)				1/Week	Grab
Total Suspended Solids	30	--	75	--	1/Month	Grab
Oil and Grease	12	--	14	--	1/Month	Grab
Hardness (as mg/L of $CaCO_3$)	Report	--	Report	--	1/Quarter	Grab
Total Recoverable Metals	Report	--	Report	--	1/Quarter	Grab
Acute Toxicity*	N/A	--	1.00 TU_a	--	1/Quarter	2 Grabs

Source: KPDES Permit Number KY0004219 effective July 13, 2005
mg/L = milligrams per liter,lb/day = pounds per day,MGD = million gallons per day s.u. = standard units
$CaCO_3$ = Calcium Carbonate
Total Recoverable Metals include: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc
*TU_a = acute toxicity unit; required quarterly.

Approximately 1,490 MGD is discharged from the CCW discharge channel through KPDES Outfall 002. Outfall 002 discharges at ORM 946. The plant's permitted discharges from Outfall 002 are once-through condenser cooling water. The CCW itself should not be affected by the proposed project. However, because the ash impoundment (Outfall 001) discharges into the CCW discharge channel, Outfall 002 could be affected by this project by potential changes to Outfall 001. The current KPDES permit contains limitations on the CCW discharge for total residual chlorine and free available chlorine (no chlorine is added as part of normal operations), total residual oxidants and time of oxidant addition (no oxidants are added as part of normal operations), as well as thermal discharge (one million British Thermal Units per hour per hour). The permit also requires reporting of flow, intake temperature, and discharge temperature.

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct the proposed dewatering facility and the bottom ash sluice would continue to be handled in accordance with the KPDES permit. Thus, continued operations at SHF under the No Action Alternative would not be expected to cause any additional direct, or indirect effects to local surface water resources and therefore, would not change existing conditions.

3.4.2.2 Alternative B – Construction/Operation of a Dewatering Facility Utilizing a Continuous or "Once Through" System

3.4.2.2.1 Surface Water Withdrawal and Discharge Rates

Withdrawal rates would not change significantly with the implementation of Alternative B. Between 3 and 20 gpm of potable water would be used for safety showers, eye washes and restrooms. Discharges from the ash impoundment would be reduced from 19.44 MGD to 8.93 MGD with the implementation of the new bottom ash pumps. Accordingly, the discharge rates from both Outfalls 001 and 002 would be reduced by approximately 10.51 MGD with the reduction in bottom ash sluice water. This reduction of bottom ash flow would also reduce the total plant withdrawal rate by 0.706 percent. The remainder of the altered discharges from the project would be minimal low volume wastewater flows and storm water driven flows. The majority of the storm water flows would be managed through the implementation of BMPs and cleaning and maintenance plans. All other flows would be co-treated as process wastewater in the current impoundment system before discharge. The primary withdrawal usage plant-wide is for the condenser cooling water, which accounts for the primary component of water discharged via Outfall 002. There would be no change in the temperature of the discharge therefore the thermal discharge characteristics at Outfall 002 would not be expected to change noticeably with the flow reduction from Outfall 001 under this alternative.

TVA would maintain wet surface impoundments on-site as required to support SHF's operations and continued management of wastewater streams. This treatment system would potentially be altered in the future in preparation for compliance with the CCR Rule (40 Code of Federal Regulations [CFR] Parts 257 and 261), but would treat the same flows. If such an alteration is necessary, this system change would be detailed and its impacts assessed in a subsequent NEPA evaluation. When surface impoundments are closed, the closure would be regulated either by the KPDES permit or a closure plan.

3.4.2.2.2 Construction Impacts

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

Soil disturbances associated with construction and demolition activities can potentially result in adverse water quality impacts. Soil erosion and sedimentation can clog small streams and threaten aquatic life. Such activities would be located on the plant property that already supports heavy industrial uses. TVA would comply with all appropriate state and federal permit requirements. Appropriate BMPs would be followed, all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters is minimized. The site BMP plan, which is part of the KPDES Permit KY0004219, would be updated to include project-specific BMPs to address construction-related activities that would be adopted to minimize storm water impacts. Because this project would not take place adjacent to or in a "Water of the United States" or a "Water of the State of Kentucky," no water quality certification or USACE permit would be required.

Where soil disturbance could occur, the area would be stabilized and vegetated with noninvasive grasses and mulched, as described in A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority (Bowen et al. 2012). BMPs would be used to avoid contamination of surface water in the project area or equivalent measures. Therefore, no significant impacts to surface water would be expected due to surface water runoff from the construction site.

Currently, 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. While the existing infrastructure would be removed from the project site; it would be replaced with the covered dewatering facility, thus altering the current storm water flows. However, because the project site is an industrial site and was already partially covered with impervious structures or ground covers that decrease percolation, the construction of the process dewatering facility would not significantly change the impervious surface area. Under this alternative, the concentrated storm water flow from the project area would come primarily from the proposed facility's roof drains. This flow would need to be properly treated with either implementation of proper BMPs or by diverting the storm water discharges to the ash impoundment for co-treatment.

With the implementation of appropriate BMPs, impacts to surrounding surface waters from construction activities would be temporary and minor.

3.4.2.2.3 Operation Impacts

Bottom Ash Dewatering Operations

The bottom ash that would be dewatered is presently sluiced from the power plant to an ash impoundment and then to the stilling impoundment. This plant currently uses a PRB coal which does not readily generate a substantial pyrite waste steam, however this factor has the potential to change based on the coal blend utilized by the facility. Under this alternative, the bottom ash would be sluiced to the dewatering facility where it would be dewatered and the solids disposed of in an on-site landfill. The sluice water would then be released to the ash and stilling impoundments and ultimately discharged through Outfall 001. Clarified water from the dewatering facility would meet current KPDES permit limits.

Additionally, the reduction of bottom ash sluice water, the increased residence time within the ash impoundment and the reduction of the exposure time to the solid waste stream has the potential to reduce the accumulation of metals in the effluent discharge.

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 KPDES permit limits, including toxicity limits, and Kentucky Water Quality Standards that are developed to be protective of surface waters and their designated uses. Additionally, process storm water associated with this facility would be routed to the ash impoundment or a water treatment facility for treatment and released through a permitted discharge outfall.

To evaluate and characterize the changes in discharges through Outfall 001 and 002 from current to post-project conditions, a mass balance model was produced to aid in the evaluation of impoundment loading, chemical characterization and receiving stream characterization and impacts. A mass balance model is a mathematical accounting of the sources (inflows) and sinks (outflows) of a substance within a system, such as a water body. A mass balance model for a water body is useful in understanding the relationship between the loadings of a pollutant. These measures are useful in predicting potential impacts to water quality that may arise in the ash impoundment and/or the receiving stream resulting from the changes to the bottom ash handling systems.

Results of the mass balance analysis under current operations and for Alternative B (i.e., following the bottom ash conversion) are presented in Tables 3-3 and 3-4. The input data and assumptions used in the mass balance analysis are also shown on the tables.

Table 3-3. Mass Balance of Current Operations at SHF

	Current Baseline		Current Operations						
Element	River Conc. (mg/L)	River Loading (lb/day)	Ash Pond Conc. (mg/L)	Ash Pond Loading (lb/day)	Projected Conc. at CCW Outfall 002 (mg/L)	Projected Loading at CCW Outfall 002 (lb/day)	Projected Mixing Conc. of Outfall 002 and Outfall (mg/L)	Total Discharge Conc. at Ohio River 7Q10 (mg/L)	KDEP* Water Quality Based Effluent Standard Conc. (mg/L)
Aluminum	0.730	9068.2754	2.700	580.64	0.730	8927.686	0.76346	0.73169	NL
Antimony	<0.001	6.2111	0.002	0.43	<0.001	6.115	0.00053	0.00050	0.64000
Arsenic	0.0011	13.6645	0.002	0.43	0.0011	13.453	0.00112	0.00110	0.15000
Barium	0.047	583.8479	0.045	9.68	0.047	574.796	0.04697	0.04700	NL
Beryllium	<0.001	6.2111	0.002	0.43	<0.001	6.115	0.00053	0.00050	0.00400
Cadmium	<0.0005	3.1056	0.002	0.43	<0.0005	3.057	0.00028	0.00025	0.00036
Chromium	0.0031	38.5091	0.003	0.65	0.0031	37.912	0.00310	0.00310	NL
Copper	0.0026	32.2980	0.004	0.86	0.0026	31.797	0.00262	0.00260	0.01289
Iron	1.100	13664.5245	0.6	129.03	1.100	13452.677	1.09151	1.09957	4.00000
Lead	0.0011	13.6645	0.002	0.43	0.0011	13.453	0.00112	0.00110	0.00515
Manganese	0.12	1490.6754	0.024	5.16	0.12	1467.565	0.11837	0.11992	NL
Mercury	0.00000243	0.0302	0.0000012	0.00	0.00000243	0.030	0.0000024	0.0000024	0.00077
Nickel	0.0032	39.7513	0.002	0.43	0.0032	39.135	0.00318	0.00320	0.07185
Selenium	<0.001	6.2111	0.002	0.43	<0.001	6.115	0.00053	0.00050	0.00500
Silver	<0.0005	3.1056	0.002	0.43	<0.0005	3.057	0.00028	0.00025	0.00726
Thallium	<0.001	6.2111	0.002	0.43	<0.001	6.115	0.00053	0.00050	NL
Zinc	0.0011	13.6645	0.011	2.37	0.0011	13.453	0.00127	0.00111	0.16511

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

* Kentucky Surface Water Standards, 401 KAR 10:31.

Table 3-4. Mass Balance of Proposed Future Operations (Alternative B)

	Current Baseline Conditions		Future Operating Conditions with Dewatering System						
Element	River Conc. (mg/L)	River Loading (lb/day)	Ash Pond Conc. (mg/L)	Ash Pond Loading (lb/day)	Projected Conc. At CCW Outfall 002 (mg/L)	Projected Loading at CCW Outfall 002 lb/day)	Projected Mixing Conc. of Outfall 002 and Outfall 001 (mg/L)	Total Discharge Conc. at Ohio River 7Q10 (mg/L)	KDEP* Water Quality Based Effluent Standard Conc. (mg/L(
Aluminum	0.730	9068.2754	2.700	343.69	0.730	8991.749	0.74995	0.7310085	NL
Antimony	<0.001	6.2111	0.002	0.25	<0.001	6.159	0.00052	0.0005008	0.64000
Arsenic	0.0011	13.6645	0.002	0.25	0.0011	13.549	0.00111	0.0011005	0.15000
Barium	0.047	583.8479	0.045	5.73	0.047	578.921	0.04698	0.0469990	NL
Cadmium	<0.0005	3.1056	0.002	0.25	<0.0005	3.079	0.00027	0.0002509	0.00036
Chromium	0.0031	38.5091	0.003	0.38	0.0031	38.184	0.00310	0.0030999	NL
Copper	0.0026	32.2980	0.004	0.51	0.0026	32.025	0.00261	0.0026007	0.01289
Iron	1.100	13664.5245	0.6	76.37	1.100	13549.211	1.09494	1.0997440	4.00000
Lead	0.0011	13.6645	0.002	0.25	0.0011	13.549	0.00111	0.0011005	0.00515
Manganese	0.12	1490.6754	0.024	3.05	0.12	1478.096	0.11903	0.1199509	NL
Mercury	0.00000243	0.0302	1.2E-06	0.00	0.00000243	0.030	0.000002	0.0000024	0.00077
Nickel	0.0032	39.7513	0.002	0.25	0.0032	39.416	0.00319	0.00320	0.07185
Selenium	<0.001	6.2111	0.002	0.25	<0.001	6.159	0.00052	0.00050	0.00500
Silver	<0.0005	3.1056	0.002	0.25	<0.0005	3.079	0.00027	0.00025	0.00726
Thallium	<0.001	6.2111	0.002	0.25	<0.001	6.159	0.00052	0.00050	NL
Zinc	0.0011	13.6645	0.011	1.40	0.0011	13.549	0.00120	0.00111	0.16511

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

* Kentucky Surface Water Standards, 401 KAR 10:31.

Results of the mass balance analysis demonstrated that for both current and proposed operations all the constituents evaluated in the receiving stream would meet KPDES permit limits and KDEP water quality standards. Additionally, the mass balance for the proposed action indicates that concentrations of the majority of the parameters evaluated showed decreased concentrations. Consequently, future operations of the bottom ash dewatering facility would be expected to have no significant impacts, or beneficial impacts on the receiving stream.

TVA would conduct an operational characterization of the altered and new waste streams to confirm that no significant impacts to the Ohio River are anticipated from this action. Additionally, no direct negative (toxic) impacts on the Ohio River are anticipated because Outfall 001 would be required to meet KPDES acute toxicity limits. If the operational characterization shows impacts, then mitigation would be undertaken to meet requirements for ensuring that discharges meet KPDES and acute toxicity limits.

Any discharges into surface waters would comply with all KPDES permit limits. Thus, continued operations at SHF under Alternative B conditions would not be expected to cause any additional direct, or indirect, effects to local surface water resources.

Runoff Streams Special Waste Landfill

Currently the bottom ash is wet sluiced to the ash impoundment where it is removed with the use of heavy machinery and transported to the Special Waste Landfill. With the implementation of the bottom ash dewatering system, the ash would no longer need to be removed from the impoundment, it would be taken from the covered storage facility after being dewatered and transported to and deposited into the permitted Special Waste Landfill. The amount of ash stored in the on-site landfill should be approximately equal to the ash stored from this process currently. Therefore, project-related environmental conditions in the project area with respect to surface waters are not expected to change.

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

This alternative would have similar impacts associated with the construction, dewatering and ash storage activities noted above in Alternative B. The operational, withdrawal and discharge impacts alterations under this alternative are discussed below.

The recirculated bottom ash dewatering process as described in Section 2.1 would be similar to the process described in Alternative B with the addition of recirculating the majority of the bottom ash sluice transport water. This recirculation would include a make-up water stream, a low volume continuous blowdown stream and a waste stream. The make-up water stream would be additional raw water that would replace or supplement the water lost from evaporation or leakage in the system. This waste stream withdrawal rate would range from 300 to 600 gpm. Not only would make-up water ensure that water lost in the system was replaced, but it would help to balance the pH and other chemical constituents in the recirculating system in order to maintain the integrity of the system's infrastructure and materials.

Wastewater would flow from the dewatering conveyor to the clarifier and process flow tanks and lastly into a wastewater containment tank prior to being recirculated. The blowdown stream from the containment tank would help to regulate the hydraulic flow levels from all nine generation units and would reduce the existing bottom ash discharge from 19.44 MGD to a maximum of 3 MGD of process water. Any discharge from the system would be managed on site , in accordance with the ELG and CCR regulations. Therefore, no bottom ash sluice transport water would be discharged from Outfall 001.

This alternative would result in potential minor benefits to water quality as compared to Alternative B due to the decrease in discharge rate, discharge concentrations and volume of surface water released via KPDES Outfall 001.

Discharge Reduction Characterization

Discharge from the bottom ash system would be managed in accordance with the ELGs. Therefore, it is assumed that bottom ash sluice waste water would not be directly discharged and that the recirculation blow downstream would be managed to comply with ELG regulations.

Results of the reduction in loading ranges for Alternative C (i.e., following the bottom ash dewatering with recirculation) is displayed in Table 3-5. Bottom Ash sluice metals data for the contributing streams were collected during a special TVA study. These samples were collected from the bottom ash sluice prior to mixing and treatment in the ash impoundment. The bottom ash sluice data displayed variability in concentrations from each unit evaluated, therefore, the minimum and maximum concentrations were used to display the range of reduction. Please note that this range of reduction does not reflect the loadings being discharged from Outfalls 001 and 002 or to the receiving stream (Ohio River), but the reduction in the loadings being discharged into the ash impoundment. The ash impoundment effectively treats and decreases these concentrations, some up to 97 percent. This treatment system works by assimilating the process waste stream and allowing time for particles that bond with metals and other parameters to settle. Following settlement within the sluice trench, much of this material is then excavated and allowed to dry in piles on the ground next to the trench. Smaller particles are conveyed within the lower end of the sluice trench to the stilling basin where they settle and are retained. Together, these processes are effective in reducing concentrations in discharge waste stream. It is assumed that the discharges from the Outfalls 001 and 002 would have the potential to also be reduced and would continue to meet KPDES permit limits and KDEP water quality standards.

The majority of concentrations would be expected to decrease with the removal of the bottom ash waste stream. The analysis indicates that the overall impact of future dewatering operations with recirculation would not have significant impacts to surface water quality. Thus, continued operations at SHF under the Alternative C would not be expected to cause any additional direct, indirect, or cumulative effects to local surface water resources.

Additionally, no direct negative (toxic) impacts on the Ohio River are anticipated because Outfall 001 would be required to meet KPDES acute toxicity limits. If the operational characterization shows impacts, then mitigation would be undertaken to meet requirements for ensuring that discharges meet KPDES and acute toxicity limits.

Analysis indicates that continued operations at SHF under the Alternative C would not be expected to cause any additional direct or indirect effects to local surface water resources.

Table 3-5. Reduction of Bottom Ash Loadings with Implementation of Alternative C

	Current Operations		Range of Loading Reductions	
	Low End	High End	Low End	High End
Element	Current Bottom Ash Sluice Conc. mg/L	Current Bottom Ash Sluice Conc. mg/L	Current Bottom Ash Sluice Loading* lb/day	Current Bottom Ash Sluice Loading* lb/day
Aluminum	1.89	28.8000	306.7924	4674.9312
Antimony	<0.002	<0.002	0.1623	0.1623
Arsenic	0.002	0.0097	0.3246	1.5680
Barium	0.146	1.5600	23.6993	253.2254
Beryllium	<0.002	<0.002	0.1623	0.1623
Cadmium	<0.001	<0.001	0.0812	0.0812
Chromium	0.00265	0.0258	0.4302	4.1880
Copper	<0.002	0.0361	0.1623	5.8599
Iron	<0.100	8.1500	8.1162	1322.9406
Lead	<0.002	0.0074	0.1623	1.1963
Manganese	<0.0150	0.1090	1.2174	17.6933
Mercury	0.0000026	0.0000030	0.0004	0.0005
Nickel	<0.002	0.0121	0.1623	1.9641
Selenium	<0.002	0.0030	0.1623	0.4870
Silver	<0.002	<0.002	0.1623	0.1623
Thallium	<0.002	<0.002	0.1623	0.1623
Zinc	<0.025	0.0448	2.0291	7.2721

* Mass Discharge and Loadings below detection were calculated using 0.5 of the Minimum Detection Limit

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

3.5 Floodplains

3.5.1 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 proposed dewatering facility permanent and temporary use areas are located along the left descending bank of the Ohio River at approximately ORM 946 to 947. The National Flood Insurance Program Flood Insurance Study and associated Flood Insurance Rate Map are available for the Ohio River at this location as illustrated in Figure 3-1.

The Ohio River flood elevations as shown on Profile 32P of the 2011 McCracken County, Kentucky, Flood Insurance Study are listed in Table 3-6.

Table 3-6. Selected Ohio River Flood Elevations

Return period (years)	Elevation at ORM 946/ Low Crest Elevation of SHF Perimeter Dike (ft North American Vertical Datum 88)	Elevation at ORM 948/ Little Bayou Creek (ft North American Vertical Datum 88)
10	328.0	328.0
50	334.5	334.0
100	336.5	336.3
500	339.5	339.0

Source: FEMA 2011

In addition, the 100- and 500-year flood elevations were confirmed by the USACE, Louisville District.

A perimeter dike is in place that bounds the area within the vicinity of the permanent use area. Based on topographic data developed by TVA, the lowest crest elevation of the perimeter dike is at about elevation 343, which is at least 3 ft higher than the Ohio River 500-year flood elevation. Therefore, the area behind the perimeter dike would be outside of the Ohio River 100- and 500-year floodplains as shown in Figure 3-2. The majority of the temporary use area is located behind the perimeter dike, while a small portion is on the river side of the perimeter dike within the 100-year floodplain.

Little Bayou Creek is an Ohio River tributary that flows along the western boundary of the perimeter dike from Little Bayou Creek Mile 0.0 to about mile 1.7. The Little Bayou Creek drainage area is approximately 9.4 square mi (U.S. Geological Survey [USGS] StreamStats 2016) with a 100-year peak discharge of 4,300 cfs based on USGS regional regression equations. The 100- and 500-year flood elevations on Little Bayou Creek in the vicinity of SHF would be influenced by backwater from the Ohio River and therefore elevations on the Ohio River would control. These elevations are listed in Table 3-6.

3.5.2 Environmental Consequences

It is necessary to evaluate development in the 100-year floodplain to ensure that the project is consistent with the requirements of Presidential 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" (United States Water Resources Council 1978). The EO 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 EO 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.

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,

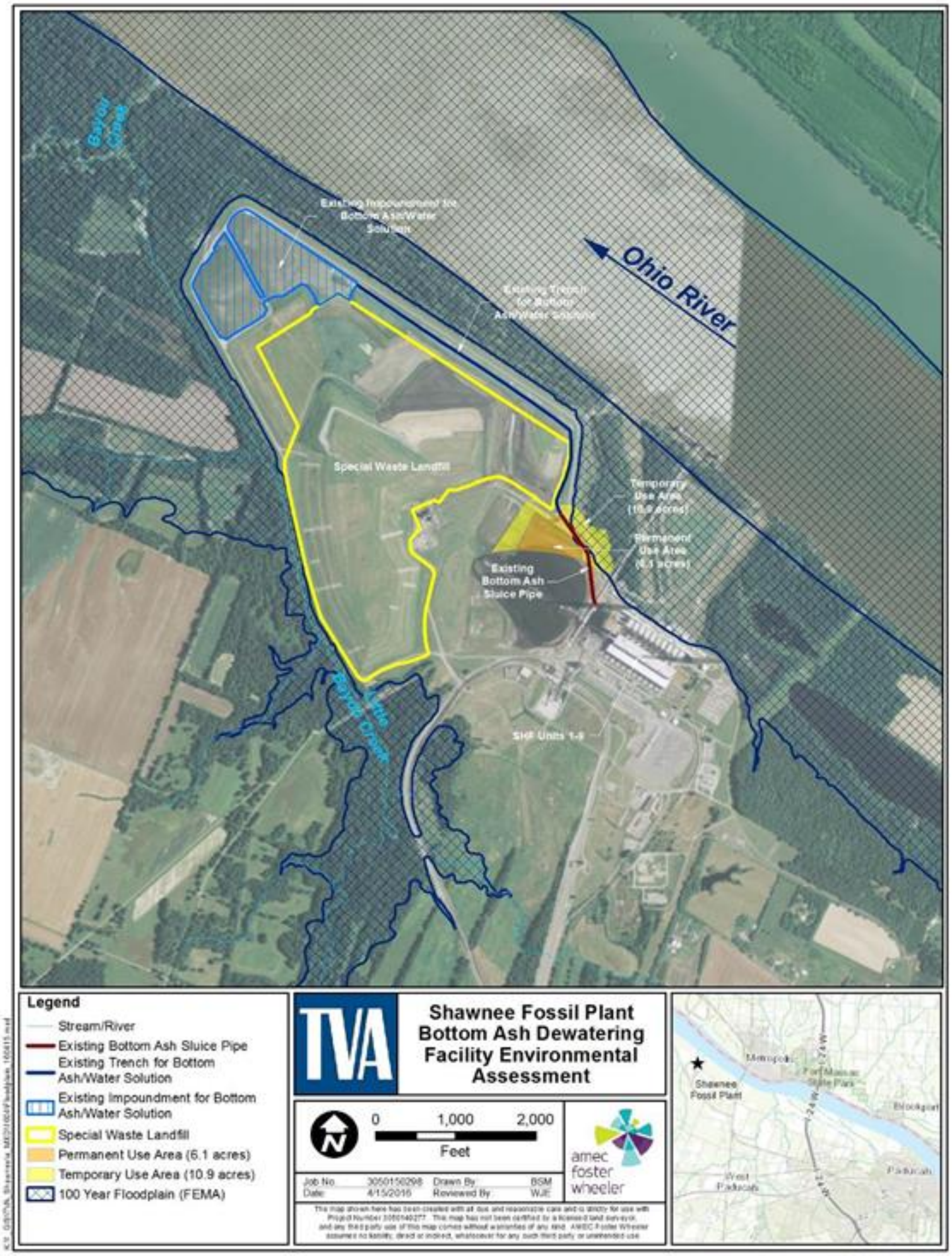

Figure 3-2. Water Resources Surrounding the Project Area

Definitions, last amended October 1, 1985). Therefore, the proposed dewatering facility would be considered a "critical action" as it is needed to facilitate the management of ash on a dry basis.

3.5.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, construction and operation of the dewatering facility would not occur. Ash would continue to be handled via wet sluicing and would result in the placement of CCR materials within the existing ash impoundment. Therefore, there would be no direct or indirect impacts to floodplains because there would be no physical changes to the current conditions found within the local floodplains.

3.5.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

Under Alternative B, TVA would construct a new bottom ash dewatering facility within an area that is protected from the 500-year flood by an existing dike. Closure of the chemical pond required fill material that raised the elevation of the current project site above the floodplain. As such, no flooding of the dewatering facility from the Ohio River would occur under either the 100-year or 500-year flood events. A portion of the temporary use area would be located on the river side of the perimeter dike within the 100-year floodplain (Figure 3-2). The temporary use area would be used for construction staging (equipment, materials loading unloading, etc.). Construction staging would be considered a temporary use of the 100-year floodplain, and therefore would have no permanent impacts on floodplains or floodplain resources, which would be consistent with EO 11988. Additionally, adverse impacts would be minimized by adhering to standard BMPs during construction and returning the area to pre-construction conditions after completion of the project.

The permanent use area would be located within the perimeter dike. As mentioned previously, the low crest of the perimeter dike is higher than the 500-year flood elevation; therefore, the permanent use area would be located outside 100- and 500-year floodplains, which would be consistent with EO 11988. The permanent use area would have no impact on floodplains.

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

Given that Alternative C has the same project boundary as Alternative B, the project impacts would be the same on floodplains under Alternative C as in Alternative B. The recirculating basin would be outside the 100- and 500-year floodplains, which would be consistent with EO 11988.

3.6 Vegetation

3.6.1 Affected Environment

SHF is located within the Wabash-Ohio Bottomlands Level IV ecoregion (Woods et al. 2002). This unglaciated level floodplain along the Ohio River was historically southern floodplain forest, a mix of oaks, cypress, and hardwood species. This region has been largely drained and converted for commercial and agricultural use.

SHF is mostly an intensely developed site that has been heavily disturbed by construction, maintenance, and operation of the facility. As a result of this alteration of the physical landscape, most areas within SHF no longer support a natural plant community. Within the project area, the land use is classified as developed, low intensity and consists of disturbed vegetation (Table 3-7).

Table 3-7. Land Use/Land Cover

Land Use Type	Acres Within Alternatives B/C	Acres within 5-mi Radius
Barren Land (Rock/Sand/Clay)		134.8
Cultivated Crops		18,351.1
Deciduous Forest		11,745.4
Developed High Intensity		528.4
Developed, Low Intensity	17.0	1,783.1
Developed, Medium Intensity		744.8
Developed, Open Space		4,002.3
Emergent Herbaceous Wetlands		1,017.3
Evergreen Forest		146.8
Grassland/Herbaceous		56.9
Open Water		4,865.3
Pasture/Hay		4,330.2
Shrub/Scrub		0.02
Woody Wetlands		2,558.4
Total	**17.0**	**50,264.9**

Source: Homer et al. 2015

A field survey was conducted in March 2016 to evaluate land cover within the project area and composition of the forested area north of the temporary use area. Within the project area, most of the land is heavily disturbed and is frequently altered with heavy machinery and is sparsely vegetated with ruderal and early successional herbaceous species. The area designated for temporary use consists of a mowed fescue lawn and contains no trees or woody shrubs. North of the temporary use area is a small forested area consisting of sweetgum, cottonwood, honey locust, hackberry, eastern red cedar, and green ash. The understory is heavily invaded by *Phragmites* and Japanese honeysuckle. The temporary use area would not extend into the forested area, and no trees are expected to be removed under Alternatives B or C.

Land use within a 5-mi radius of the project consists of agricultural, residential, rural, and commercial activity (Figure 3-3). Vegetation within 5 mi of the project area is primarily cultivated crops, deciduous forest, and pasture land. The surrounding region also contains small amounts of woody wetlands, evergreen forest, grassland, and shrub/scrub.

EO 13112 (Invasive Species) defines an invasive species as one that is not native to the local ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive plants can include trees, shrubs, vines, grasses, ferns, and forbs. Invasive plants near the project area include *Phragmites* and Japanese honeysuckle, which are located in the forested area adjacent to the temporary use area. These species have the potential to affect the native plant communities adversely because of their ability to spread rapidly and displace native vegetation.

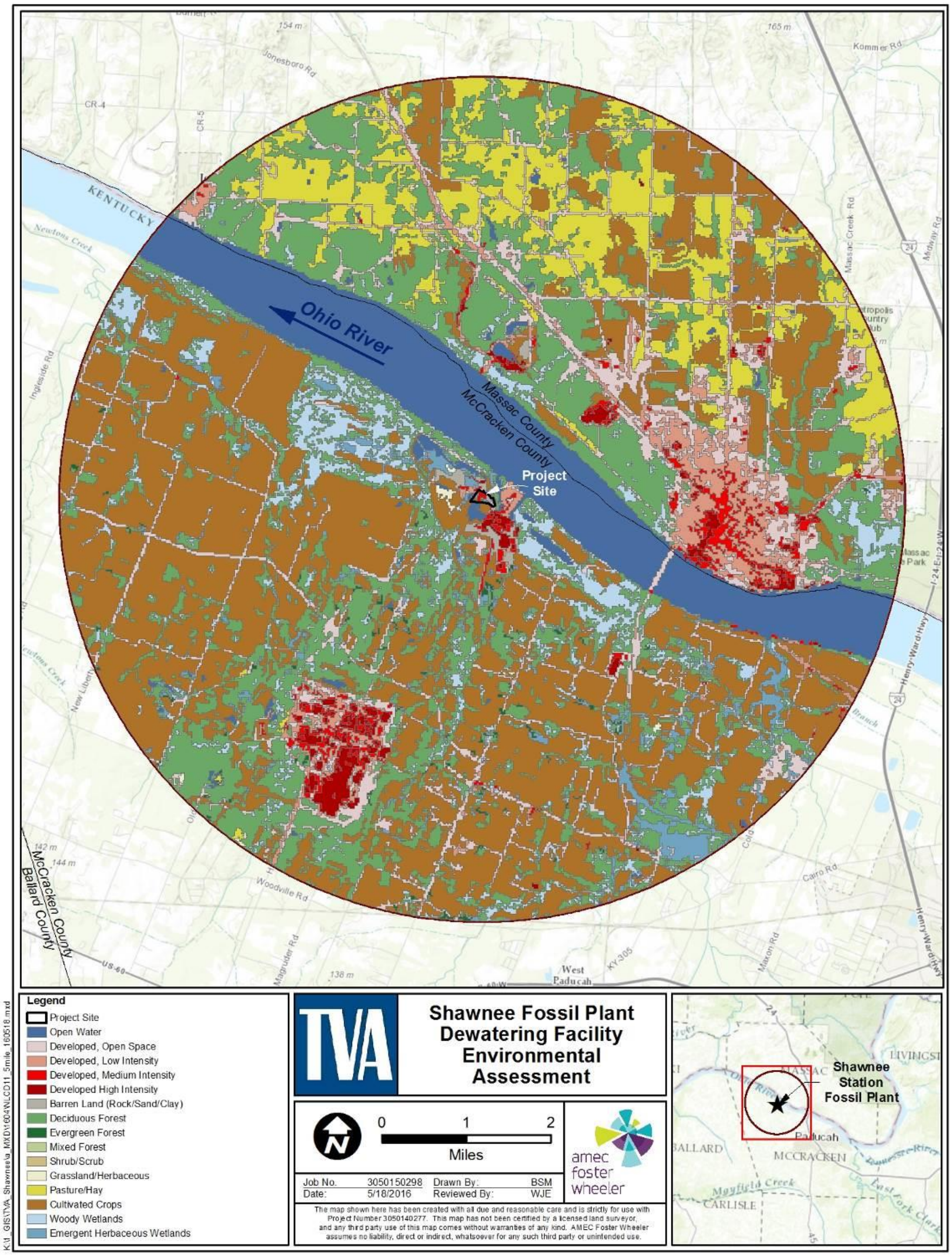

Figure 3-3. Land Cover within 5 Miles of the Project Area

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the dewatering facility. Since there would be no ground disturbance activities, there would be no impacts to vegetation. The vegetated areas within the project area would continue to be dominated by non-native and early successional species indicative of disturbed habitats

3.6.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

Vegetative cover within the project area is highly disturbed or converted to industrial use by prior on-site activities. Permanent impacts to 6.1 ac of developed land would occur to accommodate the dewatering facility; however, this area currently does not include any natural vegetation, therefore there would be no impacts to established plant communities. An additional 10.9 ac of mowed lawn would be temporarily impacted for laydown and staging areas. This area has already been disturbed due to plant construction and operation and does not contain unique vegetation with conservation value. Therefore, impacts to vegetation would be minor and temporary.

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

Because the project boundary and footprint would be the same under Alternative C as Alternative B, there is the same disturbance to vegetation as described in Alternative B. Therefore, implementation of Alternative C would have temporary, minor impacts on vegetation

3.7 Wildlife

3.7.1 Affected Environment

The proposed dewatering facility at SHF is located along the Ohio River. The project area encompasses a 6.1 ac site designated for the construction of the dewatering facility and 10.9 ac identified for temporary equipment laydown and mobilization during construction. This area includes the existing bottom ash sluice pipe, mowed fescue lawn, and contains no trees or woody shrubs. The surrounding area includes the coal stockpile to the south, the existing ash management area to the west, and SHF units 1-9 to the east. The Ohio River and Little Bayou Creek border the plant to the north and southeast. An early successional hardwood forested area is located adjacent to the temporary use area on the river side of the perimeter dike surrounding the existing ash management area. This forested habitat would not be impacted by the proposed actions. Bordering SHF to the west and southwest is the West Kentucky Wildlife Management Area (WKWMA). Mowed herbaceous fields and the bottom ash trench do not offer 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 (Palmer-Ball 1996, National Geographic 2002). Small mammals that can be found in these grassy areas include eastern cottontail, eastern mole, white-footed mouse, deer mouse, southeastern shrew, eastern gray squirrel, eastern fox squirrel, and eastern chipmunk. Other mammals that may be located in the vicinity of SHF include, striped skunk, opossum, raccoon, red fox, gray fox, coyote, bobcat, woodchuck, beaver, muskrat and mink. Mist netting in the nearby WKWMA has identified the presence of the eastern red bat, little brown bat, and tricolored bat. It is likely that the big brown bat, the hoary bat, and the silver-haired bat would also be in the vicinity (DOE 2015). White tailed deer tracks were observed within the project area during a site visit in March 2016.

Birds that may utilize the slow or standing water of the bottom ash trench and the bottom ash impoundment in this region include killdeer, double-crested cormorant, great blue heron, green heron, mallard, and Canada goose (Palmer-Ball 1996, TVA 2016b). Small patches of disturbed forest adjacent to industrialized areas are often used by the American crow, American robin, American goldfinch, blue jay, eastern towhee, northern cardinal, northern mockingbird, red-winged blackbird, red shouldered hawk, and wild turkey (National Geographic 2002). Common amphibian and reptile species also use similarly disturbed, wet areas including the American toad, Fowler’s toad, green frog, spring peeper, upland chorus frog, eastern box turtle, common snapping turtle and red-eared slider (DOE 2015, TVA 2016b). The nearby WKWMA is considered a birding hotspot, with 138 species recorded at this site (eBird 2013). There are no Audubon-recognized Important Bird Areas within McCracken County (National Audubon Society 2015). Shorebirds such as killdeer, semipalmated plover, lesser yellow legs, pectoral sandpiper may utilize these ash ponds as stop-over grounds during migration events.

As of March 2016, the TVA Regional Natural Heritage database indicated that no records of caves exist within 5 mi of the project area and none were found on the project site during a site visit in March 2016. One large great blue heron colony has been reported approximately 3.7 mi east of SHF. No additional heron rookeries, osprey nests, or aggregations of other migratory birds were observed within the project area and none are recorded within 5 mi of SHF.

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the dewatering facility. Wildlife would not be impacted under this alternative.

3.7.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or “Once Through” System

The reduction in discharge under Alternative B may create drier conditions in the sluice trench thus rendering the habitat less favorable for common amphibians, reptiles and birds; however, due to the proximity of suitable habitat along the Ohio River and Little Bayou Creek, any impact on these species would be minor. Wading birds and shorebirds migrating through the area would continue to use this habitat during the dewatering operations.

The proposed action would permanently remove the limited amount of wildlife habitat (primarily mowed grass) that is currently present in the 6.1 ac of permanent use area and temporarily impact 10.9 ac of habitat included in the temporary use area. This would result in the permanent or temporary displacement of any wildlife (primarily common native or naturalized species) currently using these areas. Direct temporary effects to some individuals may occur if those individuals are immobile during the time of construction, especially if construction would occur during breeding/nesting seasons as the species are less mobile during those times. However, given the disturbed nature of the project area, any impacts during construction would be temporary and minor.

Permanent habitat loss 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. However, considering the amount of higher quality habitat in the surrounding area compared to the industrial and heavily disturbed habitat within the project area, it is unlikely that any wildlife species would be unable to relocate successfully. Therefore, the proposed project would have minor impacts on populations of common wildlife species.

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

Given that Alternative C has the same project boundary as Alternative B, the project impacts under Alternative C would be the same on wildlife species as Alternative B. Thus impacts under Alternative C would be minor. Additionally, under Alternative C, no bottom ash sluice transport water would be discharged from Outfall 001. This reduction in discharge would possibly reduce the utilization of the sluice trench by common amphibians, reptiles and birds; however, due to the proximity of suitable habitat along the Ohio River and Little Bayou Creek, impact on these species would be negligible.

3.8 Aquatic Ecology

3.8.1 Affected Environment

SHF is located approximately 10 mi west of Paducah, Kentucky along the Ohio River and lies within the Bayou Creek-Ohio River (Hydrologic Unit Code 051402060701). The Wabash-Ohio Bottomlands ecoregion is composed of nearly level, poorly-drained floodplains and undulating terraces (Woods et al 2002). Natural streams in this region meander and consist of low gradient channels with silt and sand bottoms and are inhabited by typical Ohio River fish fauna. Much of the ecoregion is heavily forested with southern floodplain forest and bottomland mixed deciduous forests. A March 2016 site visit of the proposed project area did not identify any streams or water features. The SHF facility is bordered by the Ohio River and Little Bayou Creek, which are both classified as warm water aquatic habitat (see Figure 3-1).

The Ohio River Valley Water Sanitation Commission (ORSANCO) operates programs to improve water quality in the Ohio River and its tributaries, including setting waste water discharge standards, performing biological assessments, and monitoring the physical and chemical properties of the waterway. Fish population data was collected in 2009 at 17 randomly selected locations throughout the reach of the Ohio River near SHF (ORSANCO 2009). Forty-eight fish species and 1 hybrid taxa were collected, representing 13 different families. Overall, the most abundant species collected was gizzard shad, with large numbers of freshwater drum, river carpsucker, channel catfish, sauger, longear sunfish, yellow bass, and bluegill also collected. Benthic substrate samples collected in the river revealed that it is dominated by sand followed by fines then gravel. Woody cover was present at all of the 17 sample sites and riparian land cover was primarily natural forest with some agriculture and residential uses present. The section of the Ohio River adjacent to SHF is designated critical habitat for the rabbitsfoot mussel (see Section 3.9, Threatened and Endangered Species).

The Federal CWA Section 303(d) requires that States develop a list of the streams and lakes that need additional pollution controls because they are water quality limited or are expected to exceed water quality standards in the next 2 years. Streams where water quality is limited are those that have one or more properties that violate water quality standards and are therefore considered to be degraded by pollution and not fully meeting designated uses. Status of the assessed uses on the Ohio River are identified in Section 3.4.1.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct the dewatering facility at SHF. Because there would be no changes from the current condition, there would be no changes to aquatic ecology as a result of this alternative.

3.8.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

No direct impacts to aquatic ecosystems would occur in conjunction with the construction of the proposed dewatering facility as there would be no direct impact to the river or shoreline. Potential indirect impacts resulting from surface water runoff during construction activities would be mitigated through the implementation of storm water erosion controls in accordance with a SWPPP which will be prepared for this project. Therefore any impacts to aquatic ecosystems would be minor and temporary.

Invertebrates, fish, and mussel fauna of the Ohio River would not be affected by operation of the facility as there would be no direct impact to the river or shoreline and discharges would take place through the permitted outfall and would meet existing KPDES permit requirements. Because KPDES requirements are designed to be protective of aquatic life in receiving waters, impacts to aquatic fish and shellfish species near SHF are not anticipated.

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

Under this alternative, all existing process discharges associated with bottom ash sluicing operations would be eliminated. Any outage washes or blowdown from the dewatering process would be managed on site in compliance with ELG and CCR regulations. . Consequently, the discharges from Outfalls 001 and 002 would correspondingly be reduced, which would have an incrementally beneficial impact on aquatic life in the Ohio River. All other impacts would be the same as described in Alternative B, so no significant impacts to aquatic ecology are expected.

3.9 Threatened and Endangered Species

3.9.1 Affected Environment

The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the United States or elsewhere. The ESA outlines procedures for federal agencies to follow when taking actions that may affect federally listed species or their designated critical habitat.

The state of Kentucky provides protection for species considered threatened, endangered or deemed in need of management within the state in addition to those also federally listed under the ESA (Kentucky Department of Fish and Wildlife Resources [KDFWR] 2013). The listing of species is managed by the KDFWR; additionally, the Kentucky State Nature Preserves Commission (KSNPC) and TVA both maintain databases of aquatic and terrestrial animal species that are considered threatened, endangered, of special concern, or are otherwise tracked in Kentucky because the species is rare and/or vulnerable within the state. Plant species are protected in Kentucky through the Kentucky Rare Plant Recognition Act of 1994.

3.9.1.1 Wildlife

According to the KSNPC, 50 federal or state listed animal species occur in McCracken County (Table 3-5) (KSNPC 2015). A review of the TVA Regional Natural Heritage database in March 2016 indicated that of those species listed by USFWS and KSNPC, 21 species are currently known or have been known to occur within a 5-mi radius of the project area. Review of the USFWS Information for Planning and Conservation Web site identified one additional federally listed species that has the potential to occur in the project area (Table 3-8).

Fourteen state or federally listed freshwater mussel species are known to occur within McCracken County. In addition, three of these mussel species (orange-foot pimple back, rabbitsfoot, and sheepnose) are also recorded within a 5-mi radius of SHF. All of these aquatic species require freshwater systems with flowing water (NatureServe 2016). Because the proposed project area does not include any freshwater stream habitat, these species are not expected to occur on-site.

The reach of the Ohio River between Olmstead, Illinois and Paducah, Kentucky, which includes the portion of the river adjacent to SHF, is designated critical habitat for the rabbitsfoot mussel (see Figure 3-1) (USFWS 2015**c**). Critical habitat includes specific areas (occupied or unoccupied by the species) on which are found physical or biological features essential to the conservation of the species (constituent elements) and may require special management. The constituent elements for the rabbitsfoot critical habitat include: geomorphically stable river channels and banks; a hydrologic flow regime necessary to maintain benthic habitats where the species is found; water and sediment quality necessary to sustain natural physiological processes; the presence and abundance of fish hosts; and either little or no competitive or predaceous invasive species.

Seventeen state or federally listed fish species are known to occur within McCracken County. Ten of these fish species are also recorded within a 5 mi radius of SHF (see Table 3-5). The proposed project area does not include any aquatic habitat; therefore, these species are not expected to occur on-site.

The Northern crawfish frog is state listed as a species of special concern with a rank of S3 (vulnerable). There are 25 records of this species within 5 mi of SHF. The closest records are known from the WKWMA approximately 2.1 mi from the action area. The preferred habitat of the northern crawfish frog is native prairie, or in former prairie low meadows and pasture areas. Breeding occurs in waterholes and ditches (IL Natural History Survey 2016). As this habitat does not occur within the project area, the northern crayfish frog is not expected to occur on-site.

Table 3-8. Species of Conservation Concern within McCracken County and the Vicinity of SHF

Common Name	Scientific Name	Status	
		Federal[2]	State[3] (Rank[4])
Mollusks			
Spectaclecase	Cumberlandia monodonta	LE	END (S1)
Fanshell	*Cyprogenia stegaria*	LE	END (S1)
Longsolid	*Fusconaia subrotunda*	--	SPCO (S3S4)
Pink Mucket	*Lampsilis abrupta*	LE	END (S1)
Pocketbook	*Lampsilis ovata*	--	END (S1)
Ring Pink	*Obovaria retusa*	LE	END (S1)
Orangefoot Pimpleback*	*Plethobasus cooperianus*	LE	END (S1)
Sheepnose*	*Plethobasus cyphyus*	LE	END (S1)
Clubshell	*Pleurobema clava*	LE	END (S1)
Pyramid Pigtoe	*Pleurobema rubrum*	--	END (S1)
Fat Pocketbook	*Potamilus capax*	LE	END (S1)
Bleufer	*Potamilus purpuratus*	--	END (S1)
Rabbitsfoot*	*Quadrula cylindrica*	LT	THR (S2)
Purple Lilliput	*Toxolasma lividus*	--	THR (S2)
Fish			
Lake Sturgeon	*Acipenser fulvescens*	--	END (S1)
Alligator Gar*	*Atractosteus spatula*	--	END (S1)
Blacktail Shiner	*Cyprinella venusta*	--	SPCO (S3)
Lake Chubsucker*	*Erimyzon sucetta*	--	THR (S2)
Chain Pickerel*	*Esox niger*	--	SPCO (S3)
Cypress Darter	*Etheostoma proeliare*	--	THR (S2)
Cypress Minnow*	*Hybognathus hayi*	--	END (S1)
Chestnut Lamprey	*Ichthyomyzon castaneus*	--	SPCO (S2)
Mountain Brook Lamprey*	*Ichthyomyzon greeleyi*	--	THR (S2)
Black Buffalo*	*Ictiobus niger*	--	SPCO (S3)
Dollar Sunfish	*Lepomis marginatus*	--	END (S1)
Redspotted Sunfish*	*Lepomis miniatus*	--	THR (S2)
Burbot	*Lota*	--	SPCO (S2)
Inland Silverside*	*Menidia beryllina*	--	THR (S2)
Taillight Shiner*	*Notropis maculatus*	--	THR (S2S3)
Northern Madtom*	*Noturus stigmosus*	--	SPCO (G3)
Central Mudminnow	*Umbra limi*	--	THR (S2S3)
Amphibians			
Green Treefrog*	*Hyla cinerea*	--	SPCO (S3)
Northern Crawfish Frog*	*Rana areolata circulosa*	--	SPCO (S3)
Birds			
Sharp-shinned Hawk	*Accipiter striatus*	--	SPCO (S3B,S4N)
Bachman's Sparrow*	*Aimophila aestivalis*	--	END (S1B)
Henslow's Sparrow	*Ammodramus henslowii*	--	SPCO (S3B)
Fish Crow*	*Corvus ossifragus*	--	SPCO (S3B)
Mississippi Kite	*Ictinia mississippiensis*	--	SPCO (S2B)
Hooded Merganser*	*Lophodytes cucullatus*	--	THR (S1S2B, S3S4N)
Osprey	*Pandion haliaetus*	--	SPCO (S2S3B)
Bank Swallow*	*Riparia*	--	SPCO (S3B)
Interior Least Tern	*Sternula antillarum athalassos*	LE	END (S2B)
Barn Owl	*Tyto alba*	--	SPCO (S3)
Bell's Vireo*	*Vireo bellii*	--	SPCO (S2S3B)
Mammals			
Southeastern Myotis	*Myotis austroriparius*	--	END (S1S2)
Gray Bat	*Myotis grisescens*	LE	END (S2)
Northern Long-Eared Bat	*Myotis septentrionalis*	LT	END (S3)
Indiana Bat*	*Myotis sodalist*	LE	END (S1S2)
Evening Bat*	*Nycticeius humeralis*	--	SPCO (S3)
Cotton Deermouse	*Peromyscus gossypinus*	--	THR (S2)

Table 3-8. Species of Conservation Concern within McCracken County and the Vicinity of SHF (cont.)

Common Name	Scientific Name	Status	
		Federal[2]	State[3] (Rank[4])
Plants			
Red Buckeye	*Aesculus pavia*	--	THR (S2S3)
Lakecress	*Armoracia lacustris*	--	THR (S1S2)
Cream Wild Indigo	*Baptisia bracteata var. glabrescens*	--	SPCO (S3)
Broadwing Sedge	*Carex alata*	--	THR (S1S2)
Porcupine Sedge	*Carex hystericina*	--	HIST (SH)
Water Hickory*	*Carya aquatica*	--	THR (S2S3)
Five-lobe Cucumber	*Cayaponia quinqueloba*	--	END (S1?)
Rose Turtlehead	*Chelone obliqua var. speciosa*	--	SPCO (S3)
Star Tickseed/Downy Coreopsis*	*Coreopsis pubescens*	--	SPCO (S2S3)
Water Locust	*Gleditsia aquatica*	--	SPCO (S3?)
Common Silverbell	*Halesia carolina*	--	END (S1S2)
Broad-leaf Golden-aster	*Heterotheca subaxillaris* var. *latifolia*	--	THR (S2)
Ovate Fiddleleaf	*Hydrolea ovata*	--	END (S1)
One-flower Fiddleleaf	*Hydrolea uniflora*	--	END (S1)
Creeping St. John's-wort	*Hypericum adpressum*	--	HIST (SH)
Zigzag Iris	*Iris brevicaulis*	--	THR (S1S2)
Tall Bush-clover	*Lespedeza stuevei*	--	THR (S2S3)
Snow Squarestem	*Melanthera nivea*	--	SPCO (S3?)
Spotted Bee-balm	*Monarda punctata*	--	EXP (SX)
Hair Grass	*Muhlenbergia glabrifloris*	--	SPCO (S2S3)
Broadleaf Water-milfoil	*Myriophyllum heterophyllum*	--	SPCO (S3?)
Spotted Pondweed	*Potamogeton pulcher*	--	THR (S1S2)
Rough Rattlesnake-root	*Prenanthes aspera*	--	END (S1)
Sweet Coneflower	*Rudbeckia subtomentosa*	--	END (S1)
Compass Plant*	*Silphium laciniatum*	--	THR (S2)
Buckley's Goldenrod	*Solidago buckleyi*	--	SPCO (S2S3)
Pale Manna Grass	*Torreyochloa pallida*	--	HIST (SH)
Trepocarpus	*Trepocarpus aethusae*	--	SPCO (S3)

[1] Source: Kentucky Department of Fish and Wildlife 2015, TVA Regional Natural Heritage Database, KSNPC, and the USFWS for Planning and Conservation (IPaC) , accessed March 2016

[2] Federal Status Codes:
DM = Delisted, Recovered, and Being Monitored
LE = Listed Endangered
LT = Listed Threatened;
PE = Proposed Endangered
C = Candidate for federal listing
PS = partial status (subspecies listed in Midwest)

[3] State Status Codes:
END = listed endangered
NMGT = Listed in Need of Management
SPCO = species of special concern
THR = listed threatened
TRKD = tracked as sensitive but has no legal status
HIST = State Historic

[4] State Rank:
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 Kentucky; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)
S#? = Inexact rank

*Species documented within 5 mi of SHF.

The green treefrog is state listed as a species of special concern with a rank of S3 (vulnerable). It is known to exist in the riparian area associated with Bayou Creek approximately 0.3 mi from SHF; however the treefrog's preferred habitat is swamps, marshes and areas adjacent to waterbodies with slow moving water (NatureServe 2016).

As this habitat does not occur within the project area, the green treefrog is not expected to occur within the project area.

The sharp-shinned hawk is a small woodland hawk state listed as a species of special concern with a rank of S3B, S4N (breeding population vulnerable, non-breeding population secure). It is not known to occur within 5 mi of SHF. Year-round residents of Kentucky, sharp-shinned hawks forage along forest edges and require dense, closed canopy forests for breeding (Bildstein and Meyer 2000). Because the forested area adjacent to SHF does not have a dense canopy and the mowed lawn which could potentially be used as foraging habitat within the project area is minimal, it is unlikely this species would be found within the project area.

Bachman's sparrow is a large sparrow with a large bill and a rounded tail that is state-listed endangered with a rank of S1B (breeding population extremely rare and critically imperiled). The only record of this species is a historical record approximately 7.3 mi from the project area at SHF. This species is thought to be extirpated from McCracken County. While Bachman's sparrow can be found in old fields, savannas, and woodlands, its preferred habitat is open pine or oak woods with a dense herbaceous understory (Palmer-Ball 1996, NatureServe 2016). As there is no suitable habitat on-site, it is unlikely that this species would be found within the project area.

Henslow's sparrow is a small sparrow federally listed as a species of management concern and state-listed as a species of concern with a rank of S3B (breeding population vulnerable). This species winters along the southern coast of the United States and migrates to breeding grounds in the Midwest including parts of Kentucky. Prairies, pastures, savannas and un-mowed fields are used for breeding by Henslow's sparrow (Palmer-Ball 1996, NatureServe 2016). It is not known to occur within 5 mi of SHF and because the limited existing herbaceous vegetation at SHF is mowed, it is unlikely that this species would be found within the project area.

The fish crow is a small crow that is state-listed as a species of concern with a rank of S3B (breeding population vulnerable). It is known to occur approximately 1.4 mi west of SHF in forested habitat along the Ohio River. The fish crow forages along the shores of water-bodies and is found primarily in floodplains, on exposed sand bars, and in agricultural fields along major waterways in the interior portion of its range (Palmer-Ball 1996, NatureServe 2016). Due to SHFs proximity to the Ohio River and Metropolis Lake, transient fish crows may be observed flying over the project area or using the adjacent forested areas for perching, but this species is unlikely to be dependent on the low quality habitat available within the project area due to the proximity of higher quality habitat.

The Mississippi kite is a small raptor that is state-listed as a species of concern with a rank of S2B (breeding population extremely rare and imperiled). It is not known to occur within 5 mi of SHF. Nesting habitat in the southeastern United States is generally in undisturbed stands of lowland or floodplain forest along major waterways (Palmer-Ball 1996, NatureServe 2016). Due to the proximity of the Ohio River, Mississippi kites may be observed flying over or near the project area, but are unlikely to be found within the project area due to the lack of undisturbed stands of floodplain forest.

The hooded merganser is a small duck with a large distinctive crest that is state-listed as threatened with a rank of S1S2B (breeding population extremely to very rare and imperiled), S3S4N (nonbreeding population secure to vulnerable). It is known to occur in a large wetland immediately adjacent to the ash settling pond, approximately 0.3 mi from the project area. Hooded mergansers are usually found in shallow waters of wetlands, sloughs and ponds in the floodplains of major rivers (Palmer-Ball 1996). Like many bird species in the region, hooded mergansers may infrequently and opportunistically use the bottom ash impoundment and trench that would indirectly be impacted by the proposed dewatering actions. This is unlikely to negatively affect the hooded merganser, due to the abundant high quality habitat nearby, and the gradual pace of dewatering the impoundment and trench.

The osprey is a large raptor with dark brown wings and a white underside. It is state-listed as a species of concern with a rank of S2S3B (breeding population secure to vulnerable) and is not known to occur within 5 mi of SHF. Both foraging and nesting habitat occurs on along waterways (NatureServe 2016). Nests are constructed on natural and man-made structures in and around larger bodies of water where fish are abundant (Palmer-Ball 1996). Due to the proximity of the Ohio River, ospreys may be observed flying over and/or nesting near the project area, but are unlikely to be found within the project area due to the lack of suitable nesting and foraging habitat.

The bank swallow is a small brown and white songbird that is state-listed as a species of concern with a rank of S3B (breeding population vulnerable). It is not known 5 mi of SHF. These birds forage over water and open areas and nest in colonies in the immediate vicinity of major rivers. Natural banks along major rivers are the preferred nesting habitat of this species, but in more recent years this species has also been found nesting in vertical banks of sand and gravel quarries along the Ohio River (Palmer-Ball 1996). The bottom ash impoundment and trench provide low quality foraging habitat for this species.

The interior least tern is a small gull-like bird with a light gray body and a black cap. It is federally listed as endangered and state listed as endangered with a rank of S2B (breeding population very rare and imperiled). The interior least tern nests on open shorelines, riverine sandbars and mudflats throughout the Mississippi, Missouri, Arkansas, and Red River drainages. Small numbers of this species have been sporadically reported from the lower Ohio River, as the majority of records of this species in Kentucky are along the Mississippi River (Palmer-Ball 1996). Least terns also have been documented using inland sites created by humans such as dredge spoil and stilling ponds associated with coal plants, where site characteristics mimic (to some degree) natural habitat (Spear et al. 2007; Jenniges and Plettner 2008). No recorded use of these habitats at SHF by this species has been reported.

The barn owl is state-listed NMGT (in need of management) with a rank of S3 (vulnerable). Open habitats such as grasslands, deserts, marshes, and agricultural fields are preferred but the use of suitable foraging habitat can be limited by a lack of proximity to nesting and roosting sites. Hollow trees, cavities in cliffs and riverbanks, nest boxes, and many human structures (barns) are readily used for nesting and roosting (Palmer-Ball 1996, NatureServe 2016). This species is not known to occur within 5 mi of SHF. Based on the site visit conducted in March 2016, the forested habitat outside of the project area did not have any suitable roosting snags. Due to the project areas proximity to the WKWMA where potential roosting habitat is present, barn owl may be observed flying over or near the project area, but are unlikely to be found within the project area because of the preferable WKWMA habitat.

The Bell's vireo is a small non-distinct songbird that is a state-listed as a species of concern with a rank or S2S3B (breeding population vulnerable to very rare and imperiled). It nests and forages in dense shrub vegetation (NatureServe 2016). Two pairs of Bell's vireo were observed on SHF property approximately 0.3 mi from the action area in 1980. One of the pairs was building a nest. The birds were observed amongst shrubs and saplings along a level adjacent to Little Bayou Creek. Suitable habitat for this species may exist immediately adjacent to the project action area in this same location as the 1980 sightings as well as in the early successional forest east of the Temporary Use Area. However, no suitable habitat for this species occurs within the proposed project area.

The cotton deermouse is a small brown mouse that is state-listed as threatened with a rank of S2 (very rare and imperiled) and is not known to occur within 5 mi of SHF. This species occurs throughout the southeastern United States from as far west as Texas and as far north as Missouri. This small rodent prefers bottomland hardwood forests, swamps and other wet areas but has been found in old fields. Large logs and stumps are an important habitat component (NatureServe 2016). Due to a lack of suitable habitat, it is unlikely that this species would be found in the project area.

3.9.1.2 Bats

The Indiana bat is listed as federally endangered by the USFWS (USFWS 2007) and state endangered with a rank of S1S2 (very rare to extremely rare and imperiled). It is known to occur immediately west of the project area in the mature, forested lowlands near Bayou Creek, approximately 1.2 mi from the bottom ash impoundment. Indiana bats hibernate in caves in winter and use areas around them in fall and spring (for swarming and staging), prior to migration back to summer habitat. During the summer, Indiana bats roost under the exfoliating bark of dead and living trees in mature forests with an open understory, often near sources of water. Indiana bats are known to change roost trees frequently throughout the season, yet still maintain site fidelity, returning to the same summer roosting areas in subsequent years. This species forages over forest canopies, along forest edges and tree lines, and occasionally over bodies of water (Pruitt and TeWinkel 2007, Kurta et al. 2002, USFWS 2015b). The project area is within known summer roosting habitat for Indiana bats. Although suitable roosting habitat is lacking within the project action area, the project site may be used by the Indiana bat for foraging over the ash bottom impoundment and trench.

The southeastern myotis is state-listed as endangered with a rank of S1S2 (very rare to extremely rare and imperiled). It is not known to occur within 5 mi of SHF. This species overwinters in caves usually in association with the Indiana bat. In summer months, some bats will remain in caves but the majority move to cavities in snags usually near a water source (KYDFW 2016). The habitat range of southeastern myotis extends throughout the southeastern United States, ranging as far west at Texas and as far north as southern Illinois (NatureServe 2016). Although roosting habitat is lacking, the project site may be used by the southeastern myotis for foraging.

The northern long-eared bat is federally listed as threatened by the USFWS (2016) and state listed as endangered with a rank of S3 (vulnerable). Northern long-eared bat has been captured during mist-net surveys in the area surrounding SHF (DOE 2015). The bat can be found in the United States from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, extending into eastern Montana and Wyoming, and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting, relatively constant cool temperatures (32 to 48°F), high humidity, and minimal air currents. During summer this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter is greater than or equal to 3 inches). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats forage in upland and lowland woodlots, tree-lined corridors, and water surfaces, feeding on insects. In general, habitat use by northern long-eared bats is thought to be similar to that used by Indiana bats, although northern long-eared bats appear to be more opportunistic in selection of summer habitat (USFWS 2015a). Although suitable roosting habitat is lacking within the project action area, the project site may be used by the northern long-eared bat for foraging over the ash bottom impoundment and trench.

Gray bats are associated year-round with caves, roosting in different caves throughout the year. Bats disperse from colonies at night to forage along waterways (Tuttle 1976). The Ohio River adjacent to the SHF, wetlands adjacent to the project area, and the bottom ash impoundment and trench provide foraging habitat for gray bat that ranges from high to low in quality. No records of this species exist from McCracken County, nonetheless the USFWS has determined that this area falls within the range of this species, thus presence of this species in the project area is possible. This species is most vulnerable at roost caves. No caves are known within 5 mi of the project area and none were observed during field reviews on the project site in March 2016.

The evening bat is a small (up to 4 inches) glossy brown bat with a black face that is state-listed as a species of special concern with a rank of S3 (vulnerable). It is known to occur west of the project area in the mature, forested lowlands near Bayou Creek, approximately 1.2 mi from the bottom ash impoundment. This species is found in much of the eastern United States ranging from Nebraska to New Jersey and as far south as Veracruz, Mexico. This bat is rarely found in caves and is primarily found in cavities in trees much like those used by Indiana bat, southeastern bat, and the northern long-eared bat. Winter roosting habitat is poorly known. Foraging occurs in open areas and around tree canopies (Harvey et al. 2011, NatureServe 2016). Although suitable roosting habitat is lacking within the project area, the ash bottom impoundment and trench may be used by the evening bat for foraging.

There are no records of caves within 5 mi of SHF. A survey was conducted in March 2016 to determine bat habitat suitability within the project area and the bordering forested area. No caves or culverts of suitable size were observed within the project site. Additionally, no suitable snags or living trees with loose bark were observed in the adjacent forested area. The project area consists of developed land with a small mowed lawn, therefore tree removal would not be required for the proposed action. The grassy open area within the project area may provide limited bat foraging habitat. Proposed actions would result in the drainage of the bottom ash impoundment and trench thereby removing low quality foraging habitat for these bats. Much higher quality habitat for these species exists within a 5-mi radius of the project area and for these reasons the Indiana bat, northern long eared bat, southeastern myotis, and evening bat are unlikely to be found in the project area.

3.9.1.3 Plants

A review of the TVA Regional Natural Heritage database indicated that three state-listed plant species are known to occur within 5 mi of the proposed project site. Twenty-eight state-listed plant species are known to occur in McCracken County including one species federally listed as of management concern (see Table 3-8). Habitat requirements for each of these species are presented in Table 3-9. Based on their preferred habitat, none of the listed plants is known to exist in the project area at SHF.

Table 3-9. Habitat Requirements for Plant Species of Conservation Concern within the Vicinity of SHF

Common Name	Habitat Requirements	Habitat within Project Area
Red Buckeye	Swamp forests and rich damp woods[1]	No
Lakecress	Sloughs, cypress swamps, slow water[1]	No
Cream Wild Indigo	Prairies and open dry woods[1]	No
Broadwing Sedge	Peaty shores, marshes, wet thickets, woods[2]	No
Porcupine Sedge	Open swamps, sedge meadows, ponds, in calcareous substrates[2]	No
Water Hickory	Bottomland and floodplain swamps[1]	No
Five-lobe Cucumber	Bottomlands along bayous, swamp forests, riverbanks[1]	No
Rose Turtlehead	Floodplain and alluvial forests, swamps and sloughs[1]	No
Star Tickseed	Open woods, dry slopes and cobble bars near riverbanks[1]	No
Water Locust	Rivers, swamps and slough margins[1]	No
Common Silverbell	Rich woods and edges of sloughs and oxbow lakes[1]	No
Broad-leaf Golden-aster	Dry, sandy places and disturbed sites[1]	No
Ovate Fiddleleaf	Swamps and wet woods[1]	No
One-flower Fiddleleaf	Swampy woodlands, pond margins and wet ditches[1]	No
Creeping St. John's-wort	Acidic soils of fresh water open wetland areas[4]	No
Zigzag Iris	Forested and open wetlands, shorelines[1]	No
Tall Bush-clover	Dry woodlands[1]	No
Snow Squarestem	Floodplains and wet sandy woods[1]	No
Spotted Bee-balm	Sandy prairies and other sandy habitats[3]	No
Hair Grass	Dry/baked soils in prairies, rocky slopes, marsh edges of bottomland woods[1]	No
Broadleaf Water-milfoil	Ponds, ditches, slow streams[1]	No
Spotted Pondweed	Ponds, slow streams, swamps[1]	No
Rough Rattlesnake-root	Dry prairies, limestone glades, open rocky woods in acidic soils[1]	No
Sweet Coneflower	Prairies and open low areas[1]	No
Compass Plant	Prairies and barrens[1]	No
Buckley's Goldenrod	Dry mesic woods[1]	No
Pale Manna Grass	Bogs, fens, wetland habitats[4]	No
Trepocarpus	Margins of swamp forests and sandy river bottoms[1]	No

[1] KSNPC
[2] Flora of North America Committee 2010
[3] Illinois Wildflowers 2015
[4] NatureServe 2015

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the dewatering facility. Threatened and endangered species would not be impacted under this alternative.

3.9.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

The area of impact subject to project activities under this alternative is primarily comprised of developed or disturbed land that is generally unsuitable for the listed species in Table 3-8.

Suitable habitat for federally listed aquatic species does not occur within the project area; therefore, direct impacts to state- or federally listed threatened and endangered aquatic species are not anticipated to occur with implementation of Alternative B. Under this alternative, water use would be less than that under the No Action Alternative. Additionally, because water discharges would continue to be routed through the permitted outfall and would meet existing KPDES permit requirements, and because KPDES requirements are designed to be protective of aquatic life in receiving waters, impacts to listed fish and shellfish species near SHF are not anticipated. Additionally, the proposed project would not adversely modify the critical habitat for rabbitsfoot.

The terrestrial habitat on-site has been severely degraded and is currently maintained as developed land or mowed lawn, which is generally unsuitable habitat for the listed plant species identified within the vicinity of SHF. Therefore, impacts to threatened or endangered plants are not anticipated.

There are no records of caves within 5 mi of SHF. No suitable roosting habitat for forest dwelling bats, nesting habitat for birds, or habitat for state-listed amphibians or mammals would be impacted under this alternative. Dewatering of the bottom ash impoundment and trench would remove foraging habitat for state- and federally listed bats, interior least tern, and hooded merganser. However, high quality habitat for these species exists immediately adjacent to the project area in wetlands and the Ohio River. Loss of this small amount of poor quality foraging habitat would have no measurable effects on these species. Therefore, impacts to threatened and endangered terrestrial animals are not anticipated under this alternative.

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

Because the project boundary and the proposed action under Alternative C is not substantially different from that of Alternative B (except for the Phase 2 recirculation component), impacts to threatened and endangered species would be the same as described for Alternative B. No impacts to listed species are expected with this alternative.

3.10 Solid and Hazardous Waste

3.10.1 Affected Environment

Solid waste consists of a broad range of materials that include refuse, sanitary wastes, contaminated environmental media, scrap metals, nonhazardous wastewater treatment plant sludge, nonhazardous air pollution control wastes, various nonhazardous industrial waste (e.g., coal combustion residual) and other materials (solid, liquid, or contained gaseous substances). Subtitle D RCRA and its implementing regulations establish minimum federal technical standards and guidelines for nonhazardous solid waste management. States are primarily responsible for planning, regulating, implementing, and enforcing solid waste management.

Hazardous materials are regulated under a variety of federal laws including the Occupational Safety and Health Administration (OSHA) standards, Emergency Planning and Community Right to Know Act, RCRA, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 and Toxic Substances Control Act.

Existing SHF Waste Production

SHF utilizes approximately 9,600 tons of coal a day (TVA 2014). Total SHF ash production has ranged from approximately 252,000 to 475,000 tons per year. The fly ash/bottom ash split is about 80 percent fly ash and 20 percent bottom ash. Therefore, approximately 50,400 to 95,000 tons of bottom ash is generated annually.

SHF generates a limited quantity of hazardous waste and is considered a small quantity generator of hazardous waste. Currently generated wastes streams are related to maintenance and testing activities and include small quantities of waste paint, paint chips, solvents, absorbents, oily and solvent contaminated rags, silver containing wastes from welding, abrasive wastes, printed circuit boards, cathode ray tubes, paper insulated lead cable, and liquid-filled fuses. Used oils including pump lube oils, gear box oils, vacuum pump oils, used engine and transmission oils from vehicles and heavy equipment, hydraulic oils and cutting oils are also generated from maintenance activities. These used oils are generally recycled.

Limited amounts of universal wastes (mercury containing relays or similar mercury containing equipment, batteries, and lamps) are routinely generated from the plant infrastructure and operations. SHF is considered a small quantity handler of universal wastes.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, the dewatering facility would not be built and use of the wet impoundment as a storage method for bottom ash would continue. Bottom ash would continue to be dug out of the bottom ash impoundment, dried and placed in the special waste landfill. Fly ash would continue to be handled on a dry basis and placed in the special waste landfill.

The bottom ash impoundment and special waste disposal area would continue to operate and would be subject to CCR Rule requirements as well as Kentucky requirements. No additional management or disposal of solid, hazardous or universal wastes would be required as there are no construction activity or changes to existing operations under this alternative.

3.10.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

3.10.2.2.1 Construction

Bottom ash production rates would not change with the implementation of Alternative B. Construction of the dewatering facility would entail site preparation and construction activities that would generate typical construction debris and would generate small volumes of hazardous wastes. Construction at this site would require demolition of an existing coal yard runoff pond pump substation. The construction of the dewatering facility would require the rerouting of some fly ash piping and as a result some existing piping would be capped and abandoned under the road. The dewatering facility is located in an area that includes the former chemical treatment pond which was closed and backfilled under a separate project.

During construction, the primary solid nonhazardous wastes generated would be paper, wood, plastic refuse, scrap metal, construction debris, scrap metals, and soils as briefly summarized below:

- Paper, wood, glass, and plastics would be generated from packing materials, waste lumber, insulation, and empty nonhazardous chemical containers during project construction.
- Scrap metal would result from welding, cutting, framing and finishing operations, electrical wiring, disposal of packing materials and empty nonhazardous chemical containers.
- Construction debris would result from demolition of the coal yard runoff pond pump station and fly ash piping.
- Only a limited amount of soils would result from grading and excavation related to foundation construction.

Construction waste and debris would be placed in roll-offs and disposed of at a permitted off-site construction and demolition landfill. TVA would manage all solid wastes generated from construction of the proposed facility in accordance with established procedures. Solid wastes would be managed as required by applicable State regulations following procedures outlined in TVA's current Environmental Procedures and BMPs. Any soils generated due to grading or excavation would be managed on site. Facility solid waste construction impacts are expected to be minor.

Hazardous materials to be used during site preparation and construction may include limited quantities of fuels, lubricating oils, solvents, paints, adhesives, welding material, and other hazardous materials. Appropriate spill prevention, containment, and disposal requirements for hazardous materials would be implemented to protect construction and plant workers, the public, and the environment. A permitted third-party waste disposal facility would be used for ultimate disposal of the wastes. Therefore, impacts associated with the use of fuels, oil, lubricants, and the limited quantities of other hazardous materials during construction are expected to be minor.

3.10.2.2.2 Operation

CCR generation depends mainly on the amount and type of coal burned rather than the methods for handling these products; therefore, the amount of CCR generated would not change from existing conditions. The amount of coal burned at SHF, and consequently, CCR production, can vary from year to year depending on a variety of operating factors and conditions. Under Alternative B, dewatered bottom ash would be transported from the dewatering facility to the special waste landfill. The amount of waste stored in the on-site landfill under this alternative should be approximately equal to the ash stored currently.

Limited quantities of used oils would be generated during operation of the proposed dewatering facility from vacuum pumps, liquid and slurry transfer pumps, gear boxes, compressors and other machinery. Hydraulic oils may also be generated from components of the dewatering facility and associated equipment. These types of used oil are currently generated by SHF, and the increase in generation rate of these wastes is not expected to be significant. Used oil is recycled in accordance with applicable regulations and TVA's procedures.

Hazardous waste streams that are likely to be generated during the operation of the dewatering facility are maintenance-related and include: adhesives, paints, paint chips, degreasing solvents, absorbents, oily and solvent contaminated rags, sandblasting wastes and abrasive wastes. Only a limited increase in hazardous waste generation is expected to occur from operation of the dewatering facility, and SHF is not expected to change generator status from small quantity generator.

The transport, handling, storage, use, and disposal of hazardous materials would follow federal, state and TVA requirements. Hazardous materials would be handled in limited quantities and there is very limited potential for significant impacts related to their handling.

Operation of the dewatering facility would also generate limited quantities of universal wastes (mercury-containing relays and other mercury-containing devices, batteries and lamps). Although a limited increase in the quantities of these wastes that are generated at SHF would occur from operation of the dewatering facility, SHF is expected to remain a small quantity handler of universal waste. These wastes would continue to be managed in accordance with RCRA requirements and TVA BMPs.

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

This alternative would have similar impacts to the construction and operation impacts noted above in Alternative B. However, the impact of this alternative would be incrementally larger than Alternative B due to additional debris generated during the construction of Phase 2. Solid waste, hazardous waste and universal waste impacts from operation are anticipated to be similar to Alternative B. Therefore, solid and hazardous waste impacts from Alternative C are anticipated to be minor.

3.11 Land Use

3.11.1 Affected Environment

No residential or commercial land uses occur in the immediate vicinity of SHF or the proposed plant site. Land use/land cover based on the National Land Cover Database (Homer et al. 2015) within the project area and in the region around the proposed site are identified in Table 3-7. Land use within the 5-mi region around the project area is mostly agriculture (cultivated crops) and deciduous forest (see Figure 3-3). Other common land use types include hay/pasture land, open water associated with the Ohio River and various developed lands.

The study area for this project consists of approximately 17 acres within the existing SHF. The proposed new facility would be located within previously developed lands at SHF and within an area used for ash management. Land use within the project area is classified as barren land or developed high intensity, and it is zoned for industrial use (McCracken County and Paducah Geographic Information System 2014).

Developed lands consist of both industrial and non-industrial uses (see Figure 3-3). Industrial developed lands include the SHF plant site and the former PGDP located approximately 3 mi to the south of the proposed dewatering facility. However, this PGDP ceased operations in 2013 and is currently being decommissioned by the DOE. Non-industrial developed lands consist of moderately developed lands associated with the city of Metropolis, Illinois. The nearest residence is less than 1 mi southeast of SHF and the nearest church is approximately 1.5 mi southeast.

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action Alternative

Under Alternative A, no construction activities would be undertaken by TVA. Therefore, there would be no changes to land use.

3.11.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or “Once Through” System

Because construction is proposed to occur within an existing industrial area, construction would not result in conversion of any land uses to industrial facilities. Construction impacts include potential temporary impacts to 10.9 ac of partially developed land. Short-term impacts would include the temporary conversion of the some vacant areas to laydown areas to support various construction-related activities. These short-term impacts would include construction parking lots, laydown and stockpile areas, and temporary crew trailers and offices. Upon completion of construction activities, it is anticipated that these areas would be restored to their previous state.

Land within the permanent use area is considered to be previously developed, the installation and construction of the process dewatering facility would not change the existing land use. Furthermore, the proposed land use of the site is consistent with the current use of the site. Therefore, there would be no impacts to land use from construction and operations of the proposed dewatering facility.

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

Because the project boundary and footprint would be the same under Alternative C as is described for Alternative B, the impacts to land use would also be the same. Therefore, implementation of Alternative C would have no impact on land use.

3.12 Socioeconomics

3.12.1 Affected Environment

SHF is located about 10 mi northwest of Paducah. It is surrounded by farmland and forest on the east, south and west, and the Ohio River runs adjacent to the north side of the plant. Metropolis, Illinois is located across the Ohio River 2.5 mi from SHF. The former PGDP, which ceased operations in 2013 and is currently being decommissioned by the DOE, is located about 3 mi south-southwest of SHF.

Given the nature of the proposed action, the potentially affected population for this analysis is defined as the community within a 5-mile radius buffer around the proposed dewatering facility site. This community includes both McCracken County in Kentucky and Massac County in Illinois and, therefore, both counties and the states of Kentucky and Illinois are included as appropriate secondary geographic areas of reference. Comparison at multiple scales provides a more effective definition for socioeconomic factors that may be affected by the proposed action including minority and low-income populations.

3.12.1.1 Demographics

Demographic characteristics of the community within a 5-mi radius of the dewatering facility site are summarized in Table 3-10. This community incorporates portions of the surrounding cities and counties which is reflected in the resident population of 14,089. However McCracken County (65,545 residents) and Massac County (15,148 residents) only represent approximately 1.5 and 0.1 percent of the total populations of Kentucky and Illinois respectively. Since 2000, the population within the surrounding community has increased by 1.2 percent. During this same period, the states of Kentucky and Illinois experienced small population gains (1.0 and 0.3 percent respectively).

The vast majority (91.6 percent) of people within the surrounding community are white. This statistic is similar to the surrounding counties where white people comprise 85 to 91 percent of the population. Correspondingly, minority populations in the study area are small. Black or African Americans are the predominant minority in the study area representing 5.7 percent of the population. Black or African American populations within the study area, are lower than McCracken County (10.8 percent), Kentucky (7.9 percent) and Illinois (14.4 percent), but similar to the percent of Black or African American people in Massac County (5.6 percent). Hispanic and Latino ethnic groups are present in the study area, but are below comparative rates for the surrounding counties and states.

3.12.1.2 Economic Conditions

Employment characteristics are summarized in Table 3-11. The total employed civilian population within the surrounding community is 5,742. Approximately 8 percent of the civilian labor force in the surrounding community is unemployed, which is comparable to the unemployment rate in McCracken County (7.2 percent), but lower than Massac County (10.7 percent) and the states of Kentucky and Illinois as a whole. Median household income for the surrounding community was $41,125, which is similar to those reported for McCracken and Massac counties and the State of Kentucky. However it is lower than the median household income reported for Illinois (see Table 3-10).

Table 3-10. Demographic Characteristics

	Surrounding Community[3]	McCracken County	Massac County	State of Kentucky	State of Illinois
Population					
Population, 2014 estimate	14,089	65,545	15,148	4,383,272	12,868,747
Population, 2010	13,917	65,565	15,429	4,339,367	12,830,632
Percent Change 2010-2014	1.2%	-0.3%	-1.8%	1.0%	0.3%
Persons under 18 years, 2014	23.1%	22.1%	22.4%	23.2%	23.7%
Persons 65 years and over, 2014	17.3%	17.3%	19.1%	14.0%	13.2%
Racial Characteristics					
White, 2013[1]	91.6%	85.4%	91.1%	87.7%	72.5%
Black or African American, 2014[1]	5.7%	10.8%	5.6%	7.9%	14.4%
American Indian and Alaska Native, 2014[1]	0.2%	0.6%	0.1%	0.2%	0.2%
Asian, 2014[1]	0.6%	0.5%	0.4%	1.2%	4.9%
Native Hawaiian and Other Pacific Islander, 2013[1]	0.00%	0.1	0.0%	0.0%	0.0%
Two or More Races, 2014	1.7%	2.3%	2.4%	2.0%	2.2%
Hispanic or Latino, 2014[2]	0.5%	2.2%	2.3%	3.2%	12.9%
Income and Poverty					
Housing Units	6,547	31,242	7,093	1,938,836	5,299,423
Median household income, 2010-2014	$41,125	$43,650	$43,092	$43,342	$57,166
Persons below poverty level, 2010-2014	19.3%	17.4%	19.0%	18.9%	14.4%

[1]Includes persons reporting only one race.

[2]Hispanics may be of any race, so also are included in applicable race categories.

[3] 5 mi radius around the proposed alternative development sites.

Source: United States Census Bureau (USCB) 2016

Table 3-11. Employment Characteristics

	Surrounding Community[1]	McCracken County	Massac County	State of Kentucky	State of Illinois
Population Over 16 years	11,222	52,679	12,144	3,476,701	10,170,489
Civilian Labor Force	6,242	31,128	6,643	2,063,756	6,701,592
Employed	5,742	28,883	5,930	1,870,879	6,032,031
Unemployed	500	2,245	713	192,877	669,561
Percent of Civilian Labor Force	8.0%	7.2%	10.7%	9.3%	10.0%

Source: USCB 2016

[1]5 mi radius around the proposed alternative development sites.

The largest percentage of civilian employees in McCracken County are employed in the educational services, health care and social services industries (24.5 percent), followed by retail trade (13.5 percent) and arts, entertainment, recreation, accommodation and food services (11.1 percent). Arts, entertainment, recreation, accommodation and food services employs the largest percentage of civilian employees in Massac County (12.4 percent) followed by retail trade (11.4 percent) and transportation, warehousing and utilities (11.1 percent) (USCB 2016). Based on current commuting patterns, the labor market area is defined to include all adjacent counties (USCB 2016).

3.12.1.3 Community Facilities and Services

Community facilities and services are public or publicly funded facilities such as police protection, fire protection, schools, hospitals and other health care facilities, libraries, day-care centers, churches and community centers. Services available to the communities surrounding SHF include hospitals, fire and emergency services, law enforcement, churches, schools and an airport (Figure 3-4). All of these community facilities are located greater than 1.0 mi from the proposed project site.

Direct impacts to community facilities occur when a community facility is displaced or access to the facility is altered. Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services and affect the delivery of such services. There are no direct impacts to community services associated with any of the alternatives as there are no community facilities within 1.0 mile of the proposed project site. In addition, the temporary construction work can be accomplished with the local workforce and the operation of the dewatering facility would require a small increase in full-time employment (up to four workers). Therefore there would be no change to the current demand for services in the region.

3.12.1.4 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address Environmental Justice (EJ) in minority and low income populations. This EO mandates some federal-executive agencies to consider EJ when identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations. While TVA is not subject to this EO, TVA applies it as a matter of policy.

The analysis of the impacts of the proposed activities on EJ issues follows guidance issued by CEQ under NEPA (CEQ 1997). The analysis of EJ impacts has three parts:

1. Identification of the geographic distribution of low-income and minority populations in the affected area;

2. An assessment of whether the impacts of the proposed activities would produce impacts that are high and adverse; and

3. If impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

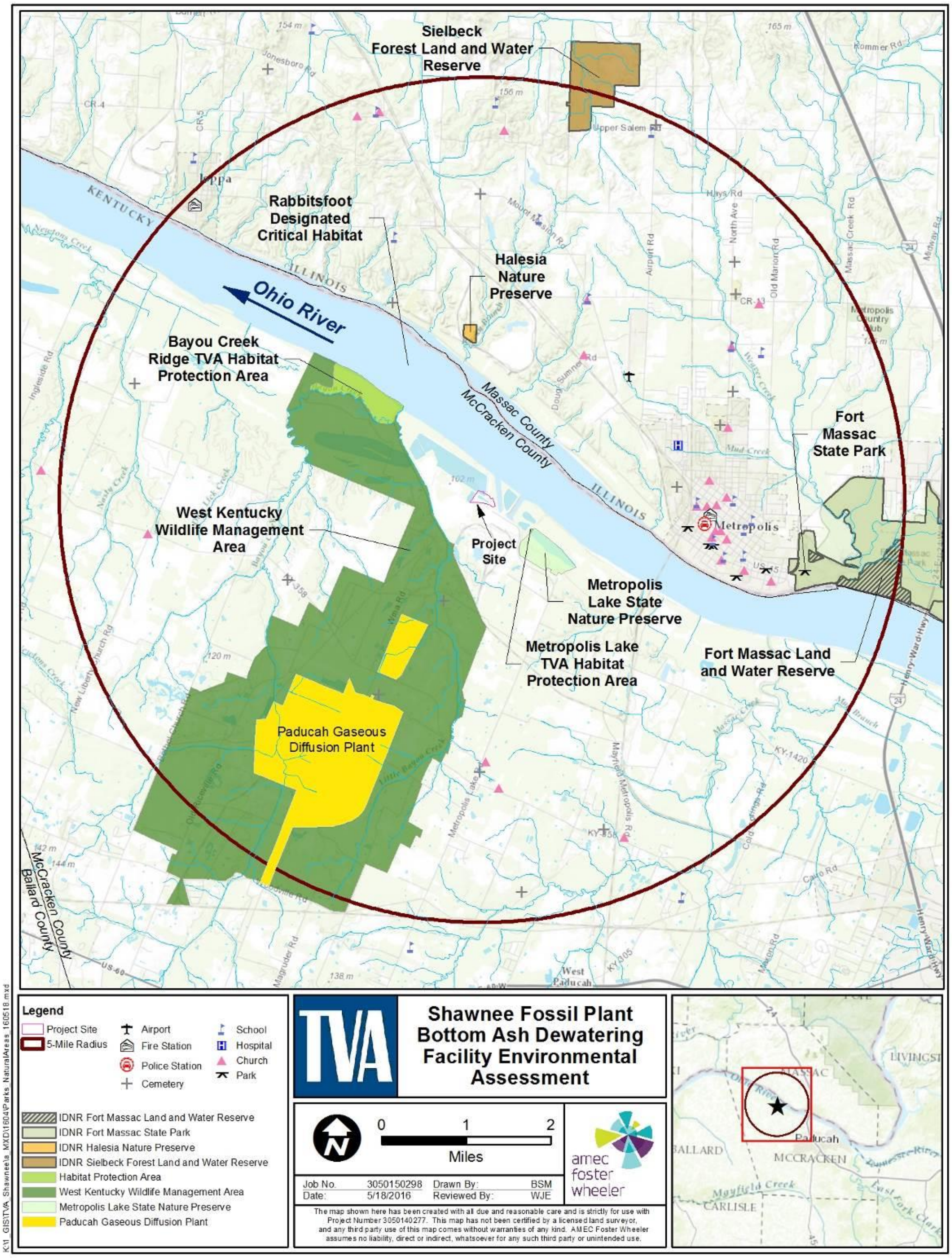

Figure 3-4. Natural Areas and Community Facilities within a 5-Mile Radius of the Project Site

In the event that impacts are significant, disproportionality will be determined by comparing the proximity of any high and adverse impacts to the locations of low-income and minority populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. Demographic data from census block groups in the potentially affected community (i.e., those within a 5-mi radius), were compared to data for McCracken and Massac counties to determine potential impacts to environmental justice communities.

The CEQ guidance concerning the analysis of EJ defines minority as individuals who are members of the following population groups: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; or a race whose ethnicity is Hispanic (CEQ 1997).

Identification of minority populations requires analysis of individual race and ethnicity classifications as defined by the USCB, as well as comparisons of all minority populations in the region. Minority populations exist if either of the following conditions is met:

- The minority population of the surrounding community exceeds 50 percent of the total population.
- The ratio of minority population within the surrounding community is meaningfully greater (i.e., greater than or equal to 20 percent) than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).

Total minority populations (i.e., all non-white racial groups combined and Hispanic or Latino) comprise 8.7 percent of the population of the block groups within the potentially affected community. The minority populations within the surrounding community did not exceed rates for McCracken County (26.4 percent minority) or Massac County (10.8 percent minority).

Low-income populations are those with incomes that are less than the poverty level (CEQ 1997). The 2015 Health and Human Services Poverty Guidelines states that, an annual household income of $24,250 for a family of four is the poverty threshold. For an individual, an annual income of $11,770 or less is below the poverty threshold. A low-income population is identified if either of the following two conditions are met:

- The low-income population of the surrounding community exceeds 50 percent of the total population.
- The ratio of low income population within the surrounding community significantly exceeds (i.e., greater than or equal to 20 percent) the appropriate geographic area of analysis.

Approximately 19 percent of persons within the potentially affected community are living below the poverty threshold. The low-income populations within these block groups did not significantly exceed corresponding rates for McCracken County (17.4 percent) or Massac County (19.0 percent minority).

However, the total low-income population exceeded 50 percent of the total population in one of the block groups included within the potentially affected community, and, persons in this block group should be considered as a low-income population subject to EJ considerations. This block group is located in the city of Metropolis.

3.12.2 Environmental Consequences

3.12.2.1 Alternative A – No Action Alternative

There would be no change in local demographics, economic conditions, or community services under the No Action Alternative.

3.12.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

3.12.2.2.1 Demographic and Employment Impacts

The on-site construction workforce is estimated to be 100 to 125 workers during the construction period (estimated to be 12 to 14 months). These workers would be drawn from the labor force that currently resides in the study area. Up to four workers would be hired full-time to maintain and operate the facility, which would create a negligible positive impact to employment in the region.

3.12.2.2.2 Economic Impacts

Potential economic impacts associated with the proposed project relate to direct and indirect effects of the construction. Construction activities would entail a temporary increase (12 to 14 months) in employment and associated payrolls; the purchases of materials and supplies; and procurement of additional services. Capital costs associated with the proposed action would, therefore, have direct economic benefits to the local area and surrounding community. Revenue generated by income tax and sales tax from new workers would benefit the local economy. Additionally, some beneficial secondary impacts to the economy are also expected in conjunction with the multiplier effects of construction activities. For example, capital expenditures associated with the project are expected to have secondary beneficial effects on suppliers of goods and services associated with the project. Economic effects of changes in employment as described above would have both short-term and long-term positive secondary impacts on the economy. However, given the anticipated minor increase in employment, this impact would be negligible.

3.12.2.2.3 Community Facilities and Services

Construction and operation of the proposed dewatering facility would not result in direct or indirect impacts to community facilities.

3.12.2.2.4 Environmental Justice

A low-income population subject to environmental justice consideration was identified in a block group within the surrounding community. This block group is located within the City of Metropolis, roughly 3 mi east of the project site. Implementation of Alternative B would have minor to no impact on the region's economy, scenic values, and other resource areas. Therefore, no disproportionate impacts to disadvantaged populations are expected to occur.

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

Because the proposed construction and operation activities under Alternative C are essentially the same as Alternative B, impacts to demographic characteristics, the local economy, community services and environmental justice are the same as described for Alternative B. However, Alternative C would result in a slight increase in the beneficial secondary impacts to the economy associated with workforce employment and multiplier effects of construction activities associated with Phase 2.

3.13 Natural Areas, Parks and Recreation

3.13.1 Affected Environment

Natural areas include managed areas, ecologically significant sites, and Nationwide Rivers Inventory streams. This section addresses natural areas that are on, immediately adjacent to (within 0.5 mi), or within the region of the project area (5 mi radius).

A review of the TVA Regional Natural Heritage database in February 2016 indicated that Bayou Creek Ridge TVA Habitat Protection Area is located approximately 2.0 mi west and the Metropolis Lake TVA Habitat Protection Area is located approximately 0.6 mi east of the Project Site. Additionally, the portion of the Ohio River adjacent to the project area has been designated by the USFWS as critical habitat for the rabbitsfoot mussel (see Figure 3-4). Further information regarding this species and the critical habitat can be found in Section 3.9 (Threatened and Endangered Species).

As illustrated on Figure 3-4, eight public recreation areas are located within 5 mi of the project site. None of these sites are located within 0.5 mi of the proposed dewatering facility boundary. The WKWMA and the Metropolis Lake State Nature Preserve are located 0.6 mi west and 0.7 mi east of the site, respectively. The WKWMA consists of lands leased to the Kentucky Department of Fish and Wildlife Resources. Public activities in this area include hunting, horseback riding, hiking and biking. (Kentucky Department of Fish and Wildlife Resources 2016). The Metropolis Lake State Nature Preserve is owned and managed by the Kentucky State Nature Preserve Commission. This site provides important habitat for rare species and recreational opportunities including hiking and fishing (KSNPC2016). Fort Massac State Park is located across the Ohio River in Metropolis, Illinois (approximately 4 mi from the proposed dewatering site). This park has been maintained since 1908 and includes an interpretive visitor center and a replica of the original fort. The park also has developed picnic areas, trails, boating access to the Ohio River, and camping and hunting facilities (IDNR 2016). In addition, there are several municipal parks within the city of Metropolis, Illinois. All of these parks are located greater than 2 mi northeast of the project site.

3.13.2 Environmental Consequences

3.13.2.1 Alternative A – No Action Alternative

Under this alternative, the project would not be undertaken and the natural areas, parks recreation facilities, and public use patterns in this area would not be affected.

3.13.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or “Once Through” System

Under Alternative B, TVA would construct the dewatering facility on lands currently used for industrial purposes. Additionally, the parks and natural areas identified in Figure 3-4 are located greater than 0.5 mi from the proposed project site. Due to the distance between the identified recreation areas and the proposed project site, and taking into account the existing industrial nature of the project location, no direct impacts to natural areas or parklands would occur with this alternative.

As noted in Section 3.14 (Transportation) construction traffic will use Steam Plant Road and Metropolis Lake Road north of Ogden Landing Road to reach the Project Site. Metropolis Lake TVA Habitat Protection Area and the Metropolis Lake State Nature Preserve would potentially be indirectly impacted by increased traffic, fugitive dust and noise generated during the initial construction period. However, given the relatively minor increase in traffic and temporary and intermittent nature of construction, this impact would not impair use or enjoyment of these resources. No impacts to parks or recreational areas would occur during operations.

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

Indirect impacts to Metropolis Lake TVA Habitat Protection Area and the Metropolis Lake State Nature Preserve would be slightly greater under this alternative as construction would occur in two phases. However, as with Alternative B, given the relatively minor increase in traffic and temporary and intermittent nature of construction this impact would be minor and would not impair use or enjoyment of these resources. No impacts to parks or recreational areas would occur during operations.

3.14 Transportation Analysis

3.14.1 Affected Environment

SHF is served by road, rail and barge modes of transportation. SHF is accessible via Steam Plant Road, a rural two-lane roadway with narrow 2-ft grass shoulders (see Figure 2-1). Steam Plant Road changes to SH 996 (Metropolis Lake Road) 0.83 mi east of SHF where it then continues as a rural two-lane roadway with narrow grass shoulders to SH358 (Ogden Landing Road). From there the road network branches out extensively to other major roads such as SH 725 (1.5 mi south), US Hwy 60 (3 mi south) and I-24 (5.5 mi east). Population in the immediate area is sparse, with a scattering of dwellings along Steam Plant Road and Metropolis Lake Road. Population density increases to the east nearer to I-24 and Paducah.

Table 3-12 summarizes the existing average annual daily traffic average annual daily traffic (AADT) on roads in the vicinity of SHF. It also identifies the AADT capacity that corresponds to the type of facility for each road listed. A traffic count for Steam Plant Road was not available from records searches. The traffic volume on Steam Plant Road was therefore estimated based on a recent estimate of the total workforce employed at SHF (Paducah 2016). The traffic volume generated by this workforce (270 workers) is assumed to represent the traffic volume for Steam Plant Road and would represent a traffic count of 540 vehicles per day (vpd). An estimated 30 delivery trucks per day (an additional traffic count of 60 vpd) has been added to the workforce traffic volume to derive the total estimated traffic volume on Steam Plant Road shown on Table 3-12.

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

Table 3-12. Average Annual Daily[1] Traffic on Roadways in Proximity to SHF

Roadway	Typical Section	AADT Capacity[2]	AADT (year)
Steam Plant Road	Rural, two-lane	9,000	600[3]
Metropolis Lake Road north of Ogden Landing Road	Rural, two-lane	9,000	1,085 (2013)[4]
Ogden Landing Road west of SH 996	Rural, two-lane	9,000	812 (2013)[4]
Ogden Landing Road east of SH 996	Rural, two-lane	9,000	1,880 (2012)[4]
Metropolis Lake Road south of Ogden Lake Road	Rural, two-lane	9,000	2,095 (2014)[4]

[1] Measured as vehicles per day (vpd)
[2] Source: AHTD 2006
[3] Estimated based on employment levels at SHF
[4] Source: KYTC 2016

3.14.2 Environmental Consequences

3.14.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct the dewatering facility. There would be no change to the existing CCR disposal operations; therefore, no transportation-related impacts are anticipated

3.14.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or “Once Through” System

Under Alternative B, TVA would construct a dewatering facility utilizing a continuous, or “once through” system. For Alternative B, the daily workforce during construction of the dewatering facility is expected to range from 100 to 125 workers. Traffic is expected to predominantly consist of a mix of passenger cars and light duty trucks (such as delivery trucks). The added daily workforce to support the operation of the dewatering facility is expected to be two to four workers. For the purpose of this analysis, the bounding value of the construction workforce (125 workers) is used to assess potential effects on traffic operations.

Construction workforce traffic is assumed to be distributed during a peak morning period (to the site) and during a peak evening period (away from the site). Therefore, a daily workforce traffic volume of 250 vpd is assumed to be generated by Alternatives B or C, which assumes one person per vehicle. An additional 15 delivery trucks per day is also estimated, which would result in an additional truck volume 30 vpd. Therefore, the total construction traffic volume resulting from Alternative B is estimated to be 280 vpd.

Traffic generated by the construction of the dewatering facility is projected to be 280 vpd. It is estimated that most of this volume will consist of an inbound volume in the morning and an outbound volume in the late afternoon. It is estimated that all of this construction traffic volume will use Steam Plant Road and Metropolis Lake Road north of Ogden Landing Road. At Ogden Landing Road, traffic would likely distribute more widely into the local road network. This additional traffic would be intermittent and occur for a period of 12 to 14 months.

Steam Plant Road is currently at 6.7 percent of capacity (600 vpd). The additional daily construction traffic volume of 280 vpd would raise that level to 9.8 percent of capacity. This slight rise in traffic volume would have a minor effect on the existing traffic operations on Steam Plant Road. Metropolis Lake Road is currently at 12.1 percent of capacity (1,085 vpd). The additional daily construction traffic volume of 280 vpd would raise that level to 15.2 percent of capacity. Again, this rise in traffic volume would have a minor effect on the traffic operations on Metropolis Lake Road. As traffic becomes more widely distributed on the local road network, the effects of construction traffic are expected to be even less significant on other roadways.

Therefore, the predicted temporary traffic volume increases resulting from the development of a dewatering system under Alternative B are expected to be minor and not significant.

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

Under Alternative C, TVA would construct the same dewatering facility as described under Alternative B in the first phase (Phase 1), but would add a recirculation system in a subsequent phase (Phase 2).

Because the analysis for the construction of the dewatering facility (Phase 1) is the same for Alternative C as it is for Alternative B, the predicted temporary traffic volume increases resulting from the development of a dewatering system under Alternative C are expected to be minor and not significant.

Under Alternative C, TVA would construct a recirculation system in a subsequent phase (Phase 2). The daily workforce during construction of the recirculation system is expected to be 75 workers and total construction traffic volume is estimated to be 180 vpd.

Because the construction workforce traffic resulting from the construction of the recirculation system (Phase 2) is much less than that resulting from the construction of the dewatering facility (Phase 1), the temporary transportation impacts associated with Phase 1 (Alternative B) bounds the potential impacts of this alternative.

Therefore, the predicted temporary traffic volume increases resulting from the development of a dewatering system under both phases of Alternative C are expected to be minor and not significant.

3.15 Visual Resources

3.15.1 Affected Environment

This assessment provides a review of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. Visual resources are evaluated based on a number of factors including existing landscape character and scenic integrity. Landscape character is an overall visual and cultural impression of landscape attributes and scenic integrity is based on the degree of visual unity and wholeness of the natural landscape character. The varied combinations of natural features and human alterations both shape landscape character and help define their scenic importance. The subjective perceptions of a landscape's aesthetic quality (scenic attractiveness) and sense of place is dependent on where and how it is viewed.

For this analysis, the affected environment is considered to include the proposed 17-ac project area, which encompasses both permanent and temporary impact areas, as well as the physical and natural features of the landscape. The project area is located entirely within the existing SHF facility in western Kentucky. The surrounding topography is predominately flat as the area is the historic floodplain area for the Ohio River. Mostly forested, undeveloped lands around SHF are visible from the project area. Low-density residential areas with similar topographical relief are located southeast of the project area.

The proposed dewatering facility would be constructed within the SHF site boundary. The proposed project would be located near the existing coal stockpile and special waste landfill and to the west of the powerhouse building. The facility would include a building for the SDCCs, clarifiers, process water tank, and utility lines. Maximum height of these structures would be 45 ft. Views from the south of the proposed dewatering facility would be blocked due to taller existing elements of the plant, including the special waste landfill and the 800 ft tall emissions stacks. 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.

Sensitive visual receptors, including parks, places of worship, cemeteries, schools, and medical centers were identified within the middleground viewing distance of the proposed dewatering facility. The closest sensitive visual receptor to SHF is Metropolis Lake State Nature Preserve, which is located approximately 0.7 mi east of the site. The only other sensitive resource within 2-mi of SHF is Hopper Cemetery, which is located approximately 1.3 mi to the south. The closest church, First Missionary Baptist Church, is located approximately 2.6 mi east in Metropolis.

3.15.2 Environmental Consequences

3.15.2.1 Alternative A – No Action Alternative

Under Alternative A, no new facility would be constructed by TVA, resulting in no changes to the viewshed. Therefore, Alternative A would pose no impacts to existing visual resources.

3.15.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

Under Alternative B, during the construction phase of the proposed dewatering facility there would be slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. Impacts from additional vehicular traffic are expected to be insignificant as the roads are already predominately used for industrial activity. This small increase in visual discord would be temporary and only last until all activities have been completed by TVA. Additionally, since the scenic attractiveness is already of minimal quality, any discord resulting from the construction activity is not anticipated to result in a change in the scenic quality.

The new facility would primarily be seen by employees and visitors to SHF. The tallest feature of the dewatering facility would be approximately 45 ft, which would be notably shorter than the existing stacks at SHF (800 ft). The proposed facility components would be visually similar to other industrial elements present in the current landscape. Therefore, the facility would generally be absorbed by existing SHF components and would become visually subordinate to the overall landscape character associated with the plant site.

Views to and from sensitive visual receptors, including the Ohio River and Metropolis Lake State Nature Preserve would remain the same. Due to the forested land cover at the preserve and surrounding SHF, the site is not expected to be visible to recreational users from most areas in the preserve. Overall, the proposed facility is not expected to be discernible from the existing scenery nor would it contrast with the overall landscape due to the distance of the viewing receptors.

Permanent impacts would include minor discernible alterations that would be viewed in the foreground of plant operations. In more distant views, the new facility would likely merge with the taller existing vertical components. Overall, the construction, operation, and maintenance of the dewatering facility would have insignificant, negligible visual impacts for area residents, motorists, recreational users, and SHF employees and visitors.

The SHF site would continue to be classified as having common to minimal scenic attractiveness and low scenic integrity. The landscape character of this highly disturbed industrial site would be similar to the existing character. Therefore, visual impacts resulting from implementation of Alternative B would be negligible.

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

Alternative C would be similar to Alternative B with the addition of a recirculation system in a subsequent phase. The recirculation system would include additional recirculating pumps, sluice line, additional power from the electrical room and a water containment facility. These additional facilities would be less than 45 ft high, the tallest feature of the dewatering facility. During the construction of the recirculation system there would be some minor visual discord due to the increase in personnel and equipment. However, these minor visual intrusions would be temporary and only visible in the foreground to SHF employees and visitors. The additional elements installed for the recirculation system would be absorbed by the existing SHF components, including the previously installed dewatering facility. Therefore, visual impacts resulting from implementation of Alternative C would be negligible.

3.16 Cultural and Historic Resources

3.16.1 Affected Environment

3.16.1.1 Regulatory Framework for Cultural Resources

Cultural resources or historic properties include prehistoric and historic archaeological sites, districts, buildings, structures, and objects as well as locations of important historic events. Federal agencies, including TVA, are required by the NHPA (16 United States Code [USC] 470) and by NEPA to consider the possible effects of their undertakings on historic properties. ‘Undertaking’ means any project, activity, or program, and any of its elements, which has the potential to have an effect on a historic property and is under the direct or indirect jurisdiction of a federal agency or is licensed or assisted by a federal agency. An agency may fulfill its statutory obligations under NEPA by following the process outlined in the regulations implementing Section 106 of NHPA at 36 CFR Part 800. Additional cultural resource laws that protect historic resources include the Archaeological and Historic Preservation Act (16 USC 469-469c), Archaeological Resources Protection Act (16 USC

470aa-470mm), and the Native American Graves Protection and Repatriation Act (925 USC 3001-3013).

Section 106 of the NHPA requires that federal agencies consider the potential effects of their actions on historic properties and to allow the Advisory Council on Historic Preservation an opportunity to comment on the action. Section 106 involves four steps: (1) initiate the process, (2) identify historic properties, (3) assess adverse effects, and (4) resolve adverse effects. This process is carried out in consultation with the State Historic Preservation Officer (SHPO) and other interested consulting parties, including federally recognized Indian tribes.

Cultural resources are considered historic properties if they are listed or eligible for listing in the National Register of Historic Places (NRHP). The NRHP eligibility of a resource is based on the Secretary of the Interior's criteria for evaluation (36 CFR 60.4), which state that significant cultural resources possess integrity of location, design, setting, materials, workmanship, feeling, association and

a. Are associated with events that have made a significant contribution to the broad patterns of our history; or

b. Are associated with the lives of persons significant in our past; or

c. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value; or

d. Have yielded, or may yield, information (data) important in prehistory or history.

A project may have effects on a historic property that are not adverse, if those effects do not diminish the qualities of the property that identify it as eligible for listing on the NRHP. However, if the agency determines (in consultation) that the undertaking's effect on a historic property within the area of potential effect (APE) would diminish any of the qualities that make the property eligible for the NRHP (based on the criteria for evaluation at 36 CFR Part 60.4 above), the effect is said to be adverse. Examples of adverse effects would be ground disturbing activity in an archaeological site or erecting structures within the viewshed of a historic building in such a way as to diminish the structure's integrity of feeling or setting.

Federal agencies must resolve the adverse effects of their undertakings on historic properties. Resolution may consist of avoidance (such as choosing a project alternative that does not result in adverse effects), minimization (such as redesign to lessen the effects), or mitigation. Adverse effects to archaeological sites are typically mitigated by means of excavation to recover the important scientific information contained within the site. Mitigation of adverse effects to historic structures sometimes involves thorough documentation of the structure by compiling historic records, studies, and photographs. Agencies are required to consult with SHPOs, tribes, and others throughout the Section 106 process and to document adverse effects to historic properties resulting from agency undertakings.

3.16.1.2 Area of Potential Effect

The 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.

Under Alternative A, TVA would continue to manage CCR in its existing bottom ash impoundment and special waste landfill. Therefore, the APE for Alternative A is the footprint of the existing impoundment and landfill. Therefore, the APE under Alternative A consists of previously developed and disturbed lands.

For Alternative B, TVA would develop a dewatering facility using a continuous or "once through" system south of the existing bottom ash impoundment and north of the coal storage area. The archaeological APE is defined as the project footprint and includes approximately 17 ac (6.1 ac for the permanent use area and 10.9 ac for the temporary use or laydown areas) as this is the area within which ground disturbance may occur during construction and operation of the dewatering facility (see Figure 2-1). The APE for architectural resources consists of the half-mile area surrounding the proposed dewatering facility as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

For Alternative C – TVA would construct the same dewatering facility as described under Alternative B, but would add a recirculation system in a subsequent phase. The archaeological and historic architectural APE for Alternative C would be the same as for Alternative B.

3.16.1.3 Previous Studies

TVA has conducted records searches at the Office of State Archaeology (OSA) in Lexington, Kentucky as well as the Kentucky Heritage Council, which is the SHPO, to identify previously recorded archaeological and architectural properties listed on, or eligible for inclusion in the NRHP within the APE. SHF has been determined eligible for listing on the NRHP and has been nominated for listing on the NRHP. The plant was nominated for significance under Criterion A due to its association with the TVA Steam Plant program and as TVA's first coal-fired steam plant in Kentucky.

TVA previously conducted a historic architectural survey of the plant and a half-mile radius APE around the plant as part of the project to install and operate selective catalytic reduction and flue gas desulfurization systems on SHF Units 1 and 4 (TVA 2014). This survey identified one historic resource, the plant itself, as eligible for listing on the NRHP. The SHPO agreed with this determination by letter dated December 4, 2014. Additionally, the Final Environmental Assessment for this project determined that the proposed removal of the 250-foot tall chimneys associated with Units 1 and 4 would result in a significant physical effect to original structures and that this effect would be adverse. The SHPO agreed with this finding and entering into a Memorandum of Agreement (MOA) with TVA for the mitigation of the adverse effect. The mitigation required Historic American Building Survey (HABS) documentation of the plant. A historic architectural survey was conducted in March 2016 to assess potential visual impacts from the proposed process dewatering system construction on the NRHP-eligible SHF. As discussed in more detail below, the survey determined that the proposed dewatering facility would not have an adverse effect on the significance of SHF under Criterion A.

For archaeological resources, the OSA site file and database research identified 13 archaeological surveys conducted and 20 previously recorded sites as located within the 1.6 mi buffer surrounding the archaeological APE. No previously recorded archaeological sites are located within the APE. A Phase I archaeological survey including a pedestrian survey and shovel test probes determined that much of the APE had been previously disturbed as the area had been used for waste management areas and coal storage. The survey did not discover any archaeological sites. Based on these results, TVA recommended that no additional archaeological work be conducted within the APE.

3.16.2 Environmental Consequences

3.16.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct a dewatering facility. TVA would continue to manage CCR in its existing impoundment and special waste landfill. Implementing Alternative A would require no new ground disturbance activities or changes to current operations. Therefore, no direct or indirect impacts to cultural resources would occur under Alternative A.

3.16.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

The Phase I archaeological survey did not identify any archaeological sites within the APE and therefore, the construction of the dewatering facility will not disrupt any archaeological resources. However, if an unidentified archaeological site is discovered during construction, TVA will cease all construction activities in the immediate area where archaeological material is discovered. TVA sought concurrence from the SHPO with its determination that no effect on cultural resources would occur within the APE (Appendix A). The SHPO did not respond to TVA's July 2016 letter within 30 days; therefore, in accordance with applicable regulations, TVA's responsibilities under the Act are fulfilled and no future coordination is required.

Based on the field reconnaissance for the architectural resources assessment, TVA determined that the majority of the views from the proposed dewatering facility to the powerhouse would be largely unobstructed. Some views from the powerhouse to the proposed process dewatering facility would be partially obscured by the coal storage area. Since the dewatering facility would be a partially visible structure, TVA determined that there will be an Adverse Visual Impact to SHF due to the potential change that the new construction would have to the historic setting of the NRHP-eligible plant. Typically Adverse Visual Impacts would require consultation with the SHPO to determine the appropriate form of mitigation. However, since HABS mitigation documentation has already been conducted for the plant, no further mitigation is recommended beyond concurrence with the SHPO. TVA sent a letter to the SHPO dated July 6, 2016 seeking concurrence (Appendix A). The SHPO did not respond within thirty days; therefore, in accordance with applicable regulations, TVA's responsibilities under the Act are fulfilled and no future coordination is required.

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

Alternative C adds as part of a second phase, a recirculation system to the dewatering facility. The recirculation system would include additional recirculating pumps, sluice line, additional power from the electrical room and a water containment facility. Similar to

Alternative B, TVA determined that there would be an Adverse Visual Impact to SHF due to the potential change that the new construction would have to the historic setting of the NRHP-eligible plant. TVA sent a letter to the SHPO dated July 6, 2016 seeking concurrence (Appendix A). The SHPO did not respond within thirty days; therefore, in accordance with applicable regulations, TVA's responsibilities under the Act are fulfilled and no future coordination is required.

3.17 Noise

3.17.1 Affected Environment

The area surrounding SHF consists of semi-rural, sparsely populated areas west of Paducah, Kentucky. The closest homes to the Units 1-9 and to the proposed permanent use area are located approximately 2,900 to 3,300 ft southeast of SHF. Population density within 1 mi of SHF is low.

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities and diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses, and the time of day the noise occurs (i.e., higher sensitivities would be expected during the quieter overnight periods).

Sound is measured in units of decibels (dB) on a logarithmic scale. Therefore, increasing the noise level by 5 dB results in a noise level perceived by the human ear to be twice as loud as the original source. The “pitch” (high or low) of the sound is a description of frequency, which is measured in Hertz (Hz). Most common environmental sounds are a composite of sound energy at various frequencies. A normal human ear can usually detect sounds that fall within the frequencies from 20 Hz to 20,000 Hz. However, humans are most sensitive to frequencies between 500 Hz to 4,000 Hz.

Given that the human ear cannot perceive all pitches or frequencies in the sound range, sound level measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel (dBA). A noise change of 3 dBA or less are not normally detectable by the average human ear. An increase of 5 dBA is generally not readily noticeable by anyone, and a 10 dBA increase is usually felt to be "twice as loud" as before.

To account for sound fluctuations, environmental noise is commonly described in terms of the equivalent sound level, or Leq. The Leq value, expressed in dBA, is the energy-averaged, A-weighted sound level for the time period of interest. The day-night sound level (Ldn), is the 24-hr equivalent sound level, which incorporates a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m., to account for the increased sensitivity of people to sounds that occur at night.

Common indoor and outdoor sound levels are listed in Table 3-13.

3.17.1.1 Noise Regulations

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978, USC 42 4901–4918), delegates authority to the states to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations. Although there are no federal, state, or local regulations for community noise in McCracken County, EPA (1974) guidelines recommend that Ldn not exceed 55 dBA for outdoor residential areas. The EPA noise guideline recommends an Ldn of 55 dBA, which is sufficient to protect the public from the effect of broadband environmental noise in typical outdoor and residential areas. These levels are not regulatory goals but are “intentionally conservative to protect the most sensitive portion of the American population” with “an additional margin of safety” (EPA 1974). The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985).

Table 3-13. Common Indoor and Outdoor Noise Levels

Common Outdoor Noises	Sound Pressure Levels (dB)	Common Indoor Noises
	110	Rock Band (15 ft)
Jet Fly-over (1,000 ft)		
	100	
Gas Lawn Mower (3 ft)		
	90	Food Blender (3 ft)
Diesel Truck (50 ft)		
	80	Garbage Disposal (3 ft)
Gas Lawn Mower (100 ft)	70	
		Vacuum Cleaner (10 ft)
		Normal Speech (3 ft)
Heavy Traffic (300 ft)	60	
	50	Dishwasher Next Room
Typical Urban Daytime		
	40	
Urban Nighttime		Library
	30	Bedroom at Night
Rural Nighttime		
	20	Whisper
	10	
	0	Threshold of Hearing

3.17.1.2 Background Noise Levels

Noise levels continuously vary with location and time. In general, noise levels are high around major transportation corridors along highways, railways, airports, industrial facilities, and construction activities. Sound from a source spreads out as it travels from the source, and the sound pressure level diminishes with distance. In addition to distance attenuation, the air absorbs sound energy; atmospheric effects (wind, temperature, precipitation) and terrain/vegetation effects also influence sound propagation and attenuation over distance from the source. An individual's sound exposure is determined by measurement of the noise that the individual experiences over a specified time interval.

Community noise refers to outdoor noise near a community. A continuous source of noise is rare for long periods and is typically not a characteristic of community noise. Typical background day/night noise levels for rural areas range between 35 and 50 dB whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (EPA 1974). Background noise levels greater than 65 dBA can interfere with normal conversation, watching television, using a telephone, listening to the radio, and sleeping.

3.17.1.3 Sources of Noise

There are numerous existing sources of noise at SHF. Operations at the existing coal plant generate varying amounts of environmental noise. Noise generating activities associated with the existing plant include coal unloading activities, periodic dozer operations associated with coal pile management and truck operations, and machine noises associated with power generation. Current ambient noise levels in the vicinity of SHF are not available; however, existing noise emission levels associated with these activities at other TVA coal plants, like. Bull Run typically range from 59 to 87 dBA (TVA 2014).

Vehicular traffic is another noise source at SHF. Transportation noise related to activities evaluated in this EA primarily includes noise from highway traffic; however, there would also be some noise related to rail and barge traffic at SHF. Three primary factors influence highway noise generation; traffic volume, traffic speed, and vehicle type. Generally, heavier traffic volumes, higher speeds, and greater numbers of trucks increase the loudness of highway traffic noise. Other factors that affect the loudness of traffic noise include a change in engine speed and power, such as at traffic lights, hills, and intersecting roads and pavement type. Highway traffic noise is not usually a serious problem for people who live more than 500 ft from heavily traveled freeways or more than 100 to 200 ft from lightly traveled roads. (Federal Highway Administration 2011). Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic will result in a 3 dBA increase in noise levels, which in and of itself would not normally be a perceivable noise increase.

The level of construction noise is dependent upon the nature and duration of the project. Construction activities for most large-scale projects would be expected to result in increased noise levels as a result of the operation of construction equipment onsite and the movement of construction-related vehicles (i.e., worker trips, and material and equipment trips) on the surrounding roadways. Noise levels associated with construction activities will increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles. Construction noise is generally temporary and intermittent in nature as it generally only occurs on weekdays during daylight hours, which minimizes the impact to sensitive receptors (residences or other developed sites where frequent human use occurs such as churches and schools).

3.17.2 Environmental Consequences

3.17.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct the dewatering facility. No changes or impacts to existing noise levels associated with SHF are anticipated under this alternative.

3.17.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

The proposed permanent use area for the construction and operation of the dewatering facility (for both Alternative B and C) lies on 6.1 ac of land west of the SHF Units 1-9 and north of the coal stockpile area. This land is already disturbed and lies within the boundary of SHF.

3.17.2.2.1 Construction Noise

Most construction activities would occur during the day on weekdays; however, construction activities could occur at night or on weekends, if necessary. Construction-related noise would result from the construction of the dewatering facility. Construction-related traffic would use Steam Plant Road and Metropolis Lake Road to access SHF. This would result in some temporary construction traffic noise on these roadways.

Construction of the dewatering facility would generate noise from front loaders, backhoes, graders, trucks and compactors. As illustrated in Table 3-14, typical noise levels from construction equipment are expected to be 85 dBA or less at a distance of 50 ft from the construction site. These types of noise levels would diminish with distance from the project site at a rate of approximately 6 dBA per each doubling of distance. Therefore, noise would be expected to attenuate to the recommended HUD noise guideline of 65 dBA at approximately 500 ft, and to the recommended EPA noise guideline of 55 dBA at approximately 1,600 ft. However, this distance would be shorter in the field as objects and topography would cause further noise attenuation. The nearest noise sensitive receptors (single family residences) are between 2,900 and 3,300 ft from the source of noise at SHF. Therefore, noise generated by construction activities will attenuate to levels set by HUD and EPA at nearby receptor sites; accordingly, there would be no impact to sensitive receptors resulting from construction noise.

Table 3-14. Typical Construction Equipment Noise Levels

Equipment	Noise Level (dBA) at 50 ft	Equipment	Noise Level (dBA) at 50 ft
Dump Truck	84	Backhoe (trench)	80
Bulldozer	85	Flatbed Truck	84
Scraper	85	Crane (mobile)	85
Grader	85	Generator	82
Excavator	85	Air Compressor	80
Compactor	80	Pneumatic Tools	85
Concrete Truck	85	Welder/Torch	73
Boring-Jack Power Unit	80		

There are three residences along Steam Plant Road that may experience slight increases in noise levels during construction from the increase in construction-related vehicles; however, these increases will be temporary and will occur primarily during the day during the morning and evening commute hours. These residences range from 185 ft to 400 ft from the edge of the pavement. The marginal increases in construction-related traffic along Steam Plant Road (from 600 vpd to 880 vpd) pose only a minor and temporary impact in noise levels. Therefore, the noise levels generated by construction-related traffic will be minor and temporary.

3.17.2.2.2 Operation Noise

Noise produced by the dewatering equipment will be below 85 dBA. As discussed previously, the nearest noise sensitive receptors (single family residences) are between 2,900 and 3,300 ft from the source of noise at SHF. The noise generated by the dewatering equipment will attenuate to levels set by HUD and EPA at the nearby sensitive receptor sites. The operation of the mechanical dewatering facility would not introduce any new sources of noise that would have a noticeable effect on current noise levels from plant operations and would have no effect on offsite noise levels.

After construction, the projected additional workforce to operate the dewatering facility is up to four workers. The noise levels resulting from this very minor increase in workforce would be negligible.

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

Under Alternative C, TVA would construct the same dewatering facility as described under Alternative B, but would add a recirculation system in a subsequent phase. TVA would implement Alternative C in two phases: Phase 1 would include construction of the dewatering facility as described in Alternative B and Phase 2 would implement construction of the recirculation system.

The noise impacts associated with the construction and operation of the dewatering equipment under Alternative C are essentially the same as the impacts with Alternative B. Therefore, there are no construction or operation noise impacts to sensitive receptors as a result of the development of a dewatering system under Alternative C.

The construction and operation of the recirculation system under Alternative C would not create noise levels above 85 dBA; therefore, for reasons stated previously relating to the dewatering equipment, there would be no noise impacts as a result of operation of the recirculation system.

3.18 Public Health and Safety

Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws may comprise both federal and state statutes. OSHA is the main statute protecting the health and safety of workers in the workplaces. OSHA regulations are presented in Title 29 *CFR* Part 1910 (29 *CFR* 1919), *Occupational Safety and Health Standards*. A related statute, 29 *CFR* 1926, contains health and safety regulations specific to the construction industry. The Kentucky Labor Cabinet has adopted federal OSHA standards (Kentucky Revised Statues Chapter 38).

TVA’s Safety Standard Programs and Processes would be strictly adhered to during the proposed actions. The safety programs and processes are designed to identify actions required for the control of hazards in all activities, operations and programs. It also establishes responsibilities for implementing OSHA and state requirements.

3.18.1 Affected Environment

SHF is generally accessible via Kentucky Highway 996 and Steam Plant Road. SHF is surrounded by a chain link security fence, with guarded entrance gates. Population in the immediate area (within approximately 0.5 mi to the south) is very sparse, with only a few dwellings in the vicinity. The WKWMA area is located to the south and west.

The routine operations and maintenance activities at SHF reflect a safety-conscious culture and are activities performed consistent with OSHA standards and requirements and specific TVA guidance. Personnel at SHF are conscientious about health and safety having addressed and managed operations to reduce or eliminate occupational hazards through implementation of safety practices, training, and control measures.

SHF has safety programs and BMPs in place to minimize the potential of safety incidents. These would include but are not limited to such programs as the following:

- Hazard Analysis
- Management of Change
- Spill and Emergency Response Plan (ERP)
- Standard Operating Procedures
- Safety Reviews
- Compliance Audits
- Training
- Incident Investigations

It is TVA policy that contractors have in place a site-specific health and safety plan prior to conducting construction activities at TVA properties. The contractor site-specific health and safety plans address the hazards and controls as well as contractor coordination for various construction tasks. A health and safety plan would also be required for workers responsible for operating the dewatering facility after construction is complete.

Health hazards may also be associated with emissions and discharges from industrial facilities. At SHF mitigative measures are used to ensure protection of human health which includes the workplace, public and the environment. Applicable regulations and attending administrative codes that prescribe monitoring requirements may include those associated with emergency management, environmental health, drinking water, water and sewage, pollution discharge, air pollution and remedial or corrective action.

Additionally, wastes generated by operations at SHF can pose a health hazard. Solid wastes, hazardous waste, liquid wastes, discharges and air emissions are managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. Furthermore, waste reduction practices are employed including recycling and waste minimization. TVA is committed to complying with all applicable regulations, permitting, and monitoring requirements.

3.18.2 Environmental Consequences

3.18.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct the dewatering facility. Activities at SHF are performed in accordance with applicable standards or specific TVA guidance. SHF will continue to address and manage reduction or elimination of occupational hazards through implementation of safety practices, training, and control measures. No changes to current public and health and safety associated with SHF are anticipated under this alternative. Therefore, Alternative A would not have an impact on public health and safety.

3.18.2.2 Alternative B – Construction/Operation of a Process Dewatering Facility Utilizing a Continuous or "Once Through" System

Under this Alternative, TVA would construct a new dewatering facility on SHF. Activities occurring offsite include construction traffic and delivery of materials and supplies using local and regional roadways. Construction activities in support of the proposed dewatering facility would be performed consistent with standards established by OSHA. Construction of the new watering facility would require the use of earthmoving, compacting, and paving equipment as well as personal vehicles for workers and trucks for hauling materials. Approximately 125 workers would be involved in construction activities with an additional 30 trucks delivering supplies on a daily basis during the construction period.

During construction, customary industrial safety standards as well as the establishment of appropriate BMPs and job site safety plans would describe how job safety will be maintained. These BMPs and site safety plans address the implementation of procedures to ensure that equipment guards, housekeeping, and personal protective equipment are in place; the establishment of programs and procedures for lockout, right-to-know, hearing conservation, equipment operations, excavations, grading, and other activities; the performance of employee safety orientations and regular safety inspections; and the development of a plan of action for the correction of any identified hazardous. Construction debris and wastes would be managed in accordance with federal, state, and local requirements.

Operation of the dewatering facility would adhere to TVA guidance and be consistent with standards established by OSHA. All facility wastes would be managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. No hazardous materials that might affect human safety are expected to be utilized under this alternative.

Therefore, worker and public health and safety during construction and operation would be maintained and there would be no impact to public health and safety.

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

Under Alternative C, the proposed dewatering facility would be the same as in Alternative B, but Alternative C adds a recirculation system as a second phase. The recirculation system would include additional recirculating pumps, sluice line, additional power from the electrical room and a water containment facility.

As discussed above with Alternative B, OSHA standards, TVA guidance, customary industrial safety standards as well as the establishment of appropriate BMPs and site safety plans would maintain safety during construction activities. The second construction phase for the addition of the recirculation system is anticipated to require less workers and equipment as well as taking less time than the initial dewatering facility construction. Approximately 75 workers would be working 8 to 10 months to add the recirculation system. Approximately eight trucks would deliver supplies on a daily basis.

The construction and operation of the dewatering facility and recirculation system would adhere to TVA safety guidance and be consistent with public health and safety standards established by OSHA as discussed in Alternative B. Therefore, under Alternative C, worker and public health and safety during construction and operation would be maintained and there would be no impact to public health and safety.

3.19 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Mitigation measures and BMPs are typically implemented to reduce a potential impact to a level that would be below the threshold of significance as defined by the CEQ and the courts. Impacts associated with construction of the dewatering and recirculation system have the potential to cause unavoidable adverse effects to several environmental resources.

Under Alternative B and C, unavoidable localized increases in air and noise emissions would occur during construction. Activities associated with the use of construction equipment may result in varying amounts of dust, air emission and noise that may potentially impact on-site workers. Potential noise impacts also include traffic noise associated with the construction workforce traveling to and from the project site. Emissions from construction activities, and equipment are minimized through implementation of mitigation measures, including proper maintenance of construction equipment and vehicles and dust suppression. During operation, on-site handling and transportation of CCRs to the special waste landfill may generate minor amounts of fugitive dust.

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

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This EA focuses on the analyses of environmental impacts associated with the construction of the dewatering and recirculation system. These activities are considered short-term uses for purposes of this section. The long-term use is considered to be initiated with the cessation of operations at SHF. This section includes an evaluation of the extent that the short-term uses preclude any options for future long-term use of the proposed project site.

The proposed dewatering and recirculation facility would be constructed in an area that has been previously disturbed and supports industrial uses. Because the site is dedicated to power production, no loss of productivity of other natural resources is anticipated. In the long term, upon cessation of operations at SHF and after decommissioning, the land could be re-used and made available for other industrial as well as non-industrial uses.

3.21 Irreversible and Irretrievable Commitments of Resources

This section describes the expected irreversible and irretrievable environmental resource commitments used in the construction and operation of the dewatering and recirculation facility. The term irreversible commitments of resources describes environmental resources that are potentially changed by the new facility construction or operation and that could not be restored at some later time to the resource's state prior to construction or operation. Irretrievable commitments involve the use or commitment of resources for a period of time, even a long period. For example, the construction of a road through a forest would be an irretrievable commitment of the productivity of timber within the road right of way as long as the road remains.

The land used for the proposed dewatering and recirculation facility is not irreversibly committed because once operations at SHF cease the land supporting the facilities could be returned to other industrial or nonindustrial uses.

Nonrenewable fossil fuels and some process materials, such as thickening agents, would be irreversibly lost through the construction and operation of the dewatering facility. In addition, the materials used for the construction of the facility would be committed for the life of the facility. Some building materials may be irrevocably committed, however some metal components and structures could be recycled. The limited use of building materials for use in this project would not adversely affect the future availability of these resources.

3.22 Cumulative Effects

This section supplements analyses in preceding sections that either explicitly or implicitly considered cumulative impacts resulting from the construction and operation of the dewatering facility. These analyses are based on baseline conditions, which reflect the impacts of past and present actions and how they have shaped the existing environment. The CEQ regulations (40 CFR §§ 1500-1508) implementing the procedural provisions of the NEPA of 1969, as amended (42 USC § 4321 et seq.) define cumulative impact as:

> "…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" (40 CFR § 1508.7).

Therefore, this section will analyze the incremental impact of the proposed action and any cumulative effects when added to other identified past, present and reasonably foreseeable future actions.

3.22.1 Geographic Area of Analysis

The appropriate geographic area over which past, present, and future actions could reasonably contribute to cumulative effects is variable and dependent on the resource evaluated. Based upon the defined list of resources potentially affected by cumulative effects, the lands and water resources within a 5-mi radius of the proposed facility was considered appropriate for consideration in this analysis. This geographic area also encompasses lands on the proposed dewatering facility site and near off-site areas proposed for use as laydown during construction.

3.22.2 Identification of "Other Actions"

Past, present, and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-12. These actions were identified within the geographic areas of analysis as having the potential to, in aggregate, result in larger, and potentially significant adverse impacts to the resources of concern.

Actions that are listed as having a timing that is “past” or “present” inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter. However, these actions are included in this discussion to provide for a more complete description of their characteristics. Actions that are not reasonably foreseeable are those that are based on mere speculation or conjecture, or those that have only been discussed on a conceptual basis.

Table 3-15. Summary of Other Past, Present or Reasonably Foreseeable Future Actions in the Vicinity of the Proposed Project

Actions Description	Description	Timing and Reasonable Foreseeability
Installation of SCR and FGD systems at SHF	TVA will install scrubbers and SCR systems to reduce NOx and SO_2 emissions at SHF by December 31, 2017	Reasonably Foreseeable Future
Construction of new CCR disposal site	TVA will reach current on-site landfill capacity at 2022, at which time TVA will have developed an alternative disposal site	Reasonably Foreseeable Future
Closure of special waste landfill and bottom ash impoundment at SHF	TVA will close the special waste landfill and bottom ash impoundment at SHF	Reasonably Foreseeable Future
Ohio River Triple Rail Megasite	Paducah County’s development of nearby parcel for industrial and commercial uses	Reasonably Foreseeable Future
Closure and Property Transfer of PGDP	DOE is evaluating a combination of industrial and recreational use at the closed PGDP	Reasonably Foreseeable Future

3.22.2.1 Installation of SCR and FGD Systems at SHF

By December 31, 2017, TVA will have installed scrubbers and SCR systems at two of SHF’s units to control emissions. These systems would result in a beneficial impact by reducing emissions of NO_x and SO_2 by approximately 22 percent. Since these would be installed in areas already occupied by components of the generating plant or otherwise heavily disturbed, permanent impacts from this action are limited to small increases in water consumption for the plant. The installation of these systems would include typical temporary construction-related impacts including traffic, noise, and fugitive dust emissions.

3.22.2.2 New CCR Disposal Site for SHF

TVA estimates that the existing special waste landfill at SHF will reach capacity by 2022 and therefore TVA will have to identify an alternative site for disposal of CCRs generated at SHF. Based on waste generation assumptions, an approximately 300 ac site would be needed for landfill development. TVA will perform a thorough NEPA analysis of reasonable options including both on-site and off-site locations. The landfill would be constructed and operated in accordance to all state and federal permits and regulations.

3.22.2.3 Closure of Bottom Ash Impoundment and Special Waste Landfill at SHF

On April 17, 2015, the EPA established national criteria and schedules for the management and closure of CCR facilities (80 Federal Register 21302). SHF’s approximately 200 ac special waste landfill will be closed pursuant to these regulations. The environmental consequences of these ash impoundment closure alternatives were analyzed at the programmatic level for TVA's coal-fired power plants, including SHF, in the EIS published in June 2016. TVA's specific decision regarding the closure option for these facilities at SHF will consider factors such as environmental impacts, economic issues, availability of resources, and TVA's long-term goals.

3.22.2.4 Ohio River Triple Rail Megasite

The economic development agency for Paducah and McCracken County, Paducah Economic Development (PED), has identified a previously undeveloped 410-ac parcel of land approximately 3-mi southeast of SHF as a location for future development called the Ohio River Triple Rail Megasite (PED 2013). The site is in an area of residential housing and agricultural land along the Ohio River. The current landowners include residential homeowners, farmers, and the Paducah Riverport Authority, however the area has been zoned for industrial use. The proposed development would include industrial and commercial uses and the development of a rail spur, barge dock, and improvements to the local transportation network. As of yet, no development proposals have been submitted; thus, analysis of specific impacts of this future megasite would be speculative.

3.22.2.5 Closure and Property Transfer of Paducah Gaseous Diffusion Plant

The DOE and its predecessors has owned and operated all or parts of the PGDP south of SHF since 1950 until its closure in May 2013. DOE is interested in reducing the footprint of the site, which would reduce the cost to maintain the site. A portion of the community is interested in reuse of the site to help offset job losses by attracting businesses to the area and using the land and facilities for potential community reuse. The facility employed approximately 1,100 people to operate the plant, and currently maintains a staff of approximately 600 people to maintain the grounds and remediate on-site environmental contamination. DOE has evaluated the potential transfer of PGDP to one or more entities that could develop this site for a use that could be different from its current use. While no future use of the site has been selected yet, a combination of industrial and recreational use is considered as the most likely future scenario for the site.

3.22.3 Analysis of Cumulative Effects

To address cumulative impacts, past, present, and reasonably foreseeable future actions the affected environment surrounding the proposed dewatering facility was considered in conjunction with the environmental impacts presented in Chapter 3. These combined impacts are defined by the CEQ as "cumulative" in 40 CFR 1508.7 and may include individually minor but collectively significant actions taking place over a period of time.

The proposed project would be located on a previously disturbed industrial site and would not substantially impact natural communities or undeveloped land uses. The facility would result in some minor, temporary adverse impacts during construction of the dewatering facility and some minor permanent beneficial impacts during operation. Primary adverse effects of the proposed action as described in the preceding sections of Chapter 3 are related to temporary and localized effects associated with air and noise emissions from construction vehicles, minor generation of solid and hazardous wastes, and temporary use of a floodplain area during construction. Because many of these effects are minor, localized and temporary, they would not be expected to contribute to a more significant cumulative effect on any of the environmental resources within the region. Additionally, while a number of other reasonably foreseeable future actions were identified within the region, it is likely that the relatively short and temporary duration of effects associated with the proposed action would overlap with environmental impacts associated with other reasonably foreseeable actions. In consideration of both of these factors, potential cumulative effects of the proposed action are considered to be negligible.

CHAPTER 4 – LIST OF PREPARERS

4.1 NEPA Project Management

Name:	**Ashley Farless, PE, AICP (TVA)**
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4.2 Other Contributors

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Name:	**Irene Weber (Amec Foster Wheeler)**
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Name:	**Stephan Cole (TVA)**
Education:	MA, Anthropology, PhD, Anthropology (Archaeology specialization)
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Experience:	12 years in cultural resources, 4 years teaching at universities/colleges

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Project Role:	Surface Water/ Groundwater and Geology
Experience:	12 years of experience in water quality monitoring and compliance; 11 years in NEPA planning and environmental services.

CHAPTER 5 – ENVIRONMENTAL ASSESSMENT RECIPIENTS

Federal Agencies

U.S. Army Corps of Engineers

U.S. Fish and Wildlife Service

National Park Service

USDA Forest Service, Region 8

Federally Recognized Tribes

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

Eastern Band of Cherokee Indians
Cherokee Nation of Oklahoma
United Keetoowah Band of Cherokee Indians in Oklahoma
Eastern Shawnee Tribe of Oklahoma
Absentee Shawnee Tribe of Oklahoma
Shawnee Tribe
The Chickasaw Nation

State Agencies

Kentucky State Clearinghouse:

Purchase Area Development District

KY Department of Transportation

KY Heritage Council - SHPO

KY Fish & Wildlife Service

KY Department of Housing, Buildings and Construction

KY Energy and Environment Cabinet, Department for Natural Resources
Office of the Secretary
Dept for Energy Development & Independence
Dept for Environmental Protection
Dept for Natural Resources

- USDA Forest Service, Land Between the Lakes
- Natural Resources Conservation Service
- Mammoth Cave National Park

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Appendix A
Coordination

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

July 6, 2016

Mr. Craig Potts
State Historic Preservation Officer and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Potts:

TENNESSEE VALLEY AUTHORITY (TVA), SHAWNEE FOSSIL PLANT, DEWATERING FACILITY, MCCRACKEN COUNTY, KENTUCKY

TVA proposes to construct and operate a dewatering facility at its Shawnee Fossil Plant (SHF) in McCracken County, Kentucky. The dewatering facility would be used to convert from a wet, bottom ash storage system to dry ash storage system. SHF combusts approximately 9,600 tons of coal per day for power generation. The resulting coal combustion residuals (CCRs), primarily ash, are managed on-site with the use of "wet" impoundments and a "dry" landfill. The proposed new dewatering facility would eliminate the use of wet impoundments in the ash storage process. This project would also support TVA's compliance with the final Disposal of Coal Combustion Residuals from Electric Utilities rule (CCR rule), published by U.S. Environmental Protection Agency (EPA) in 2015. TVA has determined that the SHF Dewatering Facility Project constitutes an undertaking (as defined at 36 CFR § 800.16(y)) that has the potential to cause effects on historic properties. We are initiating consultation under Section 106 of the National Historic Preservation Act for this undertaking.

In 2014, our offices agreed that SHF is eligible for inclusion in the National Register of Historic Places (NRHP) under Criterion (a) of 36 CFR § 60.4 for its historical significance as TVA's first fossil plant in the Commonwealth of Kentucky. In 2015, our offices executed a Memorandum of Agreement (MOA) for resolution of the adverse effect from TVA's SHF Emissions Control project on SHF. In fulfillment of the MOA's stipulations, TVA has submitted a KHC Individual Buildings Survey Form for SHF; prepared a National Park Service NRHP Registration Form, which has been approved by the Kentucky National Register Review Board; and prepared Historic American Engineering Record (HAER)-equivalent documentation of SHF. TVA recently mailed the NRHP Registration Form to the National Park Service.

Last year, we consulted with your office concerning TVA's proposed SHF Waterfront Rehabilitation Project. The project involved TVA granting a license to Four Rivers Terminal, LLC to repair or replace some or all of the mooring dolphins on the SHF Waterfront, which is a contributing element to SHF. TVA found that the project would result in an adverse effect on SHF, but that by carrying out the mitigation measures stipulated in the recently executed SHF Emissions Control Project MOA, the adverse effect of the SHF Waterfront Rehabilitation Project

Mr. Craig Potts
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would be adequately mitigated. TVA did not receive a response from your office to our March 18, 2015 letter. TVA notified the Advisory Council on Historic Preservation (the Council) of the adverse effect, and provided the documentation specified by 36 CFR Part 800.11(e) by letter dated May 1, 2015.

The dewatering facility would be constructed on 6.1-acres of land ("permanent use area") within the SHF reservation, located adjacent to and north of the coal pile and circa 850 feet northwest of the powerhouse. A settling pond and the existing bottom ash sluice pipe are currently located in this area. The facility would be 45 feet in height. In addition, a 10.9-acre area ("temporary use area") surrounding the permanent use area would be used for equipment staging during construction.

TVA has determined that the area of potential effects (APE) for archaeological resources consists of the permanent use and temporary use areas, with a combined total of 17 acres. The APE for above-ground resources consists of areas within a one-half mile radius of the permanent use area, from which unobstructed lines of sight to the new facility would be possible.

TVA contracted with AMEC Foster Wheeler Environment and Infrastructure, Inc. (AMEC Foster Wheeler) to perform a Phase I archaeological survey of the archaeological APE and an architectural assessment of the proposed dewatering facility's possible visual effects on SHF. Enclosed are two copies of the draft archaeological survey report, titled *Phase I Archaeological Survey, TVA Shawnee Bottom Ash Dewatering Facility, McCracken County, Kentucky*, and two copies of the architectural assessment letter report, titled *RE: Historic Resources Assessment for the Shawnee Fossil Plant Project, Paducah, McCracken County, Kentucky*. For each report, we also enclose two CDs containing digital copies.

AMEC Foster Wheeler's background study, conducted prior to the field study, indicated that no previously recorded archaeological sites or properties listed in the NRHP are located within the survey area. The field study included pedestrian survey and systematic shovel testing. The study identified no artifacts or archaeological sites, and all areas within the APE showed clear signs of modern ground disturbance. AMEC Foster Wheeler recommends no additional archaeological investigations prior to initiation of the undertaking.

Based on TVA's 2014 architectural assessment for the SHF Emissions Control project, the only NRHP-eligible above ground resource within a one-half mile radius of the proposed Dewatering Facility is SHF itself. Based on the current architectural assessment, AMEC Foster Wheeler recommends that the undertaking would result in a visual effect on NRHP-eligible SHF, as views to the new facility from SHF would be largely unobstructed. Further, AMEC Foster Wheeler recommends that the effect would be adverse, due to the potential change that the new construction would have on the historic setting of SHF.

TVA has read both reports and agrees with the findings and recommendations of the authors. TVA finds that there are no archaeological sites in the archaeological APE. TVA finds that the undertaking would result in an adverse visual effect on NRHP-eligible SHF.

Mr. Craig Potts
Page Three
July 6, 2016

TVA finds that the mitigation measures stipulated by the MOA would adequately mitigate the adverse effect resulting from the SHF Dewatering Facility project. Those mitigation measures are comprehensive, in that they include full documentation of the history and engineering design of the entire SHF complex. The HAER-equivalent documentation, Kentucky Individual Buildings Survey Form, and NRHP Registration form that have been prepared pursuant to the MOA all include SHF and all contributing elements. Therefore, TVA finds that no additional measures are required to mitigate the adverse effect resulting from the current undertaking.

Pursuant to 36 CFR Part 800.5(d)(2), we are seeking your concurrence with our findings that the SHF Dewatering Facility project will result in an adverse effect to SHF, and that the mitigation measures specified by the MOA adequately mitigate this adverse effect.

In keeping with 36 CFR §800.11, and pending your concurrence with TVA's findings, TVA will provide documentation of the adverse effect to the Advisory Council on Historic Properties.

If you have any questions or comments, please contact Richard Yarnell by telephone at (865) 632-3463 or by email at wryarnell@tva.gov.

Sincerely,

Clinton E. Jones
Manager, Biological and Cultural Compliance
Safety, River Management and Environment
WT11C-K

SCC:CSD
Enclosure

PHASE I ARCHAEOLOGICAL SURVEY

TVA Shawnee Bottom Ash Dewatering Facility, McCracken County, Kentucky.

June 2016

June 13, 2016

Mr. Richard Yarnell
400 W. Summit Hill Drive
Knoxville, TN 37902
865-632-3463

RE: Determination of Effects Assessment of Historic Resources for the Shawnee Fossil Plant Dewatering Facility Project near Paducah, McCracken County, Kentucky.

Dear Mr. Yarnell:

On 3 March 2016, Amec Foster Wheeler Environment and Infrastructure, Inc. conducted a Historic Resources Assessment survey for the proposed Tennessee Valley Authority (TVA) Shawnee Fossil Plant (SHF) project located northwest of Paducah, McCracken County, Kentucky (Tennessee Valley Authority [TVA] 2016) (**Figure 1**). TVA has proposed to build a new dewatering facility on the 1,696 acre site near the Ohio River which would provide for the safe storage of Coal Combustion Residuals (CCRs), such as fly ash, bottom ash, and gypsum, through a dry ash storage system (TVA 2016). Currently, SHF uses a wet ash storage system, but it was the goal of the TVA Board of Directors in 2009 to consider converting wet ash storage to dry ash storage for the plant. Moreover, in 2015, the U.S. Environmental Protection Agency (EPA) established new criteria for the disposal of CCRs in landfills and set additional requirements for wastewater streams from fly ash and bottom ash operations which further increased the need for a dry storage system at SHF (TVA 2016).

As reported in the 2014 Final Environmental Assessment of Shawnee Fossil Plant Units 1 and 4, TVA completed a Phase I historic architectural survey which concluded that SHF is eligible for inclusion in the National Register of Historic Places (NRHP) (Tennessee Valley Authority [TVA] 2014). The Kentucky Historical Commission (KHC), the State Historic Preservation Office (SHPO) concurred with these recommendations by letter dated December 4, 2014 and designated SHF as site McN-372. The plant was nominated for significance under Criterion A due to its association with the TVA Steam Plant program and as the agency's first coal-powered steam plant in Kentucky (Weaver et al. 2015). A NRHP Nomination Form for SHF was submitted, although currently it has not been official listed. Additionally, the Final Environmental Assessment determined that the proposed removal of the 250-foot tall chimneys associated with Units 1 and 4 would result in a significant physical effect to original structures and that this effect would be adverse. KHC agreed with this finding in a letter dated January 21, 2015and entered into a Memorandum of Agreement (MOA) with TVA for the mitigation of the adverse effect. These mitigation efforts were conducted in the form of Historic American Building Survey (HABS) documentation, preparation of a Kentucky Individual Buildings Form, and preparation of an NRHP Registration Form.

The purpose of the Historic Resources Assessment was to assess the potential indirect (visual) impacts to the NRHP eligible SHF from the construction of the new dewatering facility in the Area of Potential Effect (APE). The proposed project would entail constructing an above ground structure that would take up an area of 6.1 acres for permanent use and an additional 10.9 acres for temporary use (TVA 2016). In all, the

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Appendix B
Response to Comments

Appendix B – Public and Agency Comments Received on the Draft EA and TVA's Response to Comments

A draft of the EA was released for public review and comment on June 15, 2016. The Draft EA was transmitted to state, federal, and local agencies and federally recognized tribes. It was also posted on TVA's website. A notice of availability including a request for comments on the Draft EA was published in the Paducah Sun, the newspaper that serves the McCracken County area. Comments were accepted through July 15, 2016, via TVA's website, mail, and e-mail. Responses to comments raised during the comment period are provided below.

TVA received one email comment from a member of the public. The remaining comments received on the draft EA were from the Kentucky Department of Environmental Protection / Solid Waste Branch (KYDEP) and from a document jointly submitted by the Sierra Club and Southern Alliance for Clean Energy. TVA carefully reviewed all of the comments and edited the text of the final EA as appropriate. To avoid repetition, TVA grouped similar comments and produced one synthesized comment for each comment grouping.

In addition, TVA received a letter from the Kentucky State e-Clearinghouse, the official designated Single Point of Contact for the Commonwealth. The letter identified statutory and regulatory requirements. Other than the comments provided by KYDEP, no response to these comments are necessary. The letter from the Kentucky State e-Clearinghouse is included in the end of this section.

Following is a listing of the comments ordered by commenters and TVA's responses to the comments. A copy of each of the comments is included at the end of this section.

Public Comment: We were following the development of the Shawnee power plant bottom ash dewatering facility and wanted to know how far out before an EPC contractor would be awarded and civil/site construction on this project begins? Our interest is civil/foundation or electrical subcontracting when available. (*Commenter*: Jack Garvin, Industrial Construction Services API Flow Control)

Response: Comment noted. This comment is out of the scope of the Environmental Assessment.

Comments from KYDEP

KYDEP Comment 1: The provided values for water use of various sorts vary at several places in the document. These should be consistent or where different uses have the same name, this should be clarified, preferably by a combined table showing all of the values of the various water streams.

Response: Table 2-1 has been edited for clarity.

KYDEP Comment 2: The recirculation mode, Alternative C, makes claims concerning water release and blowdown water that appear to be both wrong and inconsistent.

Response: TVA believes the analysis presented in the EA is correct. However, several of the comments are related to the total plant withdrawal of 543,019 million gallons per year (MGY) as stated in the Draft EA. The Final EA corrects this to note that SHF withdraws an average of 543,019 MGY for use as condenser cooling water and plant process water. This equates to approximately 1487.72 million gallons per day (MGD). Additional responses to this comment are integrated into the specific comments below.

KYDEP Comment 3: Claims of metals reduction in the ash impoundment and new treatment system need to be substantiated.

Response: Response to these comments are integrated into the specific comments below.

KYDEP Comment 4: Plant water withdrawal given as 543,019 MGD and process water 2% which would equate to 10,860 MGD.

Response: Text has been corrected as follows: average plant water withdrawal is 543,019 MGY which equates to approximately 1487.72 MGD of which 2 percent is process water (29.75 MGD).

KYDEP Comment 5: Verify the statement that under current operation, 19.44 MGD of sluice water is discharged to the ash impoundment only twice per day for 30 minutes to and hour.

Response: This statement is correct. Additional text has been added to clarify that sluice water is discharged intermittently (30 minutes to an hour twice per day per unit) at a rate of approximately 19.44 MGD (flow includes both times of sluice flow and raw water flow).

KYDEP Comment 6: KYDEP notes that the KIF dewatering EA mentions the use of flocculants. TVA should identify flocculants or other chemicals that would be used in the clarifier and the effects these chemicals would have on the water treated.

Response: TVA has revised text to indicate waste water treatment chemicals would be used to facilitate settling of the solids in the clarifiers. These chemicals have not been chosen, but would be evaluated to ensure they are safe for aquatic organisms and are not detrimental to water quality.

KYDEP Comment 7: Clarify the meaning of the sentence starting “Excess water from the process ….” As a once-through process, wouldn’t alternative B require disposal of all or nearly all of the 8.93 MGD used for coal ash transport. What else would be done with this in a once-through process?

Response: TVA concurs that under this alternative, all water from the process water tank would be discharged. Text in the EA was edited for clarity.

KYDEP Comment 8: What is the function of the chemical building shown on Figure 2-3?

Response: The chemical building would be where the waste water treatment chemicals which may include: flocculants, polymers and/or pH control chemicals would be housed for use in this dewatering and clarification process.

KYDEP Comment 9: Please clarify the statement regarding storage or throughput capacity is exceeded. Wouldn’t this happen all the time under Alternative B?

Response: Text in the EA states that sufficient capacity exists under a 25-year storm event conditions to manage normal runoff. However, if this capacity is exceeded process and contact water streams would be discharged to the impoundment system and ultimately could be discharged to a SHF KPDES permitted outfall.

KYDEP Comment 10: The EA states Alternative C would require a net increase in total plant-wide withdrawals of 0.864 MGD. This appears to ignore that the plant no longer need withdraw the water used in alternative B in a once-through process, which would appear to save 8.93 MGD less blowdown water. There should be a substantial reduction in water usage.

Response: TVA agrees that Alternative C would reduce overall plant withdrawals, like Alternative B (i.e. 19.44 MGD decreased to 8.93 MGD which equates to an overall reduction of 10.51 MGD). However this alternative would require additional make-up/recirculation water (estimated to be 300 to 600 gpm) which results in a decrease in overall withdrawals for the plant by approximately 9.65 MGD under this alternative. Additional text was added to the EA to clarify.

KYDEP Comment 11. The EA states that 0.864 MGD amount represent a .05% increase in total plant-wide withdrawals, this means the current total plant-wide withdrawal rate is 1,728 MGB. Since this differs from the 543,019 MGD provided on page 7, clarify the terminology and what is meant by the term "total plant-wide withdrawal".

Response: This comment is based on the incorrect assumption that overall plant wide withdrawals are 543,019 MGD. As identified in the response to KYDEP comment 2, the Final EA has been corrected to identify that SHF withdrawals approximately 1477.72 MGD. The reduction of bottom ash flow of 9.646 MGD under Alternative C would also reduce the total plant withdrawal rate (1477.72 MGD) by 0.653 percent.

KYDEP Comment 12: The EA states 15% blowdown is needed for alternative C, the recirculating water option. It then incorrectly calculates this as 2.92 MGD, which is 15% of 19.44 MGD. However, on page 8 this states the sluice water rate is 8.93 MGD for alternatives B and C. A 15% blowdown should be calculated as 1.34 MGD.

Response: The analysis for Alternative C is considered in comparison to the base condition (No Action) in which the base flow is 19.44 MGD. Under Alternative B, the reviewer is correct that the 8.93 MGD of sluice water flow would occur, which would not include blowdown during the operational period as recirculation is not a part of this alternative. For the ultimate condition, Alternative C would eliminate the bottom ash flow to the ash impoundment. Any blowdown flow that would be generated would be managed on site in accordance with ELG and CCR regulations. TVA has revised the discussion to identify that Alternative C would require a blowdown waste stream of approximately 2 to 3 MGD. This waste stream would be managed onsite in accordance with ELG and CCR regulation. Details regarding specific flow rate and management are still in the design phase and would be better defined later in the design process.

KYDEP Comment 13: The EA should clarify what is being done to and with this blowdown water.

Response: Additional narrative has been added to acknowledge that Alternative C would eliminate discharge to the ash impoundment, but would include a blowdown waste stream that would be managed on site in accordance with ELG regulations. This waste stream's flowrate and management are still in the design phase and would be better defined later in the design process.

KYDEP Comment 14: Figure 2-5 does not include the blowdown water or outage stream associated with this alternative.

Response: The EA states that the blowdown waste stream will be managed on site in accordance with ELG regulations. This text was added to the figure.

KYDEP Comment 15: Table 2-1 incorrectly states alternative C will produce a net increase in withdrawal of surface water. As noted above, this ignores the reduced need for water withdrawals for sluice water under a recirculation approach

Response: This row on the table identified the additional make up stream of 300 to 600 GPM. The table was edited to show the reduction of withdrawal for both alternatives as identified in the text of the Draft EA.

KYDEP Comment 16: The Process Water Discharge as shown on Table 2-1 would also not likely be zero because of disposal of blowdown water and outage stream water. If it is zero, the table should state what is being done to dispose of sluice transport blowdown water.

Response: Table 2-1 in the EA states that any discharge would be managed on site in accordance with ELG and CCR guidelines. Text was clarified to note the stream would be managed on site.

KYDEP Comment 17: The units in column 7 of Tables 3-3 and 3-4 should be lb/day rather than mg/l.

Response: Units in both tables were corrected.

KYDEP Comment 18: According to Tables 3-3 and 3-4, the values for iron, manganese, mercury, and nickel are lower for the ash pond concentration than for the Ohio River, which was the source of the sluice transport water. This would require the ash pond to actually act to reduce these metals below their starting concentrations. Justify or clarify this by stating the mechanisms that account for this if these numbers are correct. It is also noted that table 3-5 on page 36 provides different, higher numbers for these constituents in the sluice leading to the ash pond. Verify and explain if these ash pond numbers are correct.

Response: The numbers are correct. The bottom ash sluice waste stream is a mixture of the heavier particles that fall to the bottom of the boiler and are wet sluiced out to the pond. Because these solids are primarily made up of larger particles these particles settle out early in the impoundment and are dredged out of the pond. The impoundment and stilling impoundment have enough retention time to allow smaller particles and fines to settle out also. Metals and other parameters are adequately treated in these ponds and show reductions in most parameters. As stated in Section 3.4.2.2.3, the reduction of bottom ash sluice water, the treatment within the ash impoundment and the reduction of the exposure time to the solid waste stream has the potential to reduce the accumulation of metals in the effluent discharge.

Results of the reduction in loading ranges for Alternative C, displays loadings and concentrations for bottom ash sluice water going into the impoundment system, and does not account for the treatment in the pond. Table 3-5 is showing the change from Alternative A and therefore the numbers convey the range of reductions that would be expected in the impoundment system, without taking into account any treatment.

KYDEP Comment 19: Section 3.4.2.3 states the blowdown stream would help regulate the hydraulic flow levels of generation units and would reduce bottom ash discharge to 2.92 (1.34 correct number) MGD. Clarify what is meant by this statement and provide information concerning how this blowdown water is contained/reused

Response: The blowdown waste stream would be required in the recirculation system to ensure that the pH and other parameters are balanced in the system, which in turn ensures the integrity of the infrastructure. These types of systems at times concentrate certain parameters, such as pH, the introduction of makeup water and the release of a blowdown stream would be required to maintain a balance of usable sluice water. These streams also aid in making sure the necessary water for the system is readily available as the process requires. Any discharge from the system (estimated to be a maximum of 3 MGD), would be managed onsite in accordance with ELG and CCR regulations.

KYDEP Comment 20: Section 3.4.2.3 states the ash impoundment effective treats and decreases these concentrations, some up to 97 percent." Explain what processes are occurring in the impoundment that produces these reductions. I am assuming you are referring to filtered samples so that suspended solids are not present in the water samples tested.

Response: Additional text has been added to the Final EA to identify the mechanism by which this is achieved. Please see response to KYDEP Comment 18 for additional information on the treatment of the pond.

KYDEP Comment 21: In section 3.8.2.3, the first sentence states "… all existing flows associated with bottom ash sluicing operations would be eliminated." This sentence depends how blowdown water not being released. This is to be clarified relative to my previous comments and this statement adjusted if needed following that.

Response: Under Alternative C all blowdown will be managed on site in accordance with ELG and CCR rules. This statement has been added to this section of the final EA.

Comments from Laurie Williams, Sierra Club and Angela Garrone, Southern Alliance for Clean Energy)

Comment: [Although] TVA is correct to conclude that . . . Alternative C better meets the stated purpose and need of the proposed project . . . the Draft EA fails to consider a reasonable range of alternatives because it should have considered retirement of the Shawnee facility as a practicable alternative that would have far lesser environmental impact than TVA's preferred alternative, and would also avoid another costly expenditure on an old, marginal coal plant that is not needed to meet TVA's demand. Retrofitting the Shawnee plant is also unreasonable in light of its age.

Response: The purpose and need for this EA's proposed action is to help TVA convert CCR storage from wet to dry, complement compliance with the CCR rule, and enhance compliance with the ELG rule. TVA considered in depth three alternatives to fulfill this purpose and need: no action, a once-through process dewatering system, and a recirculating dewatering system. The EA also considered two other alternatives—separate processing of bottom ash and pyrite streams and dry boiler bottom conversion—but eliminated them from further consideration because they did not to meet the project's purpose and need.

Your comments address the EA's proposed action only briefly and instead focus on the issue of retiring the Shawnee plant. Retirement of Shawnee was not considered in this EA because it had been previously analyzed in TVA's 2014 EA for the installation of pollution controls on Shawnee Units 1 and 4 as well as in TVA's 2015 Integrated Resource Plan. Neither NEPA review recommended retirement of Shawnee.

In the 2014 EA, TVA concluded that continuing to operate Shawnee Units 1 and 4 was preferable to retiring them because doing so furthered TVA's mission to provide reliable and affordable power, advanced TVA's goal of maintaining a balanced portfolio of generation resources, and preserved two units on the TVA system that have unique value because of their load-following capabilities, their fuel diversity, and their low operating costs.

While the 2015 Integrated Resource Plan did recommend continuing with the announced unit retirements at Allen, Colbert, Johnsonville, Paradise and Widows Creek, it did not include Shawnee in this unit retirement group. Instead, the IRP recommended that retirement of Shawnee be evaluated in the mid-2020s if additional environmental controls were required.

Shawnee's age does not make continuing its operation unreasonable. The large number of coal-fired unit retirements contained in the U.S. Energy Information Administration (EIA) reports to which you refer are largely due to the emission limits imposed by EPA's Mercury and Air Toxic Standards (MATS). Shawnee is MATS-compliant. The EIA also notes "Retirement decisions are based on the relative economics and regulatory environment of the electricity markets. A plant may retire if higher coal prices, lower wholesale electricity prices (often tied to natural gas prices), or reduced utilization make investment in equipment like scrubbers uneconomical." (See *AEO2014 projects more coal-fired power plant retirements by 2016 than have been scheduled*, U.S. Energy Information Administration, at http://www.eia.gov/todayinenergy/archive.cfm?my=Jun2014.) Because Shawnee complies with MATS, has low operating costs, and remains economical to operate, retirement of Shawnee is neither required nor recommended as it may be for other units of similar vintage.