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DRAFT ENVIRONMENTAL ASSESSMENT

KINGSTON DRY FLY ASH CONVERSION

Roane County, Tennessee

PREPARED BY:
TENNESSEE VALLEY AUTHORITY

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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

<	Less Than
≤	Less Than or Equal To
µg/m ³	Micrograms per Cubic Meter
AADT	Average Annual Daily Traffic
APC	Air Pollution Control
APE	Area of Potential Effect
APHW	Air Preheater Washes
BACT	Best Available Control Technology
BMPs	Best Management Practices
CAA	<i>Clean Air Act</i>
CCP(s)	Coal Combustion Product(s)
CCW	Condenser Cooling Water
CO	Carbon Monoxide
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CRM	Clinch River Mile
CWA	<i>Clean Water Act</i>
DOE	United States Department of Energy
DSN	Discharge Serial Number
EA	Environmental Assessment
I-	Interstate Highway
KIF	Kingston Fossil Plant
lb/day	Pounds per Day
LOS	Level of Service
MGD	Millions of Gallons per Day
mg/L	Milligrams per Liter
NAAQS	National Ambient Air Quality Standards
NEPA	<i>National Environmental Policy Act</i>
NO₂	Nitrogen Dioxide
NOx	Nitrogen Oxide
NPDES	National Pollutant Discharge Elimination System
NNSR	Nonattainment New Source Review
O₃	Ozone
Pb	Lead
PCBs	Polychlorinated Biphenyls
PM	Particulate Matter
PM_{2.5}	Particulate Matter whose particles are less than or equal to 2.5 micrometers
PM₁₀	Particulate Matter whose particles are less than or equal to 10 micrometers
ppb	Parts per Billion
ppm	Parts per Million
PRB	Powder River Basin
PSD	Prevention of Significant Deterioration
RFPs	Request for Proposals
SCR	Selective Catalytic Reduction
SO₂	Sulfur Dioxide
SR	State Route
TDEC	Tennessee Department of Environment and Conservation
TRM	Tennessee River Mile
TSP	Total Suspended Particulates
TVA	Tennessee Valley Authority
US	United States Highway
USEPA	United States Environmental Protection Agency

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CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1. The Decision

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

KIF is an important source of base load power to TVA in providing and maintaining safe, reliable, and cost-effective electricity for the people of the TVA Power Service Area. The proposed changes to dry storage at KIF would provide TVA with a state-of-the-art, secure storage system that leads the industry in the management of CCPs, as well as allows for future marketing of ash products that is not currently feasible under the wet ash storage system. TVA will decide whether to convert the wet fly ash handling system at the KIF to a dry fly ash handling system with the capacity to handle approximately 1,000 tons of fly ash per day. The anticipated construction schedule is 14 months. The anticipated construction completion is July 2011.

Fly ash production and disposal is an ongoing activity at KIF. TVA has not determined the final destination for the fly ash from the operation of the KIF beyond 2011. TVA currently has contracted to ship up to three million cubic yards of ash for final disposal in the Perry County, Alabama, landfill. The ash going to the Alabama landfill consists of both recovered ash from the 2008 KIF ash spill and continually generated production ash. TVA is investigating regionally for sites and construction of new landfills for disposal of CCPs. However, at this time, results of that study have not progressed to the point of maturity to be available for current decisions. This EA presents a reasonable set of representative and bounding disposal options and analyzes the bounding impacts of the transportation of ash under these disposal options. Each of the identified representative sites is a state-approved site, appropriately permitted to receive CCPs and with adequate capacity to do so. At this time, TVA is not proposing to select among those disposal options. The proposed action of this EA to implement a dry fly ash handling system would not preclude consideration of any of these representative-bounding options, nor those of either current or other long-term ash disposal options for KIF. Disposal options that would be considered as an outcome of completing that study would undergo appropriate environmental review at that time.

1.2. Site Description and Location

KIF is located in Harriman, Tennessee (Roane County), at the base of a peninsula formed by the Clinch and Emory Rivers embayment of Watts Bar Reservoir, north of Interstate Highway (I-) 40, and about 30 miles west of Knoxville, Tennessee. A site locality map (Figure 1-1) provides details of the location and property boundaries. At KIF, TVA operates nine coal-fired boilers, which are fitted with electrostatic precipitators that remove fly ash from the exhaust stream. Selective catalytic reduction (SCR) systems are also in place to reduce nitrogen oxide (NO_x) emissions. Scrubbers to reduce sulfur dioxide (SO₂) emissions are currently under construction for all nine units.

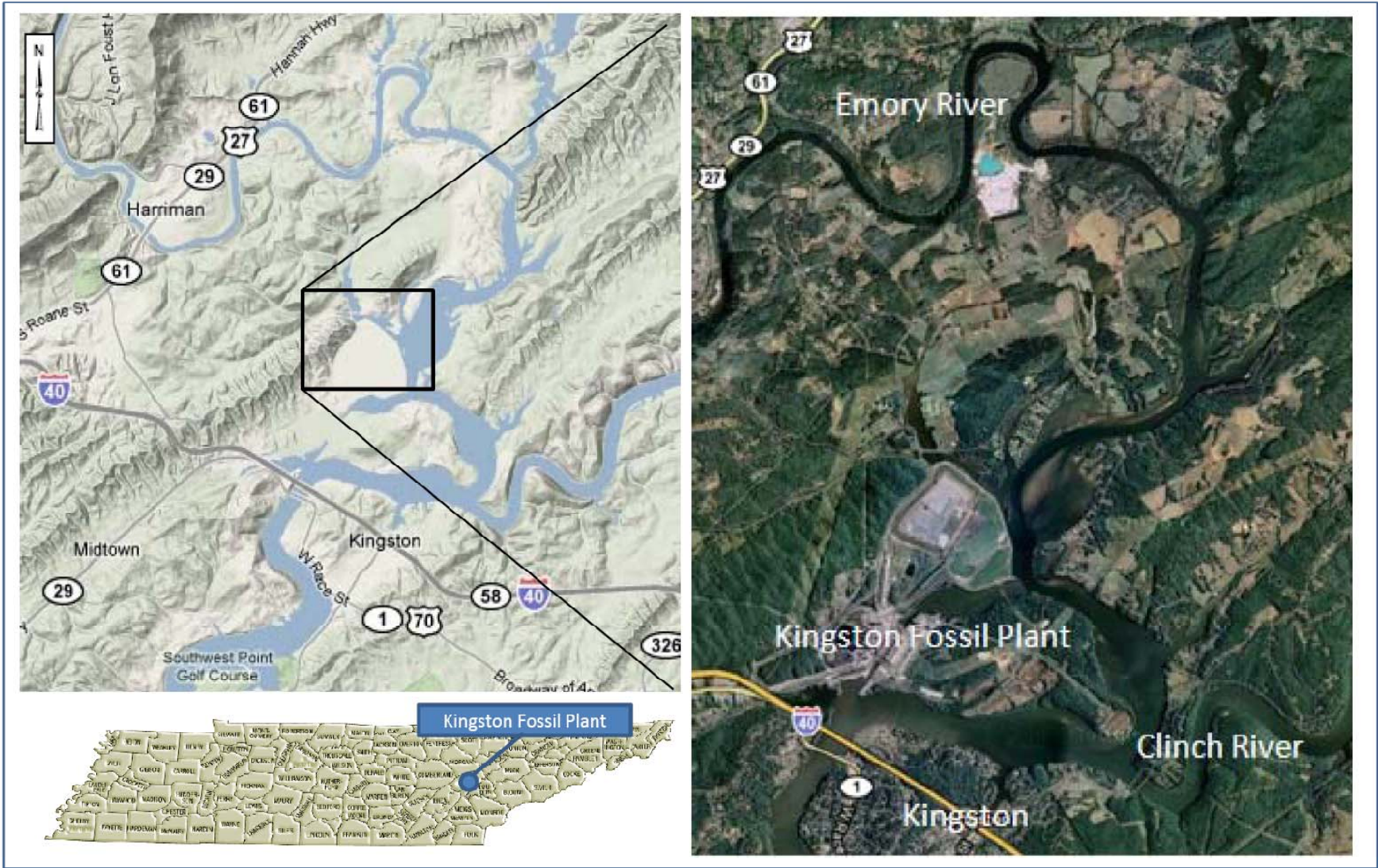


Figure 1-1. Kingston Fossil Plant Locality Map

1.3. Other Pertinent Environmental Reviews or Documentation

- *Coal Combustion By-Product Marketing Environmental Assessment* (TVA 1990)
- *Emergency Dredging for the Kingston Fossil Plant Ash Dike Failure Final Environmental Assessment* (TVA 2009)

1.4. The Scoping Process

Because TVA is a federal agency, the proposed project constitutes a federal action subject to the requirements of the *National Environmental Policy Act* (NEPA) and TVA's NEPA implementing procedures. Accordingly, TVA has prepared this EA to evaluate alternatives for converting the fly ash handling system at KIF from wet to dry; to identify and evaluate potential environmental impacts associated with those alternatives; to describe any conditions or commitments required; and to communicate its findings to TVA decision makers and the public.

TVA staff conducted internal scoping of issues and determined that impacts to floodplains, wetlands, navigation, natural areas, recreation, or prime farmlands would be minor or absent. Due to the industrialized and highly disturbed nature of the site, coupled with the proposed reductions in water usage and discharge volume, there would be no impacts to either terrestrial or aquatic threatened and endangered species or general terrestrial or aquatic biological communities or habitats. Additionally, TVA 2009 evaluated noise, socioeconomic, and environmental justice impacts from the hauling of recovered ash, which bounds the potential impacts of the presently proposed action. TVA identified no significant impacts on these media in that review, and the information is valid for this review. No production of hazardous waste, waste requiring special handling and storage, or negative social or socioeconomic impacts are anticipated. The project is not in conflict with any plan, existing land use, or zoning regulation. TVA made the determination to prepare this EA to address impacts to the following resources

- Air
- Water
- Solid and Hazardous Waste
- Transportation
- Cultural

1.5. Necessary Federal Permits or Licenses

The proposed action would be subject to the following environmental permit requirements and regulations.

- Air permitting regulations under the *Clean Air Act* (CAA) would require the project to secure an air construction permit prior to the start of new facility construction.
- The project would also require modifications to the Title V permit under the CAA.
- National Pollutant Discharge Elimination System (NPDES) permitting regulations under the *Clean Water Act* (CWA) would require modifications to the wastewater discharge permit for KIF.
- A Storm Water Construction Permit under the CWA would be required prior to commencement of construction.

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CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Alternatives

This EA documents the evaluation of two reasonable alternatives: the No Action and Action Alternatives. The No Action Alternative would be a continuation of the current operation, and the Action Alternative would involve converting the wet fly ash handling system to a dry handling system.

2.1.1. *Alternative A – The No Action Alternative*

Under the No Action Alternative, TVA would continue the use of the wet fly ash handling system and use of existing impoundments. The ash being generated from the operation of KIF would continue to be collected from the sluice channel prior to its entering the existing ash pond facility. The ash pond is also being used as a settling basin for ash being recovered from the Emory River. This recovered ash, which is being processed with production ash, would continue to be shipped off site to the Arrowhead Landfill in Perry County, Alabama, for disposal. This disposal site has received regulatory approval from the United States Environmental Protection Agency (USEPA) and Alabama Department of Environmental Management. TVA anticipates that the ash efforts would be completed by the second quarter of 2010. However, to ship all of the approximately three million cubic yards of recovered ash may require shipping into the first quarter of 2011.

2.1.2. *Alternative B – Action Alternative – Dry Fly Ash Conversion*

Under the Action Alternative TVA would remove the current wet fly ash handling system at KIF and convert it to a dry collection system. This change would require construction of dry ash silos and supporting infrastructure to allow for disposal or marketing of the ash with transportation using either truck or rail. The addition and layout of new equipment would be as depicted in Figure 2-1.

The new system would convey ash from the precipitators, SCRs, and the economizers to one of two storage silos (Figure 2-1) at the storage collection facility located near the current coal pile. So as to allow for flexibility in plant operations, the system capacity is designed to handle a range of 5 to 50 percent Powder River Basin (PRB) blend ash. Dry fly ash collected in the storage silos would be unloaded into pneumatic trucks, hopper trucks, or rail cars and hauled off site. The system has been conservatively estimated to handle a total process throughput of 600,000 tons per year of dry fly ash and would operate 8,760 hours per year.

The new dry ash system would include a negative pressure air system to evacuate the ash from the ash collection hoppers to the proposed ash silos. The existing water-driven hydro-evacuators would be removed. A liquid ring vacuum system equipped with nine operating and two standby vacuum pumps and corresponding filter separators for each of KIF's nine boiler units would remove fly ash from the precipitators, SCRs, and economizers.

Each vacuum pump and corresponding filter separator would be connected to an adjacent unit for redundancy. Each filter separator would be sized at a 4:1 air to cloth ratio and would contain 65 Ryton® 16-ounce bags with a Teflon® membrane. All nine filter separators would have a FilterSense® dust detector to verify that all bags are performing as designed. The vacuum system would have a total airflow of 18,548 standard cubic

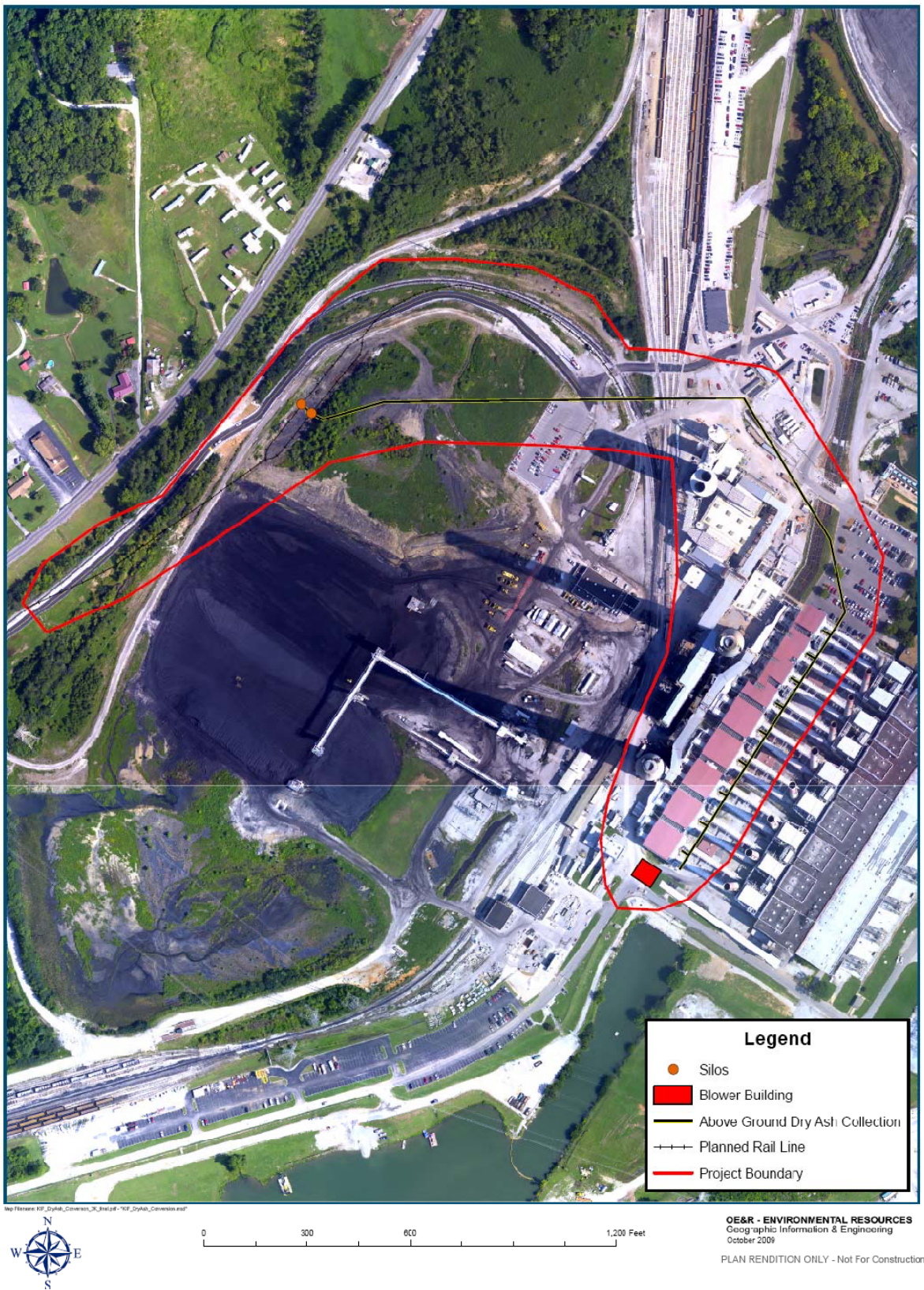


Figure 2-1. Project Boundary and Equipment to be Installed

feet/minute. The maximum clean air dust concentration exiting each filter separator would be 0.005 grains/standard cubic foot. The collected ash would then drop into a vacuum pressure transfer system and be blown into one of the storage silos. The vacuum pressure system would consist of five operating and two standby compressors that would convey ash to the silos through pressure piping. The total airflow entering the silo would be 24,037 standard cubic feet/minute.

Each of the ash storage silos would be sized to accommodate three days of storage. The storage silos would be used alternately, i.e., only one silo would be used at any given time. Each would also have one pin mixer ash unloader for unloading to trucks or rail cars, a bin vent for exhaust into the atmosphere, and provisions for future dry ash unloading. The new silos would also be constructed in a manner to allow the addition of a coal ash beneficiation system to remove excess carbon to enhance the potential marketability of future ash production. The excess carbon causes the ash to have a darker color, which is considered undesirable by the concrete industry, the primary market for this material.

Each silo would be equipped with weight scales. The new silos would have the capacity to load trucks and rail cars that are either open containers or pressurized containers. Any ash loaded into open containers would be conditioned with approximately 20 percent water to reduce fugitive emissions. During fly ash unloading to hopper trucks or rail cars (batch drop operations), fly ash conditioners would also moisten the dust to 20 percent moisture for dust control before discharge. The open bed trucks and rail cars would then be covered, and the material would be transported off site. The trucks would travel a total distance of 0.99 mile on paved roads within the TVA property boundaries.

Railroad tracks and standard roads would be constructed for each silo in a layout to allow for pneumatic truck, hopper truck, or rail car loading. Each silo would also have a set of scales to weigh rail cars or trucks. During dry fly ash unloading to pneumatic trucks, the exhaust would feed back into the silo for discharge through the bin vent with filter into the atmosphere.

Ash would be transported off site by rail or truck for disposal or use, as there is no landfill capacity for fly ash on site. The present EA includes representative disposal sites for bounding the impacts of transportation of ash. Each of the identified representative sites is a state-approved site, appropriately permitted to receive CCPs and with adequate capacity to do so. At this time, TVA is not proposing to select among those disposal options. TVA is investigating regionally for sites and construction of new landfills for disposal of CCPs. However, at this time, results of that study have not progressed to the point of maturity to be available for current decisions. The proposed action of this EA to implement a dry fly ash handling system would not preclude consideration of any of these representative-bounding options nor those of either current or other long-term ash disposal options for KIF. Disposal options that would be considered as outcome of completing that study would undergo appropriate environmental review at that time.

2.2. Comparison of Alternatives

Table 2-1 compares the environmental consequences of the No Action and the Action Alternatives. The No Action Alternative would be a continuation of the current operation, and the Action Alternative would involve converting the wet handling fly ash system to a dry handling system and subsequent operation of the new dry ash system.

Table 2-1. Comparison of the Environmental Consequences of the No Action and Action Alternatives

Issue Area	No Action Alternative	Proposed Action Alternative
Air Resources	There is no available landfill space for fly ash on site. The plant would continue to operate with mechanical ash removal and dewatering of the ash to a moisture level sufficient to load the material for off-site transport. This would result in emissions from operation of internal combustion engines and the potential for continuation of current levels of fugitive emission from handling the fly ash.	Construction activities would deposit less than 5 percent of the total fugitive emissions beyond the property boundary. Emissions from construction equipment internal combustion engines would be small and would result in minimal off-site impacts. The operation of the proposed project would not exceed federal and state prevention of significant deterioration (PSD) thresholds.
Water Resources	No potential reduction in water usage or mass loading of certain constituents to the ash pond.	Impacts to the Clinch River from construction activities would be minor and temporary. Operation of the new system would reduce water usage by the plant and would potentially reduce mass loading of certain constituents to the ash pond by approximately 80 percent.
Solid Waste	<p>There is a lack of landfill space for additional fly ash disposal at KIF. TVA has identified four Subtitle D landfill locations with adequate capacity for disposal of substantive portions of KIF ash by truck and two by rail.</p> <p>The only impacts to solid waste resources would be utilization of existing capacity in the permitted Subtitle D landfills identified in this EA. There would be no opportunity for beneficial use marketing of ash.</p>	<p>There is a lack of landfill space for additional fly ash disposal at KIF. TVA has identified four Subtitle D landfill locations with adequate capacity for disposal of substantive portions of KIF ash by truck and two by rail.</p> <p>The only impacts to solid waste resources would be utilization of existing capacity in the permitted Subtitle D landfills identified in this EA. If beneficial use marketing is established, some reduction in the amount of ash for disposal could occur.</p>
Transportation	Due to the lack of landfill space at KIF for fly ash, the ash would have to be transported off site for disposal or use. Of the four identified Subtitle D landfills, which required transportation by truck, one roadway would experience a level of service (LOS) drop from LOS A to LOS B due to an increased time spent following the approximately 90 trucks per day leaving the plant. The addition of rail traffic would not have any significant impact on the current LOS of the roads in the general vicinity of the two identified landfills for rail transportation.	Same as for No Action Alternative.
Cultural Resources	None	None

2.3. The Preferred Alternative

TVA's preferred alternative, Alternative B, is to add a dry fly ash collection system and to remove the current wet fly ash handling facility.

2.4. Summary of TVA Commitments and Proposed Mitigation Measures for the Preferred Alternative

Emissions from open construction areas and unpaved roads would be mitigated by spraying water on the roadways, as needed, to reduce fugitive dust emissions by as much as 95 percent.

During dry fly ash unloading to pneumatic trucks, the exhaust would feed back into the silo for discharge through the bin vent with filter into the atmosphere.

During fly ash unloading to hopper trucks or rail cars (batch drop operations), fly ash conditioners would moisten the dust to 20 percent moisture for dust control before discharge. The hopper trucks and rail cars would then be covered, and the material would be transported off site.

Portable toilets would be provided for the additional construction workers as needed. These toilets would be regularly pumped out and the sewage transported by tanker truck to a publicly owned treatment works accepting pump out.

Depending on the types of coal being burned when the dry ash systems are implemented, the wastewaters entering the remaining CCP system and discharging through Discharge Serial Number (DSN) 001 could have a higher or lower pH. If the pH of DSN 001 fluctuates substantially, installation of mitigative measures, such as a carbon dioxide diffuser to lower pH, would be evaluated and implemented to ensure compliance with the NPDES permit limits.

Although the impacts of the trucks transporting ash materials would be minor on the transportation network, TVA's request for proposals (RFPs) would require potential bidders to consider reducing the potential impact of their KIF trucking activities upon the environment. The contractor would take into account such factors as air pollution, erosion control, noise control, solid waste disposal, and wastewater disposal, among other things. The contract would require that truck owners maintain trucks properly, including tune-ups. Truck routes would avoid schools, historic districts, and downtown areas to the extent possible. Additional requirements such as use of ultra-low sulfur diesel fuel and minimizing idling time would also be required.

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CHAPTER 3

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Currently, two sources contribute ash to the ash pond facility, i.e., (1) ash dredged from the Emory River as part of ongoing recovery and restoration efforts following the KIF ash spill of December 2008 and (2) the limited production ash being generated from the operation of the plant in the ash sluice channel prior to the ash pond facility. The ash pond acts as a settling basin for both sources of ash. There is no available landfill capacity for disposal of fly ash on the KIF Reservation.

3.1. Air Resources

3.1.1. Affected Environment

The KIF dry fly ash facility would be subject to both federal and State of Tennessee air quality regulations. These regulations impose permitting requirements and specific standards for expected air emissions. The standards and regulations that pertain to the proposed facility include:

- State of Tennessee Process and Fugitive Dust Regulation (Tennessee Department of Environment and Conservation [TDEC] 2001)
- State of Tennessee requirements for construction and operating permits

Air quality is a valuable environmental resource. Through its passage of the CAA, Congress has mandated the protection and enhancement of our nation's air quality resources. National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants have been set to protect the public health and welfare:

- sulfur dioxide (SO₂)
- ozone (O₃)
- nitrogen dioxide (NO₂)
- particulate matter whose particles are less than or equal to 10 micrometers (PM₁₀)
- particulate matter whose particles are less than or equal to 2.5 micrometers (PM_{2.5})
- carbon monoxide (CO)
- lead (Pb)

The primary NAAQS were promulgated to protect the public health, and secondarily, to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas in violation of the NAAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements. Table 3-1 presents a listing of the NAAQS. National standards, other than annual standards, are not to be exceeded more than once per year (except where noted).

Table 3-1. National Ambient Air Quality Standards

Pollutant	Primary Standards ^a		Secondary Standards ^b	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide (CO)	9 ppm (10,000 µg/m ³)	8-hour ⁽¹⁾	None	
	35 ppm (40,000 µg/m ³)	1-hour ⁽¹⁾		
Lead (Pb)	0.15 µg/m ³ ⁽²⁾	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m ³	Quarterly Average	Same as Primary	
Nitrogen Dioxide (NO ₂)	0.053 ppm (100 µg/m ³)	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM ₁₀)	150 µg/m ³	24-hour ⁽³⁾	Same as Primary	
Particulate Matter (PM _{2.5})	15.0 µg/m ³	Annual ⁽⁴⁾ (Arithmetic Mean)	Same as Primary	
	35 µg/m ³	24-hour ⁽⁵⁾	Same as Primary	
Ozone (O ₃)	0.075 ppm (2008 standard)	8-hour ⁽⁶⁾	Same as Primary	
	0.08 ppm (1997 standard)	8-hour ⁽⁷⁾	Same as Primary	
	0.12 ppm	1-hour ⁽⁸⁾ (Applies only in limited areas)	Same as Primary	
Sulfur Dioxide (SO ₂)	0.03 ppm (80 µg/m ³)	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m ³)	3-hour ⁽¹⁾
	0.14 ppm (365 µg/m ³)	24-hour ⁽¹⁾		

ppm = parts per million

µg/m³ = micrograms per cubic meter

Source: (40 CFR Part 50)

^(a) Standards set to protect public health^(b) Standards set to protect public welfare⁽¹⁾ Not to be exceeded more than once per year⁽²⁾ Final rule signed October 15, 2008⁽³⁾ Not to be exceeded more than once per year on average over three years⁽⁴⁾ To attain this standard, the three-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m³.⁽⁵⁾ To attain this standard, the three-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m³ (effective December 17, 2006).⁽⁶⁾ To attain this standard, the three-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).⁽⁷⁾ (a) To attain this standard, the three-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as USEPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

⁽⁸⁾ (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

(b) As of June 15, 2005, USEPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact Areas.

The feasibility of constructing a dry fly ash handling system at the given site may be affected by several air quality considerations. One of the factors is regulatory status or attainment of air quality standards. Sources must obtain a construction permit prior to

commencing construction on an air emission source. Sources locating in attainment areas may be subject to the prevention of significant deterioration (PSD) of air quality rules, whereas those locating in or affecting areas failing to attain air quality standards may be required to comply with nonattainment new source review (NNSR). An overriding constraint in either program is that no source may cause or significantly contribute to a violation of an ambient air quality standard. Emissions from the proposed KIF project are below the thresholds that would trigger either PSD or NNSR. Emissions of PM_{2.5} are subject to a Best Available Control Technology (BACT) evaluation due to the partial county nonattainment designation of Roane County for PM_{2.5}.

The air quality in the vicinity of the KIF site is generally good. Table 3-2 shows the results of ambient air quality monitoring of criteria pollutants, that are considered representative of the site. USEPA has designated Roane County as partial county nonattainment for PM_{2.5}. Nearby Anderson, Knox, and Loudon Counties are all nonattainment for PM_{2.5}. Roane County is currently in attainment for all other criteria pollutants.

All areas in Tennessee had met attainment of the old 1-hour ozone standard. However, for some areas, attainment of an 8-hour ozone standard of 80 parts per billion (ppb) has been more difficult to achieve. Subsequently on March 27, 2008, USEPA made revisions to the primary and secondary NAAQS for ozone (40 CFR Part 50). The level of the 8-hour primary standard was revised to 75 ppb, and the secondary standard was revised making it identical to the revised primary standard.

Table 3-2. Ambient Concentrations of Criteria Air Pollutants Compared With Air Quality Standards

Pollutant	Level of Standard (ppm) ^a	One-Year Maximum or Mean	
		Concentration (ppm) ^a	Percent of Standard (%)
Ozone (New Standard)	4 th Highest 8-hour average (0.075)	0.073 ^c	97
Sulfur Dioxide	Maximum 3-hour average (0.5)	0.094 ^b	19
	Maximum 24-hour average (0.14)	0.025 ^b	18
	Annual mean (0.030)	0.002 ^b	6
Nitrogen Dioxide	Annual mean (0.053)	0.007 ^d	13
Carbon Monoxide	Maximum 1-hour average (35)	0.9 ^e	3
	Maximum 8-hour average (9)	0.5 ^e	6
PM ₁₀ (Old Standard)	($\mu\text{g}/\text{m}^3$) Maximum 24-hour average (150)	($\mu\text{g}/\text{m}^3$) 47 ^g	31
PM _{2.5} (New Standard)	Annual average (15)	13.7 ^f	91
	24-hour average (35)	30.3 ^f	87
Lead	($\mu\text{g}/\text{m}^3$) Quarterly mean (1.5)	($\mu\text{g}/\text{m}^3$) 0.06 ^h	4

^a - ppm unless otherwise noted

^b - Sulfur dioxide values for Bull Run, Anderson County, Tennessee, 2006

^c - Ozone values for Oak Ridge, Anderson County, Tennessee, 2008

^d - Nitrogen dioxide values for Meigs County, Tennessee, 2006

^e - Carbon monoxide values for Look Rock, Blount County, Tennessee, 2007

^f - PM_{2.5} values for Harriman, Roane County, Tennessee, 2008

^g - PM₁₀ values for Rockwood, Roane County, Tennessee, 2008

^h - Lead value for Knox County, Tennessee, 2008

3.1.2. Environmental Consequences

3.1.2.1. No Action Alternative

Under the No Action Alternative, the plant would continue to operate with the wet sluice system. However, since the plant does not have any landfill capacity for fly ash the ash would continue to be dredged from the sluice channel and periodically from the ash pond. After dredging, the ash would be allowed to dewater for a couple of days and then be loaded into open containers for transportation off site for disposal. This would result in continued internal combustion engine emissions from equipment dredging and ash loading and fugitive emissions from ash handling.

3.1.2.2. Action Alternative

Under the Action Alternative, the project under consideration would have associated transient air pollutant emissions during the construction phase. Construction-related air quality impacts are primarily related to land clearing, site preparation, and the operation of internal combustion engines.

Land clearing, site preparation, and vehicular traffic over unpaved roads and the construction site result in the emission of fugitive dust particulate matter (PM) during site preparation and active construction periods. If necessary, emissions from open construction areas and unpaved roads would be mitigated by spraying water on the roadways as needed to reduce fugitive dust emissions.

Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of PM, NO_x, CO, volatile organic compounds, and SO₂ during the site preparation and construction period. The total amount of these emissions would be small and would result in minimal off-site impacts.

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

Impacts of Operation

Operations of the dry fly ash handling system are subject to specific State of Tennessee process regulations, fugitive dust regulations, and a review for applicability of PSD or NNSR regulations. These analyses also demonstrate compliance with all federal and State of Tennessee requirements for air quality protection. An Application for Air Pollution Control Permit to Construct would be completed and submitted to the Tennessee Department of Environment and Conservation (TDEC). The proposed project does not exceed federal and state PSD or NNSR thresholds.

Table 3-3 presents sources of emission and estimates of totals for KIF's fly ash system operating at conservative maximum process weight throughput of 600,000 tons per year of dry fly ash, assuming operations of 8,760 hours per year.

The primary emissions and standards of concern for a dry fly ash collection and handling system project of this nature would be PM. Based on the estimates provided in Table 3-3, the project would be in compliance with the State of Tennessee process regulations and fugitive dust regulations and would have total PM emissions below the 25 ton (15 tons of PM 10 microns and 10 tons of PM_{2.5}) PSD and NNSR significant emission levels.

Table 3-3. Kingston Fossil Plant Fly Ash Handling Potential Particulate Emissions

Source	Parameter	Controls	Controlled	
			pound/hour	ton/year
Fly Ash Vacuum System	TSP	---	0.795	3.48
	PM10		0.795	3.48
	PM2.5		0.795	3.48
Storage Silo With Pressure System	TSP	---	1.03	4.51
	PM10		1.03	4.51
	PM2.5		1.03	4.51
Fly Ash Loadout to Trucks	TSP	None	0.0413	0.0430
	PM10		0.0196	0.0203
	PM2.5		0.00296	0.00308
Fly Ash Handling Haul Roads	TSP	Wet Suppression	2.41	2.51
	PM10		0.471	0.490
	PM2.5		0.0705	0.0733
Haul Roads Watering	TSP	Wet Suppression	2.67	0.556
	PM10		0.521	0.108
	PM2.5		0.0780	0.0162
Total Emissions	TSP		6.95	11.1
	PM10		2.84	8.61
	PM2.5		1.98	8.09

TSP = Total suspended particulates

Table 3-4 provides a comparison between the emissions presented in Table 3-3 with the applicable PSD thresholds. The emission increases for this proposed project indicate that the pollutants would not exceed PSD significance levels; therefore, no further PSD analysis is required.

Table 3-4. Dry Fly Ash Handling System Emissions and Prevention of Significant Deterioration Limits

Pollutant	Emissions Rate (tons/year)	PSD Threshold (tons/year)
TSP	11.1	25
PM ₁₀	8.61	15
PM _{2.5}	8.09	10

Scenario Emissions Used for Analysis of Particulate Matter

Each storage silo would transfer the dry fly ash through a pin mixer ash unloader into pneumatic trucks, hopper trucks, or rail cars for removal off site. When transferring to hopper trucks or rail cars, fugitive emissions would occur from batch drop operations. The trucks would travel a total of 0.99 mile of paved on-site roads. Water suppression (via a water suppression truck) would be used as needed to control fugitive emissions during dry fly ash removal off site. Table 3-5 provides a summary of the fugitive emissions generated during dry fly ash hauling operations.

Table 3-5. Dry Fly Ash Handling Fugitive Emissions Summary

Source	PM _{2.5} Emissions* (tons/year)	PM ₁₀ Emissions* (tons/year)	TSP Emissions* (tons/year)
Ash Loadout to Trucks	0.00308	0.0203	0.0430
Ash Hauling	0.0895	0.598	3.07
TOTAL	0.0926	0.619	3.11

Note: *Proposed actual emissions are controlled and provided in Table 3-3.

Process Emissions

The dry fly ash handling system is required to meet TDEC APC process emission standards for particulate matter (Total Suspended Particles (TSP), PM₁₀, and PM_{2.5}). Table 3-6 provides a comparison between the emissions provided in Table 3-3 and the TDEC APC emission standard.

Table 3-6. Dry Fly Ash Hauling System Emissions and Tennessee Department of Environment and Conservation Air Pollution Control (APC) Emission Standards

Emission Point	Emissions ^[1] (grains/standard-foot ³)	APC Limit ^[2] (grains/standard-foot ³)	Citation ^[1]
9 Operating Vacuum Pumps With Filter Separators	0.005	0.25	1200-3-7-.04(2)
Silo With Pressure System and Bin Vent Filter	0.005	0.25	1200-3-7-.04(2)

Source: TDEC 1982

Notes:

¹ Proposed actual emissions are controlled and are provided in Table 3-3.

² TDEC emission limits as of July 1, 1990.

The TDEC APC emission standards provided in Table 3-6 are not expected to be exceeded by the operation of the proposed project as the proposed emissions are 50 times lower than the standard.

3.2. Water Resources, Surface Water, and Water Quality

3.2.1. Affected Environment

KIF is located in eastern Tennessee, and situated on a peninsula formed by the confluence of the Clinch and Emory rivers at Clinch River Mile (CRM) 2.6. This area is in the headwaters of Watts Bar Reservoir. Watts Bar Dam is approximately 40.5 river miles below KIF (37.9 miles on the Tennessee River and 2.6 miles on the Clinch River) at Tennessee River Mile (TRM) 529.9. River reaches on the Clinch and Emory in the vicinity of KIF are impounded waters from Watts Bar Dam.

River flow rates past KIF are regulated by upstream dams on the Clinch River (Melton Hill and Norris dams) and downstream on the Tennessee River by Watts Bar Dam (Table 3-7). The flow rates are also influenced by upstream dam operations on the Tennessee River (Tellico and Fort Loudoun dams).

Table 3-7. Kingston Fossil Plant Area Watershed Average River Flows

Location	Watershed Area (square miles)	Average Annual Flow (cubic feet per second [cfs])	Average Summer Flow (cfs)	Average Winter Flow (cfs)
Emory River at River Mouth	865	1,778	504	2,675
CRM 2.6	3,540	5,226	4,306	6,221
Tennessee River at Watts Bar Dam (TRM 567.7)	17,310	26,873		

Flow patterns can be complex in the Emory and Clinch rivers embayments. When Emory River flow is greater than the 2,100 cfs required by the cooling water system for KIF, the Emory River flows downstream into the Clinch River, and the Emory River water alone provides all KIF cooling water. According to stream gauge records, this happens about 18 percent of the time and is most likely in the winter flood season, which occurs December through March.

When Emory River flow is not adequate (less than 2,100 cfs) to provide all of the cooling water needed by KIF, water flows upstream from the Clinch River through the Emory River embayment. This is encouraged by the presence of an underwater weir in the Clinch River just downstream of the Emory River confluence. Under some other conditions, the Emory River also flows backward upstream of the plant. Water is pushed up the Emory River as a result of inflows that raise the pool elevation in Watts Bar Reservoir. Such inflow typically occurs when the reservoir is filling in the spring or during a spring flood event. Different rates and timing of releases from Watts Bar, Fort Loudoun, and Melton Hill reservoirs can also cause reverse flows in the Clinch River arm of Watts Bar Reservoir. There is, thereby, the potential for the water from the Clinch River to flow upstream on the Tennessee River during filling of Watts Bar Reservoir.

These flow patterns are further complicated by temperature and density differences in the water. Warmer water is less dense and therefore stays on the surface of a reservoir. In the summer, sun and air temperatures warm the surface water, and this thermal layering becomes stable (stratification). The Emory River water also warms up, though not as much as the water on the surface of the reservoir, while Norris Dam and Melton Hill Dam discharges keep the Clinch River cool. When Clinch River water flows upstream into the Emory River embayment to the KIF intakes in the summer, this cooler water flows along the bottom of the embayment, and the warmer Emory River water can flow downstream over the top of the cooler Clinch River water.

Water Quality (Pre-December 2008)

The *Emergency Dredging for Kingston Fossil Plant Ash Dike Failure Final Environmental Assessment* (TVA 2009) produced following the fly ash dredge cell dike failure of December 22, 2008, provides details concerning water quality before the slide. The Emory River arm of Watts Bar Reservoir is on the state 303(d) list of impaired waters (TDEC 2008a) because of sediments contaminated with polychlorinated biphenyls (PCBs) and chlordane from industrial point sources. The section of the Emory above the influence of the Watts Bar impoundment is listed because of mercury from atmospheric deposition. Several tributaries of the Emory River upstream of KIF are listed for manganese, iron, and pH from historic coal mining activities. Furthermore, a few of these upstream tributaries are also impacted by sediment or other causes from agriculture or development.

The Clinch River arm of Watts Bar Reservoir is also on the state 303(d) list. The Clinch River is on the list due to PCBs and chlordane contamination of sediment from legacy pollutants, industrial point source discharges, and atmospheric deposition. Nearby tributaries past the Clinch that are also listed for PCBs, chlordane, and mercury and one nearby tributary listed for arsenic may be sources of contamination to the Clinch. Some of this contamination occurs as a result of former United States Department of Energy (DOE) operations on the Oak Ridge Reservation (TDEC 2008a). Past DOE actions at Oak Ridge resulted in the contamination of sediments by radioactive and other wastes. The primary concern is PCBs contamination in fish. Other contaminants include radioactive materials and metals.

TVA conducted the Vital Signs Monitoring Program on Watts Bar Reservoir annually from 1991 through 1994 to establish baseline data on the reservoir's ecological health under a range of weather and flow conditions. Subsequent to 1994, Watts Bar Reservoir has been evaluated every other year. The Vital Signs Program uses five metrics to evaluate the ecological health of TVA reservoirs: chlorophyll concentration, fish community health, bottom life, sediment contamination, and dissolved oxygen. Values of good, fair, or poor are assigned to each metric TVA monitored.

The reservoir ratings for Watts Bar have fluctuated between high "fair" and "poor" and have generally followed reservoir flow conditions with the lowest ratings during droughts resulting in low flows. Of the indicators included in the Vital Signs Program, dissolved oxygen is the most responsive to flow rates.

Water Quality (Post-December 2008)

The KIF dike failure of December 22, 2008, released about 5.4 million cubic yards of coal ash along with about 327 million gallons of water. This ash and water spread over nearly 300 acres of land and water adjacent to the plant and into the Emory River. USEPA (Region 4), TDEC, and TVA crews have been sampling water to assess the quality of public drinking water supplies, private wells, in-stream river water (both near the slide and at multiple downstream locations), and local springs. As of December 7, 2009, TVA has taken more than 20,442 surface and utility water samples. Surface samples were taken from the Emory, Clinch, and Tennessee rivers. TDEC has also taken more than 130 water samples. Additionally, between December 23, 2008, and January 2, 2009, the USEPA took 28 samples.

In general, levels of contaminants in water increase as flows increase and decrease as flows recede. The higher flows and higher water velocities cause small particles of solid materials to be suspended in the water column. TDEC found exceedences of the more stringent criteria for chronic exposure of fish and aquatic life at least once in January 2009 for aluminum, cadmium, iron, and lead. Most of these exceedences were in the Emory River near the ash slide. Criteria for thallium in waters that serve as a source of drinking water and from which fish are consumed have also been exceeded in some TDEC samples from both the Tennessee and Emory rivers, but there have been no exceedences of the Tennessee thallium standard for drinking water only.

The chemical constituents of greatest concern are the metals contained in the ash. These trace constituents are chemically combined with the ash. Depending on the temperature, pH, and oxygen availability in the water, the metals may disassociate from the ash. As shown on the Web site www.tva.com, the maximum levels of arsenic, mercury, and selenium from all standard sampling locations on the Emory, Clinch, and Tennessee rivers

have been below both the Tennessee Fish and Aquatic Life Criteria for Continuous Concentration and the Tennessee Domestic Water Supply Criteria.

Existing Wastewaters

Cooling water for KIF's condensers is pumped from the Watts Bar Reservoir pool at Emory River Mile 1.9. At full operating capacity, cooling water flows through the condensers at a rate of 1,297 millions of gallons per day (MGD). Water from the ash pond is discharged into the plant intake channel.

Existing CCPs Wastewater Treatment Facilities

As detailed earlier in Section 3.3 of this EA, KIF currently produces two CCPs: fly ash and bottom ash, which are by-products from the combustion of coal. The CCP handling systems include the ash pond, which receive and treat wastewater effluents and which may be impacted by the proposed action. The ash pond currently receives all of the fly ash and bottom ash wastewater.

Fly ash comprises approximately 80 percent, and bottom ash is the remaining 20 percent. Currently, both ash from power production and ash dredged from the river are discharged to a channel, dipped out, dewatered, and then loaded onto rail cars for disposal at a permitted landfill in Alabama. The decant water goes through the remaining ash pond system and is discharged through DSN 001.

Ash Pond Discharge (DSN 001)

Based on the current NPDES permit, on average 40.5 MGD of ash sluice water and other constituent flows are discharged from the ash pond via DSN 001. Current inflow sources to the ash pond and their average annual daily flow are summarized below in Table 3-8. The largest source other than the fly ash sluice is the station sump discharge (7.712 MGD). The station sump primarily receives equipment cooling water, unit leakage, etc. The constituents of interest in the station sump discharge are pH, total suspended solids, oil, and grease. However, its pH and alkalinity are usually near that of the KIF intake water.

Table 3-8. Inflow Sources to the Kingston Fossil Plant Discharge Serial Number 001

Ash Pond (DSN 001)	Inflow to Pond (MGD)
Fly Ash Sluice Wastewater	25.178
Bottom Ash Sluice Water and Groundwater	6.814
Station Sump Discharge	7.712
Precipitation	0.574
Water Treatment Plant Wastes	0.267
Coal Yard Runoff Pond Discharge	0.145
Miscellaneous	0.031
Evaporation	-0.238
Total	40.483

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

The coal yard runoff is driven by precipitation. Following a 10-year, 24-hour rainfall event of 4.9 inches per day, the estimated coal yard runoff could increase to approximately 10.9 MGD. Based on the NPDES permit flow schematic for KIF, the average annual daily flow for the coal yard runoff is 0.145 MGD. This is less than 0.4 percent of the total flow through DSN 001. However, during a design storm event, the daily coal yard runoff flow could be approximately 27 percent of the current flow through DSN 001. With the current coal blend

being burned at KIF, the coal yard runoff is neutral (pH 6.8 standard units). The primary constituents of interest in the coal yard runoff are pH and total suspended solids.

Air preheater washes (APHW) are classified as nonchemical metal cleaning wastes because only water, with no additional chemicals, is used in these cleanings. The average annual daily flow for APHW is only 0.002 MGD, so they are included in the miscellaneous category in Table 3-8. However, APHW occur when the air preheater becomes fouled and impacts unit performance. Therefore, these cleanings are intermittent. When they do occur, APHW could generate flows of 0.1-0.2 MGD. Even though there are no chemicals added to an APHW, the first flush (20-30 percent of the total flow) is usually acidic because sulfur and other compounds from the flue gas have accumulated on the air preheater surfaces. When some of these compounds dissolve in the wash water, they can make the APHW acidic.

These non-CCP sources currently receive treatment through neutralization with other wastewaters and sedimentation in the ash pond system. DSN 001 discharges directly into the 1,347 MGD plant intake. TVA is required to meet effluent characteristics for DSN 001 of a minimum pH of 6.0 units and a monthly average total suspended solids concentration of 29.9 milligrams per liter (mg/L). DSN 001 also has to meet a monthly average oil and grease concentration of 14.4 mg/L.

Mass Balance of Current Operations

Mass balance is a mathematical accounting of the sources and sinks of a substance within a system, such as a water body. A mass balance model for a water body is useful to help understand the relationship between the loadings of a pollutant and the levels in the water, biota, and sediments. The ash pond and therefore the potential impact of CCP operations discharge into the intake channel. The potential impact of this discharge was evaluated using the metals mass balance analysis presented in Table 3-9. The purpose of the analysis was to estimate concentrations of ash-related contaminants in the intake channel (and ultimately the Emory River downstream of the plant) resulting from current operations. The analysis accounts for ash-related contaminants associated with (1) dredged ash supernatant, (2) ash sluice water from plant operation, and (3) background river water entering the intake channel. All dredged ash supernatant and ash sluice water were assumed to discharge into the ash pond and ultimately into the intake channel at DSN 001. All input data and assumptions used in the mass balance including initial concentrations of the ash leachate contaminants are given in Table 3-9.

Results of the mass balance analysis summarized in Table 3-9 show that all of the constituents except aluminum and cadmium meet the TDEC lowest criteria (i.e., limit equal to minimum of the drinking water and aquatic toxicity limits). The estimated aluminum level exceeds the secondary drinking water standard, but with further mixing of plant cooling water discharge downstream of the plant, aluminum concentrations would be expected to fall below this limit. The aluminum standard is a secondary drinking water standard and should not cause any major impact to aquatic life downstream. In addition, the river itself is also providing 93 percent of the estimated total CCW plus ash pond loading of aluminum. The cadmium exception is an artifact produced by the method of treating censored data in mass balance calculations (i.e., values below detection limits set equal to one-half detection limit) and the fact that the cadmium detection limit of 0.0005 mg/L exceeds the TDEC criteria of 0.00025 mg/L. The mass balance analysis indicates that the overall impact of current CCP operations, including dredging, on surface water quality is minor. Even without taking any benefits for mixing of the discharge in the receiving body.

Table 3-9. Metals Mass Balance Results

Analyte	Intake Concentration (mg/L)	River Loading* (lb/day)	Total Ash Pond + CCW (lb/day)	Total Ash Pond + CCW (mg/L)	TDEC Lowest Criteria** (mg/L)
Aluminum	0.5	5411	5795	0.51	0.2
Arsenic	<0.001	5.41	27.5	0.0024	0.01
Barium	0.041	444	589	0.052	2
Beryllium	<0.001	5.41	5.64	0.0005	0.004
Cadmium	<0.0005	2.71	2.85	0.0003	0.00025
Chromium	<0.001	5.41	10.6	0.0009	0.011
Copper	0.0013	14.07	16.1	0.0014	0.009
Iron	0.3	3247	3323	0.295	0.3
Lead	<0.001	5.41	6.73	0.0006	0.0025
Mercury	<0.0002	1.08	1.13	0.0001	0.00077
Manganese	0.049	530	545	0.048	0.05
Nickel	<0.002	10.82	13.8	0.0012	0.052
Selenium	<0.001	5.41	9.4	0.0008	0.005
Silver	<0.0005	2.71	3.37	0.0003	0.0032
Thallium	<0.001	5.41	17.9	0.0016	0.002
Zinc	<0.01	54.1	62.5	0.0055	0.12

mg/L = Milligrams per liter

lb/day = Pounds per day

* River loadings were calculated using 0.5, the Minimum Detection Limit.

**TDEC Criteria, Rule 1200-4-3-.03 (TDEC 2008b)

The type of coal burned can have an effect on the constituency of wastewaters. KIF is currently burning a blend of eastern bituminous coal and PRB coal. The PRB coals contain less sulfur and more calcium than eastern bituminous coals. This could result in some of the wastewaters listed in Table 3-8 having a higher pH and more alkalinity than if only eastern bituminous coals were being burned. Bohac (1990) stated that "If the ash contains more equivalent leachable sulfur compounds than alkaline metal oxides, the ash sluice water would tend to have a depressed pH compared to the intake water prior to the ash addition. If the alkaline metal oxides predominate, the sluice water would tend to have an elevated pH."

After the planned flue gas desulphurization scrubber is placed into service, the makeup of the coals burned at KIF might change. If more eastern bituminous coals are burned in the future, some of the wastewaters, which are currently neutral, such as the coal yard runoff or an APHW, might become more acidic and contain different amounts of various metals than the present wastewaters. Historically, in the 1970s and 1980s KIF burned primarily eastern bituminous coal. At that time, the coal yard runoff and the APHW were substantively more acidic than they are currently.

3.2.2. Environmental Consequences

3.2.2.1. No Action Alternative

Under the No Action Alternative, TVA would not convert the ash handling systems to a dry fly ash vacuum system, and the current CCP and other wastewater systems would not be changed.

3.2.2.2. Action Alternative

As detailed in Chapter 2, the proposed Action Alternative includes replacing the current wet sluicing fly ash system with a dry, vacuum fly ash handling system. The dry collected ash would be either marketed or stored off site. This would reduce the DSN 001 discharge by more than 62 percent.

Construction Impacts

Wastewaters generated during construction of the proposed KIF dry ash handling systems may include construction storm water runoff, domestic sewage, dewatering of work areas, nondetergent equipment washings, and hydrostatic test discharges.

Surface Runoff

Most construction activities related to the dry ash systems installation would be performed within the existing plant site. The proposed facilities would be constructed in accordance with appropriate best management practices (BMPs) and would result in only minor and temporary impacts to surface water. Appropriate BMPs would be adopted, and all construction activities would be conducted in a manner to ensure that waste materials are contained and that the introduction of polluting materials into the receiving waters would be minimized. A Construction Storm Water Permit would be in effect that would require development of a project-specific Storm Water Pollution Prevention Plan. This plan would identify specific BMPs to address construction-related activities, which would be implemented to ensure that storm water impacts are minimized and that no sediment or other polluting materials are introduced into receiving waters. Therefore, only minor and temporary, if any, impacts to surface water would be expected from construction and installation of the proposed facilities.

Construction Workforce Domestic Sewage Disposal - Portable toilets would be provided for the additional construction workers as needed. These toilets would be regularly pumped out and the sewage transported by tanker truck to a publicly owned treatment works accepting pump out.

Equipment Washing – These discharges would be handled in accordance with BMPs developed in accordance with the Construction Storm Water Permit (that covers water only cleaning) and/or NPDES Permit TN0005452.

Thus, with the implementation of BMPs, impacts to the Clinch River from construction activities would be minor and within the existing permit limits.

Operational Impacts

Water Withdrawals for the Proposed Dry Ash Handling Systems – Converting to a dry fly ash handling system would reduce existing water needs for KIF by 25.178 MGD. While this would be a substantial reduction of the flow through DSN 001, it would be less than a 2 percent reduction in the overall KIF withdrawals (1,347 MGD).

Ash Pond DSN 001

NPDES permitting regulations would require modifications to the wastewater discharge permit for KIF. Changing the volumes of ash pond sources could affect the assimilative capacity currently used for treating storm water, APHW, coal yard runoff, and station sump discharges. Potential new effluent guidelines from USEPA may also require lower discharge limitations, which could require additional treatment for some waste streams.

Removing approximately 25.2 MGD of fly ash sluice waters from DSN 001 would reduce the average daily flow through DSN 001 from approximately 40.5 MGD to approximately 15.3 MGD. In general, reducing the flow through the existing ash pond system would provide additional time for mixing and settling of these wastewaters and would provide enhanced treatment, especially for neutral wastewaters such as general area storm water and station sump discharge. However, removing the fly ash sluice water would reduce the alkalinity in the system and thereby reduce its effectiveness in treating acidic wastewaters, such as coal yard runoff or APHW.

Metals and other constituents that are currently leached from the fly ash during the wet process would no longer be present in DSN 001. The literature suggests (Ainsworth and Rai 1987) that arsenic, boron, chloride, fluoride, sulfur, and selenium are concentrated on the surface of fly ash at higher levels than in bottom ash. Thus, loadings of these constituents would be reduced beyond that expected based only on the reduction in flow to DSN 001. Bohac (1990) concluded that removing the fly ash from the wet ash handling system could reduce the mass loading to the ash pond by approximately 80 percent. Therefore, under current operations the change to dry ash handling would substantially reduce the mass of metals currently discharged to the river.

Estimates of future operations are complicated because these systems would be impacted by possible changes in the types and amounts of coal burned in the KIF units. Depending on the types of coal being burned when the dry ash systems are implemented, the wastewaters entering the remaining CCP system and discharging through DSN 001 would have either a higher pH or a lower pH. If the pH of DSN 001 appears to be increasing or decreasing substantially, installation of potential mitigative measures, such as a carbon dioxide diffuser to lower pH, would be evaluated and implemented. If determined to be necessary, appropriate mitigative measures would be evaluated and implemented as needed to ensure that any NPDES limitations on DSN 001 were not exceeded. Additional details about potential further mitigative actions for the coal yard runoff and APHW, which could, and would, be implemented if needed to maintain KIF compliance with NPDES requirements, are given below.

Coal Yard Runoff

If the fly ash sluice (25.178 MGD) is removed from DSN 001, then the coal yard runoff would be approximately 1 percent of the total flow. However, during a design storm event, the daily coal yard runoff flow could reach 10.9 MGD. Without the fly ash sluice, the coal yard runoff from a design storm could reach over 70 percent of the flow through DSN 001.

With the current coal blend being burned at KIF, the coal yard runoff is neutral with a pH of approximately 6.8 standard units and is adequately treated in the CCP system. Therefore, with the current coal blend, removing the fly ash sluice water from the CCP should not result in a significant treatment problem for coal yard runoff. However, if the coal blend at KIF changes to more eastern bituminous coal and the coal yard runoff becomes more acidic, then additional treatment, such as a neutralization system, would be designed and implemented as necessary to ensure that all applicable NPDES permit limitations are met.

Air Preheater Washes

The purpose of the air preheater is to recover the heat from the boiler flue gas, which increases the thermal efficiency of the boiler by reducing the heat lost in the flue gas. Consequently, the flue gases are also sent to the stack at a lower temperature that allows for deposition of sulfur compounds that can trap fly ash causing clogging. APHW occur at infrequent intervals based on the amount of clogging from fly ash in the air preheater

baskets. Typically, they are washed at two- to five-year intervals, and units at KIF are being washed this winter. TVA would collect data from these washes and if potential impacts on DSN 001 are indicated. TVA would then take appropriate and effective action to avoid impacts to the discharge. These actions could include capturing the first flush of the wash in holding tanks and neutralizing any acidity before discharge to DSN 001.

3.3. Solid and Hazardous Waste

3.3.1. Affected Environment

KIF currently produces two CCPs, i.e., fly ash and bottom ash. KIF is expected to burn between 3.2 and 4.4 million tons of coal annually through at least 2015. The coal averages 12.5 percent ash; therefore, total ash production would range from approximately 400,000 to 550,000 tons of ash per year. Fly ash comprises approximately 80 percent (320,000 to 440,000 tons per year), and bottom ash is the remaining 20 percent (80,000 to 110,000 tons per year). The *Emergency Dredging for Kingston Fossil Plant Ash Dike Failure EA* (TVA March 2009) produced following the fly ash dredge cell dike failure of December 22, 2008, provides details concerning properties of the ash.

To date, all fly ash and bottom ash produced at KIF have been handled by wet sluicing to the active ash pond area. Bottom ash has been reclaimed for use in on-site dike and roadway construction primarily in the ash pond area. Prior to the failure of the disposal area dike, fly ash was periodically hydraulically dredged from the active ash pond and conveyed into either of two active dredge cells. Decant water from the dredge cells drained by gravity back to the ash pond for discharge.

Since there are no remaining on-site areas at KIF suitable for CCP disposal, TVA proposes to transport the collected ash by either rail or truck for disposal off site or for beneficial reuse. TVA has identified six Subtitle D landfill locations with adequate capacity for disposal of substantive portions of KIF ash.

These potential sites for ash removal placement include four sites in Tennessee, i.e., Anderson County, Athens, Dayton, and Oneida, suitable for truck transport, and two sites suitable for ash removal placement by railcar, i.e., the Taylor County Landfill located in Mauk, Georgia, and the Perry County Landfill located near Uniontown, Alabama. Disposal of the ash would be in accordance with applicable state and federal regulations in landfills that meet at least *Resource Conservation and Recovery Act* Subtitle D Class standards. In order to be acceptable for placement in a permitted disposal facility, TVA must regularly characterize and submit analytical and physical data of the CCP waste to the disposal site owners/operators. This documentation is specific and in accordance with regulatory permitting requirements for the disposal sites. Beneficial reuse of the ash would meet the criteria set forth in TVA1990.

KIF is considered a small quantity generator by TDEC for generation of hazardous waste. The types of these wastes currently generated include small quantities of waste paint; waste paint solvents; mercury contaminated debris; sandblasting, scraping, paint chips; solvent rags due to cleaning electric generating equipment; Coulomat (used as moisture removal from oil); and liquid-filled fuses.

3.3.2. Environmental Consequences

3.3.2.1. No Action Alternative

Under the No Action Alternative, TVA would continue to operate the current CCP handling system consisting of wet impoundments. However, the ash would still be transported off site for disposal due to the lack of on-site disposal capacity for fly ash at KIF. Disposal would be in accordance with applicable state and federal regulations in approved and properly permitted landfills, and beneficial reuse would be unlikely due to the wet nature of the ash, which makes handling difficult. The status of KIF as a conditionally exempt small quantity generator of hazardous waste would not change as a result of either the No Action or Action Alternatives.

3.3.2.2. Action Alternative

The Action Alternative, Dry Fly Ash Conversion, would remove the current wet ash handling systems at the KIF and convert to dry collection. This would require the construction of dry ash silos and supporting infrastructure to allow for the dry collection of CCPs. Transportation of the ash would be by either truck or rail. Disposal of ash would be in accordance with applicable state and federal regulations in approved and properly permitted landfills. Beneficial reuse of CCPs would be in accordance with criteria as set forth in TVA1990. If beneficial use marketing is successful following the conversion to dry ash handling under the Action Alternative, a reduction in the amount of ash needing disposal could be anticipated. The status of KIF as a conditionally exempt small quantity generator of hazardous waste would not change as a result of either the No Action or Action Alternatives.

3.4. Transportation

This information and analysis is provided to bound the potential for environmental impacts resulting from transporting the ash off site. As noted earlier, TVA is not proposing to select among those disposal options.

3.4.1. Affected Environment

Roadway, railway, and waterway modes of transportation can serve KIF. However, there are currently no barge facilities on site. Much of the property along the Clinch River a few miles upstream from KIF belongs to DOE; however, shoreline residential properties and recreational areas are in close proximity to the site. As TVA is not proposing transportation of ash by barge, the affected environment described is that related to transport by rail and truck to the representative sites identified.

KIF adjoins Swan Pond Road just off United States Highway (US) 70. US 70 is a principal, four-lane divided highway with wide shoulders traversing a gently rolling suburban area in an east-west direction. Swan Pond Road is a rural, two-lane road. Trucks exiting the KIF Reservation by way of Swan Pond Road would travel west on US 70 to Pine Ridge Road and then to I-40 or State Route (SR) 27. Therefore, Swan Pond Road, US 70, and Pine Ridge Road are the common routes considered and are identified as such in Table 3-10. Figure 3-1 illustrates the common routes.

Table 3-10. Annual Average Daily Traffic (AADT) From 2008 With Projected Data and Level of Service Data From the Analyses

Landfill	Route	Traffic Data 2008 AADT	Projected 2010 Traffic	LOS	Traffic 2010 With Increase	LOS	Comments
Common	Swan Pond Road	3,263	3,736	C	3,826	C	Common access road from plant
	US 70	10,194	11,671	A	11,761	A	Common access
	Pine Ridge Road	9,931	11,370	B	11,460	B	Access road common to I-40 or US 27
Anderson	SR 170	3,135 4,360	3,589 4,992	C C	3,679 5,082	C C	Low AADT High AADT
	Fleenor Mill Road	No data					
Athens	SR 30	11,980	13,716	D	13,806	D	Two lane
	SR 30	20,103	23,016	C	23,106	C	Four lane
	SR 750	2,141	2,451	C	2,541	C	
Dayton	US 27	4,622	5,292	A	5,382	A	
	US 27	4,622 8,463	5,292 9,689	A B	5,382 9,779	A B	Low AADT High AADT
	Smyrna Road	1,134	1,298	A	1,388	B	
Oneida	Ruitan Road	10,240	11,724	D	11,814	D	
	US 27 _a ¹	16,983	19,444	B	19,534	B	
	US 27 _b	12,001	13,740	C	13,830	C	
	US 27 _a	8,148 9,564	9,329 10,950	A A	9,419 11,040	A A	Low AADT High AADT
	US 27 _c	2,203 4,945	2,522 5,662	C D	2,612 5,752	C D	Low AADT High AADT
	US 27 _d	5,528	6,329	D	6,419	D	
	US 27 _b	12,134	13,892	B	13,982	B	
	US 27 _c	8,709 16,120	9,971 18,456	D E	10,026 18,546	D E	Low AADT High AADT
	Bear Creek Road	(No data)					

¹ Note: The subscripts for US 27 refer to the number of lanes. US 27_a indicates four-lane divided highway. US 27_b indicates four-lane undivided highway. US 27_c indicates two lanes, and US 27_d is for three lanes.

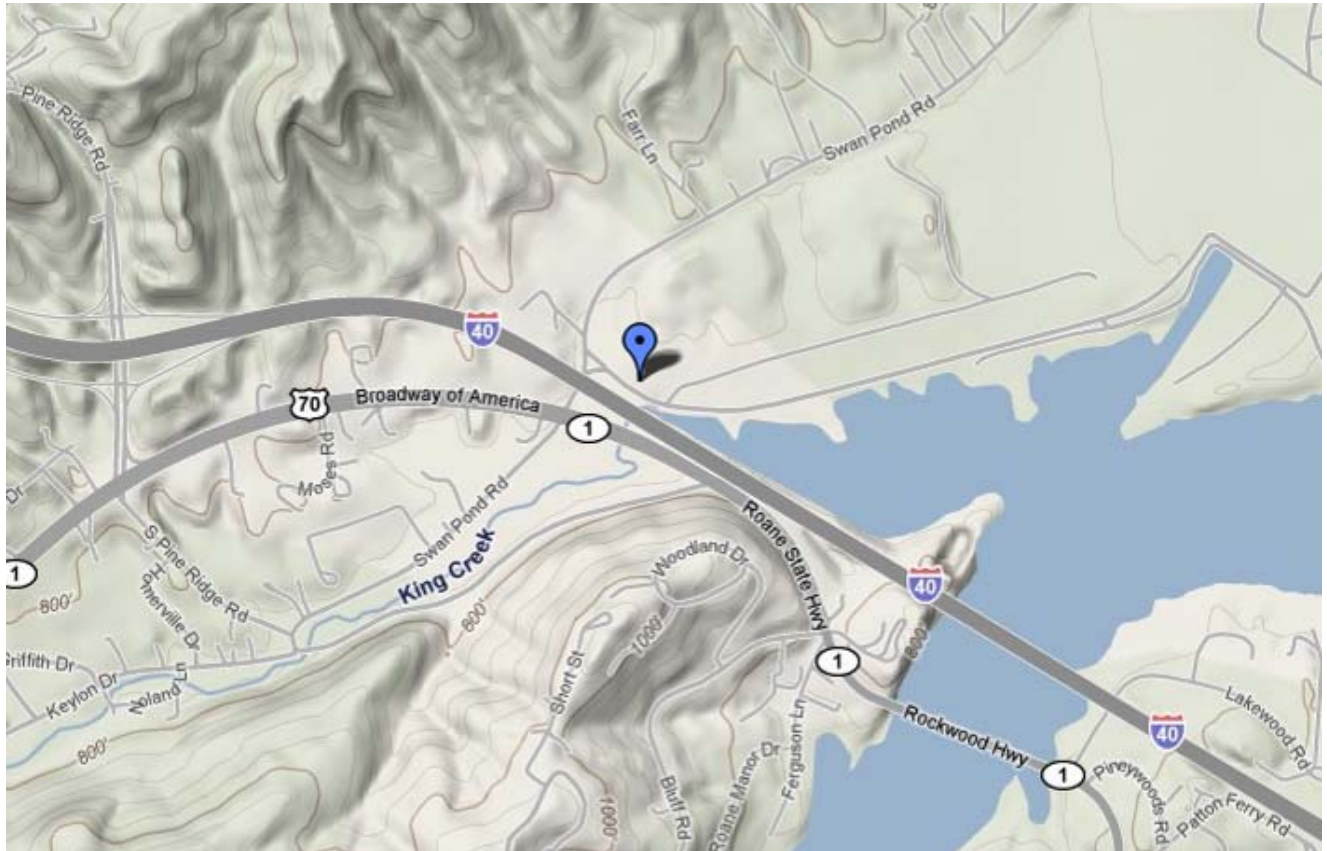


Figure 3-1. Kingston Fossil Plant Common Route

Four Subtitle D landfill locations are potential sites in Tennessee for ash removal placement: Anderson County, Athens, Dayton, and Oneida. If used, the Anderson County location (Chestnut Ridge Landfill) would be accessed by I-40 East to I-640 East/I-75 North to Exit 117 (SR 170) and right on Fleenor Mill Road. This route is approximately 50 miles in length (one way), and most of the route is interstate highway. The Athens Landfill would be accessed by I-40 East to I-75 South to Exit 49 (SR 30 [Decatur Pike]) to right on SR 750 (Piney Grove Road). This route is approximately 65 miles (one way). The Dayton Landfill would be accessed by I-40 West to Exit 347 (SR 27) toward Harriman/Rockwood, to Smyrna Road. This route is approximately 36 miles (one way). The Oneida Landfill would be accessed by Ruitan Road (SR 29) to US 27 to Bear Creek Road. This route is approximately 62 miles (one way). Figures 3-2 through 3-5 depict the four proposed routes.

Two Subtitle D landfill locations are potential sites for ash removal placement by railcar. The Taylor County Landfill is located near Mauk, Georgia. The Perry County Landfill is located near Uniontown, Alabama. Figures 3-6 and 3-7 provide the general locations of the two proposed landfill locations in proximity to KIF.

Kingston Dry Fly Ash Conversion

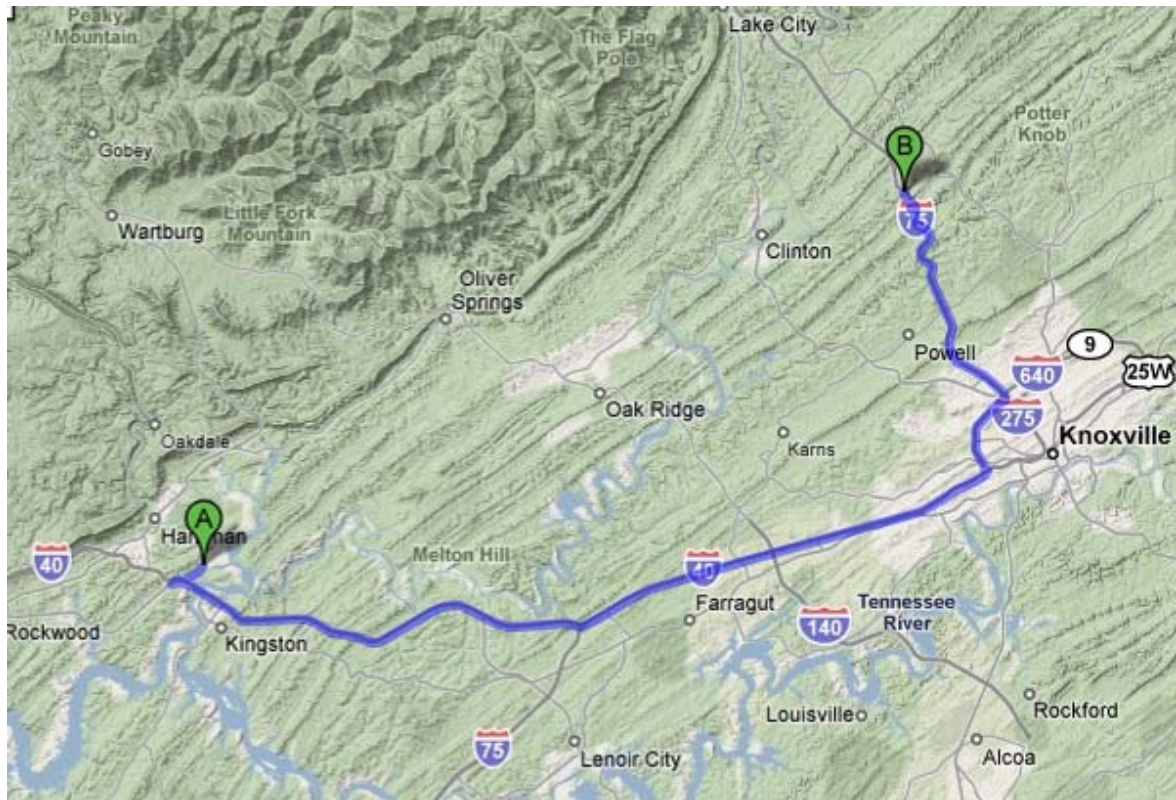


Figure 3-2. Area Map (Kingston to Anderson County Landfill)



Figure 3-3. Area Map (Kingston to Athens Landfill)



Figure 3-4. Area Map (Kingston to Dayton Landfill)

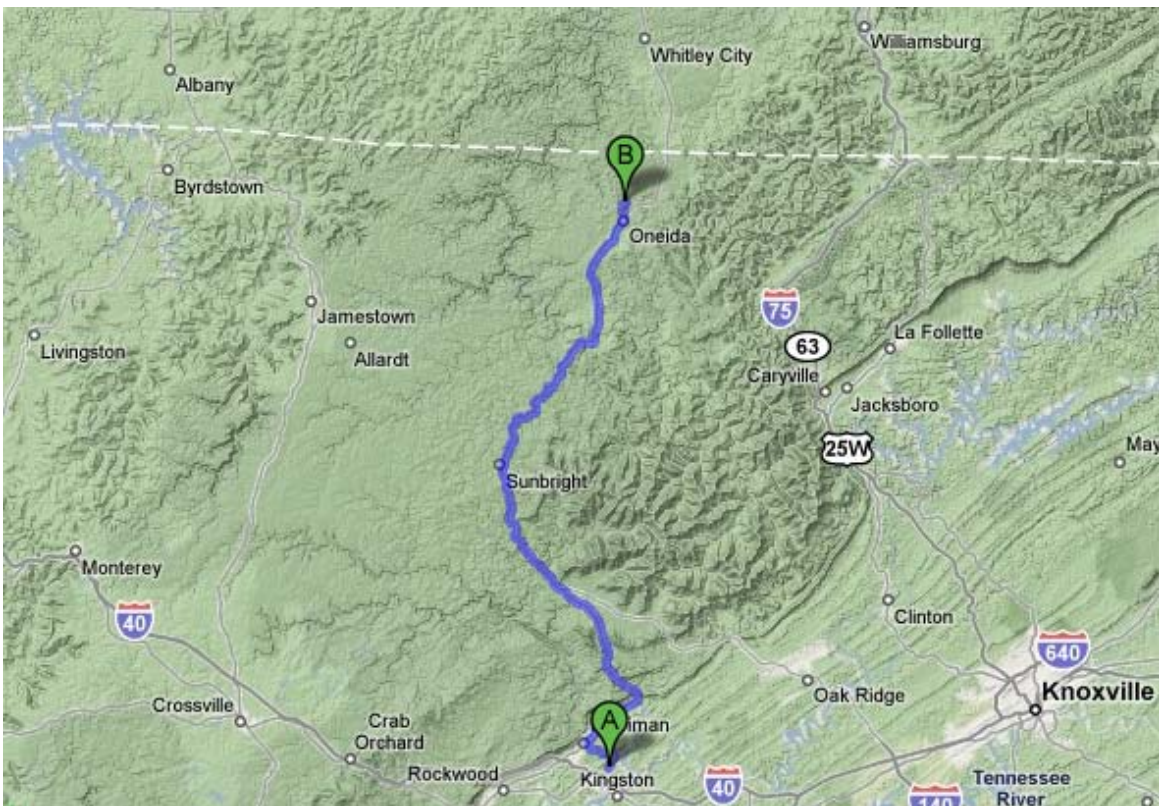


Figure 3-5. Area Map (Kingston to Oneida Landfill)



Figure 3-6. Area Map (General Location of Taylor County Landfill)

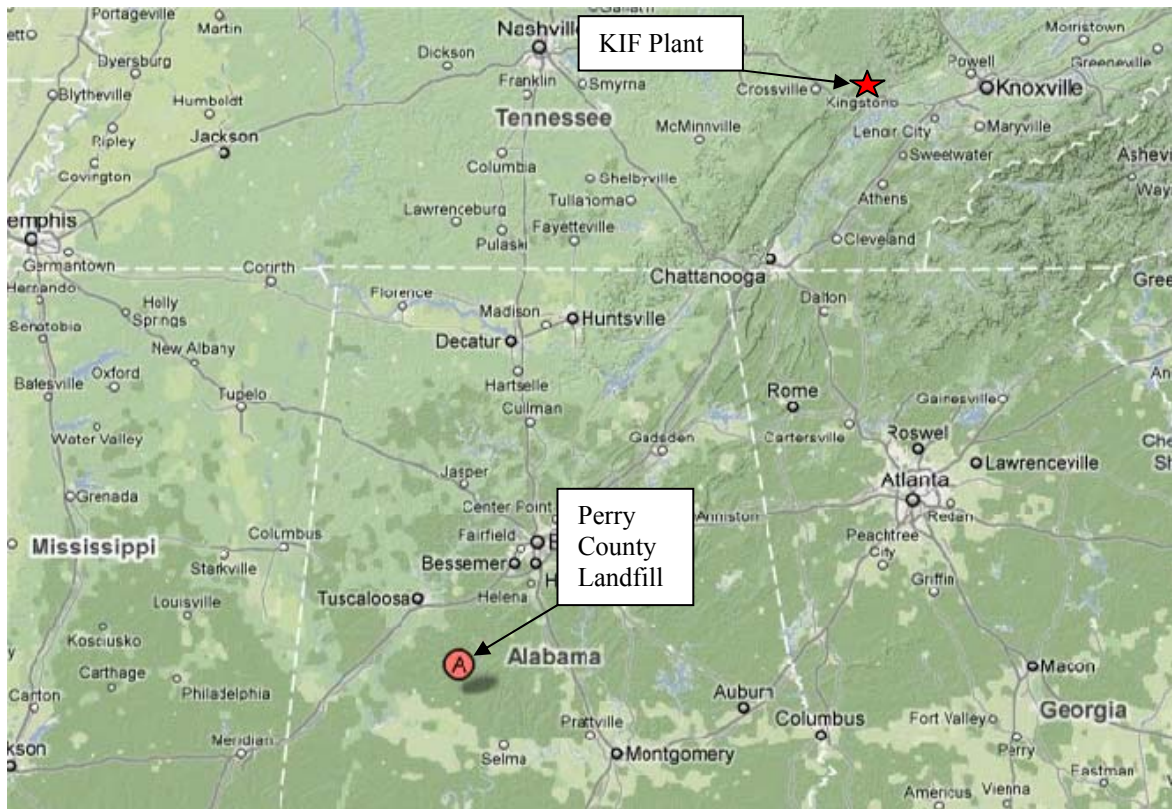


Figure 3-7. Area Map (General Location of Perry County Landfill)

3.4.2. *Environmental Consequences*

3.4.2.1. **No Action Alternative**

Under the No Action Alternative TVA would continue to operate the current CCP handling system consisting of wet impoundments. However, the ash would still have to be transported off site for disposal due to the lack of on-site disposal capacity for fly ash at KIF resulting in similar impacts to transportation resources as described below for the Action Alternative.

3.4.2.2. **Action Alternative**

This analysis evaluates the impacts of transporting ash materials by trucks on roadways and rail and includes the projected KIF annual production of 351,900 tons of dry fly ash material. Each truck has a 24-ton capacity, and the ash is to have 20 percent moisture content once it is loaded into the truck. Based on 200 workdays per year, approximately 90 truck trips per day would be generated on days that the fly ash is hauled. Likewise, for a 100-ton capacity railcar, 11 railcars per day would be needed for this amount of ash material.

Hauling dry ash material to locations off site of KIF, as stated above, would result in additional highway traffic. The *Highway Capacity Manual* (Transportation Research Board 2000) outlines methods for evaluating the operational conditions within a traffic stream. These methods take into account average highway speed, lane widths, shoulder widths, and alignment among other inputs. These methods define six levels of service (LOS), using the letters A through F:

- LOS A is defined as the highest quality of service that a particular class of highway can provide. It is a condition of free flow in which there is little or no restriction on speed or maneuverability caused by the presence of other vehicles.
- LOS B is a zone of stable flow. The restriction on maneuverability is negligible, and there is little probability of major reduction in speed or flow.
- LOS C is a zone of stable flow, but at this volume and density level, most drivers are becoming restricted in their freedom to select speed, change lanes, or pass.
- LOS D approaches unstable flow. Tolerable average operating speeds are maintained, but could be subject to considerable and sudden variation. This condition is tolerable for short periods.
- LOS E is unstable with lower operating speeds and some momentary stoppages. There is little independence of speed selection and maneuverability. The upper limit of this level is the capacity of the facility.
- LOS F indicates forced-flow operations at low speeds. The level of density increases to the effect of a traffic jam

Table 3-10 contains the AADT from 2008 with projected data and LOS data from the analyses, based on 90 truck trips for the days ash is hauled from the plant (Tennessee Department of Transportation 2008). The projected values for 2010 include: (a) 7 percent annual increase in AADT and (b) 7 percent annual increase in AADT plus the additional traffic due to hauling ash. The analyses assume that 100 percent of the additional traffic

would use Swan Pond Road, US 70, and Pine Ridge Road to reach SR 27 or I-40 and the final destinations.

As shown in Table 3-10, a drop in LOS occurs at Smyrna Road. Smyrna Road drops from a LOS of A to a LOS of B. The drop is due to an increase in the percent time spent following, which increases from 37.8 percent to 40.6 percent. In this case, the increase in following time is relatively small, and the drop in LOS is not substantial.

The remaining routes have varying LOS (A through E) with no other decreases in LOS. According to the *Highway Capacity Manual* (Transportation Research Board 2000), most design or planning efforts typically maintain service rates at LOS C or D, to ensure an acceptable operating service for facility users that minimizes the inconveniences resulting from traffic delays.

Two-lane portions of US 27 and SR 30 have the worst LOS of any of the routes examined. However, in both cases, the increased trips generated are less than 0.5 percent of the total AADT and do not result in an increased LOS rating.

It should be noted that the trips created from truck hauling are relatively small compared to the total increase in the project AADT. In most cases, the truck trips account for less than 0.5 percent of the increase for all the proposed routes. The 7 percent annual increase to the AADT should be considered the major driver in the LOS change. A more detailed look at prior year AADT counts for most of the proposed routes would show that a 7 percent increase is not occurring, with some routes actually having decreases. Therefore, the estimated truck trips would have a minor impact on these transportation networks.

The typical hauling days for KIF dry ash material would only be on the weekdays. It is unlikely that hauling would be done on weekends or holidays, which tend to be the peak traveling days for any highway.

Although the impacts of the trucks transporting ash materials would be minor on the transportation network, TVA's RFPs nonetheless would require potential bidders to consider reducing the potential impact of their KIF trucking activities upon the environment. Contractors would need to take into account such factors as air pollution, erosion control, noise control, solid waste disposal, and wastewater disposal, among other things. The contract would require that truck owners maintain trucks properly, including tune-ups. Truck routes would avoid schools, historic districts, and downtown areas to the extent possible. Additional requirements such as use of ultra-low sulfur diesel fuel and minimizing idling time would also be required.

Railroads

As stated above, 11 rail cars per day would be needed to transport the ash at 20 percent moisture content. If rail were used to haul the dry ash, the current plan would be only to haul ash once a week by rail, which would generate approximately 80 railcars a week. Two sites have been determined to have capacity and the capability to accept ash by rail at this time, the Taylor County Landfill in Mauk, Georgia, and the Perry County Landfill in Alabama, which is currently receiving ash from the KIF recovery efforts. It appears that the rail lines that connect the KIF to these two landfills generally follow a rural route. Rural areas tend to have fewer railroad crossings than urban areas. These areas have low AADT, and traffic congestion is normally not an issue. The two suggested landfill sites already have rail capacity, so new rail crossings would not be added to the rail network and therefore not create a potential stopping point for traffic flow. The addition of rail traffic on

existing lines would have a minor impact on the current LOS of the roads in the general vicinity of the two proposed landfills.

3.5. Cultural Resources

3.5.1. Affected Environment

East Tennessee has been an area of human occupation for the last 12,000 years. This includes five broad cultural periods: Paleo-Indian (11,000-8000 B.C.), Archaic (8000-1600 B.C.), Woodland (1600 B.C.-A.D. 1000), Mississippian (A.D. 1000-1700), and Historic (A.D. 1700 to present). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. In East Tennessee, during the 17th and 18th centuries, Europeans and Native Americans began interacting through the fur trading industry. European-American settlement increased in the early 19th century as the Cherokee were forced to give up their land. Roane County was established in 1801. During the Civil War, the commercial potential of local mineral deposits was recognized in the county. Around the late 19th century, the county benefited from many diversified industries that came to the area (Hall and Parker 1998).

The archaeological area of potential effect (APE) was determined as the proposed elevated pressure pipe, railroad spur, blower building, and two storage silos. The APE for architectural resources includes a 0.5-mile area surrounding the proposed facilities as well as any areas where the project would alter existing topography or vegetation in view of a historic resource. A preliminary records search was conducted prior to the survey, and no previously recorded archaeological or architectural resources were identified within the APE.

The archaeological survey (McKee and Karpynek 2009) identified no previously unrecorded archaeological resources within the APE. The architectural survey identified one previously unrecorded architectural resource at KIF within the APE.

3.5.2. Environmental Consequences

Under either alternative, the cultural resources investigations identified no previously recorded archaeological resources or architectural resources within the APE. The survey identified no previously unrecorded archaeological resources and one previously unrecorded architectural resource within the APE. The KIF facility does not retain a high degree of architectural integrity. It has undergone a series of modifications that have severely altered its appearance. Due to these alterations and modifications, KIF is recommended ineligible for the National Register of Historic Places.

Based on the above, TVA has determined that there will be no effect on historic properties. Pursuant to Section of 106 of the *National Historic Preservation Act*, TVA is currently in consultation with the Tennessee State Historic Preservation Officer regarding these findings and recommendations.

3.6. Cumulative Impacts

Implementation of the Action Alternative could result in annual emission of approximately 16.7 tons of fine PM less than 10 microns in size. This is under the 25-ton threshold established for PSD permitting. Water usage could be reduced by 25 MGD with an approximate 80 percent reduction in the discharge of arsenic, boron, chloride, fluoride, sulfur, and selenium from the ash pond. Impacts to landfills would be associated with

reducing capacity for municipal waste in Subtitle D landfills under either the Action or No Action Alternatives. Traffic impacts would be similar under both alternatives since no LOS drops are expected with one exception: for Smyrna Road that could experience a LOS drop from A to B because of following distance. This roadway is located off US 27 near Dayton, Tennessee, and is the last road leading into the landfill.

CHAPTER 4

4.0 LIST OF PREPARERS

4.1. NEPA Project Management

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Position: Senior NEPA Specialist
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Experience:	38 years, Cultural Resource Management
Involvement:	Cultural Resources

CHAPTER 5

5.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES ARE SENT

Federal Agencies

National Park Service
U.S. Department of Energy
U.S. Environmental Protection Agency

State Agencies

Tennessee Department of Environment and Conservation
Tennessee Wildlife Resources Agency

Individuals

The Honorable Mike Farmer
Mayor of Roane County
Kingston, Tennessee

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CHAPTER 6

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