Document Type: EA-Administrative Record
Index Field: Environmental Document Transmitted Public/Agencies
Project Name: JOF Dike Stabilization
Project Number: 2009-59

ENVIRONMENTAL ASSESSMENT

JOHNSONVILLE FOSSIL PLANT DIKE STABILIZATION

Humphreys County, Tennessee

PREPARED BY:
TENNESSEE VALLEY AUTHORITY

IN COOPERATION WITH
UNITED STATES ARMY CORPS OF ENGINEERS

FEBRUARY 2010

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HUMPHREYS COUNTY, TENNESSEE

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The Proposed Decision and Need

Tennessee Valley Authority (TVA) proposes to enhance the stability of approximately 1,600 linear feet of a dike that supports the northeast side of an ash storage area located at its Johnsonville Fossil Plant (JOF) near New Johnsonville in Humphreys County, Tennessee (see Figure 1). The proposed project would include clearing vegetative cover and riprap from the existing dike face; extending the thickness of the dike wall both above and below the normal summer and winter pool elevations (~359 feet and 354 feet, respectively) with riprap and clay; and stabilizing the dike surface by seeding to establish a vegetative cover. Construction activities would begin February 2010 and would be complete by June 2010.

The proposed project is necessary to meet safety standards set by the U.S. Army Corps of Engineers (USACE) as well as to allow TVA to perform routine dike maintenance without affecting slope stability. From geotechnical borings, TVA has determined that the subject dike section to be stabilized has a factor of safety less than 1.5. The proposed action is needed to increase the factor of safety to greater than 1.5 to prevent potential failure. A minimum static safety factor of 1.5 or greater has been determined to be sufficient for coal ash dikes. The engineering term "safety factor" describes the structural capacity of a system beyond the applied loads or actual loads. A summary of the scope of the geotechnical exploration and stability analysis is contained in Attachment A. A general description of the existing dike conditions and a preliminary (Phase 1) evaluation assessment of dike stability is available online at http://www.tva.gov/power/stantec/.

Scope of Environmental Review

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 environmental assessment (EA) to evaluate alternatives for stabilizing and regrading the northeast side of the JOF ash storage area, identify and evaluate potential environmental impacts, describe any conditions or commitments required, and communicate its findings to agency decision-makers and the public. Because the USACE would issue a permit under Section 404 of the *Clean Water Act* for the project and, therefore, must also comply with NEPA, USACE is a cooperating agency in the preparation of this EA.

TVA staff conducted internal scoping of potential environmental issues and completed a draft categorical exclusion checklist (CEC) No. 21069 (see Attachment B) for the proposed project. Because a mussel survey of the project area indicated a high-quality mussel bed that may support endangered mussel species, TVA made the determination to prepare this EA to address aquatic ecology, terrestrial ecology, endangered and threatened aquatic and terrestrial animal species, and floodplain impacts.

Figure 1. Johnsonville Fossil Plant Dike Stabilization Project Vicinity

Based on its preliminary evaluation documented in the attached CEC 21069, TVA determined that impacts to wetlands, cultural resources, visual or aesthetic resources, natural areas, air quality, noise, navigation, transportation and recreation would be absent or minor. No production of hazardous waste, wastes 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 regulations.

Other Environmental Reviews and Documentation

Documents that influenced the scope of this EA include:

- Draft TVA CEC 21069 (Attachment B) documents issues to be excluded from detailed evaluation in this EA.

- TVA Biological Assessment (BA), January 7, 2010, with USACE, Nashville District, as a cooperating agency (Attachment C) documents potential impacts to endangered and threatened species as part of formal consultation with the U.S. Fish and Wildlife Service (USFWS).

- Stantec Consulting Service Inc., June 24, 2009, *Report of Phase I Facility Assessment – Coal Combustion Product Impoundments and Disposal Facilities* located online at http://www.tva.gov/power/stantec/) provides a description of dike conditions.

Plans, permits certification and consultation requirements include:

- An Erosion Prevention and Sediment Control (EPSC) Plan would be required prior to any land-disturbing activity on the project site.

- A USACE permit under Section 404 of the *Clean Water Act* that allows for discharge of dredged or fill material into waters of the U.S.

- USFWS consultation requirement under Section 7 of the *Endangered Species Act* because of the presence of federally-listed species within the project area.

- Tennessee Department of Environment and Conservation (TDEC) 401 water quality certification (Attachment D) affirms that the discharge would not violate water quality standards.

Alternatives and Comparison

TVA considered two alternatives: the No Action Alternative and the Proposed Action Alternative.

No Action Alternative

Under the No Action Alternative, TVA would not stabilize the dike that supports the northeast side of the ash storage area at JOF. The dike's condition would continue to be of concern. Further, the dike structure would not meet USACE's safety requirements. Environmental conditions in the project area would remain unchanged. Adoption of this alternative would not meet TVA's project objectives and need to ensure that its ash ponds meet minimum safety requirements. No impacts to aquatic and terrestrial resources and the 100-year floodplain would occur. However, should the dike fail, potential adverse

impacts to those resources would include coal ash and debris materials filling the embayment in the vicinity of the JOF ash storage area.

Action Alternative

Under the proposed Action Alternative, TVA would stabilize and regrade the dike supporting the northeast side of its ash storage area at JOF. Aquatic life and habitat would likely be indirectly affected from storm water runoff resulting from construction and maintenance activities, which could result in elevated levels of suspended solids and sediment deposition. Best management practices (BMPs) would be used to reduce the short-term effects from sediment runoff. Approximately 151 pink mucket mussels would likely be indirectly affected from disturbance and habitat alteration. The effects are not expected to result in the death of individuals but would likely reduce the amount of suitable habitat for the pink mucket and other mussels in the affected area. Furthermore, adoption of the Action Alternative would result in the loss of about 9.0 acre-feet of flood control storage in Kentucky Reservoir; however, the amount of lost flood control storage has been minimized while achieving the project objectives. Therefore, the project complies with the TVA Flood Control Storage Loss Guideline.

Proposed Project Description

The JOF ash storage area is situated on a 125-acre island within Kentucky Reservoir and has been in operation for 40 years. It has been at its current top-of-dike elevation since 1978. The area within the dike perimeter is approximately 87 acres. The perimeter dike is 25 to 30 feet in height and is approximately 2 miles in length. The southern one-third of the area contains three impoundments (Ponds A, B, and C) that total about 26 acres in surface area and contain about 330 acre-feet in water storage volume. Accumulated ash is periodically dredged and disposed elsewhere to maintain the required water storage volume in the ash pond.

The northern two-thirds of the storage area contains sluice channels, a temporary bottom ash stacking area, and several temporary dredge cells. Geotechnical issues associated with this facility include stability and seepage. Along the east and southeast sides, exterior slopes are steep and stand at 1.6 units horizontally for each vertical unit (1.6H: 1V). Previous stability issues in 2001 and 2009 in these areas were addressed using riprap and geotextile fabric or perforated pipe/crushed stone collection system. Those areas have remained stable since the improvements.

The proposed action would include construction of a rock-toe buttress depicted in Figure 2 that would provide additional stabilizing weight at the dike toe and would stabilize the steep bank above the water's edge against erosion. The stabilization would also include placing clay to flatten the exterior slope of the dike to a minimum of 2.5H:1V as depicted in Figure 2. Seepage collection filters would be placed at several points along the toe of the dike prior to placing the soil and against the lower bank before placing the riprap. Once in place, the filters would collect water from seeps, reduce saturation of the new clay fill, and safeguard against soil piping.

Site Preparation and Work Conditions - All work near the water would take place when the reservoir level is at or within two feet of normal winter pool (elevation 354.0 feet above mean sea level [feet msl]). Work would be halted when the pool level is above elevation 356.0 feet above msl or forecasted to be higher during a work shift. An Erosion Prevention and Sediment Control (EPSC) Plan would be implemented prior to any land-disturbing activity on the project site. All EPSC BMPs would be maintained at all times and regularly inspected. The

first BMP would be the installation of perimeter silt fencing prior to land disturbance activities.

Prior to construction of the rock-toe buttress, all trees on the bank slope along the Boat Harbor Channel would be cut, and the remaining trunk, stump, and roots would be disposed of at an approved disposal site. The bank slope would be graded to allow for placement of the graded filter and riprap. In order to minimize potential impacts, as a BMP, disturbed areas of the bank slope would be stabilized before the contractor leaves the site each day during this phase of the project. Furthermore, to achieve stabilization, all disturbed soil or sand (components of the graded filter) would be covered with a layer of aggregate.

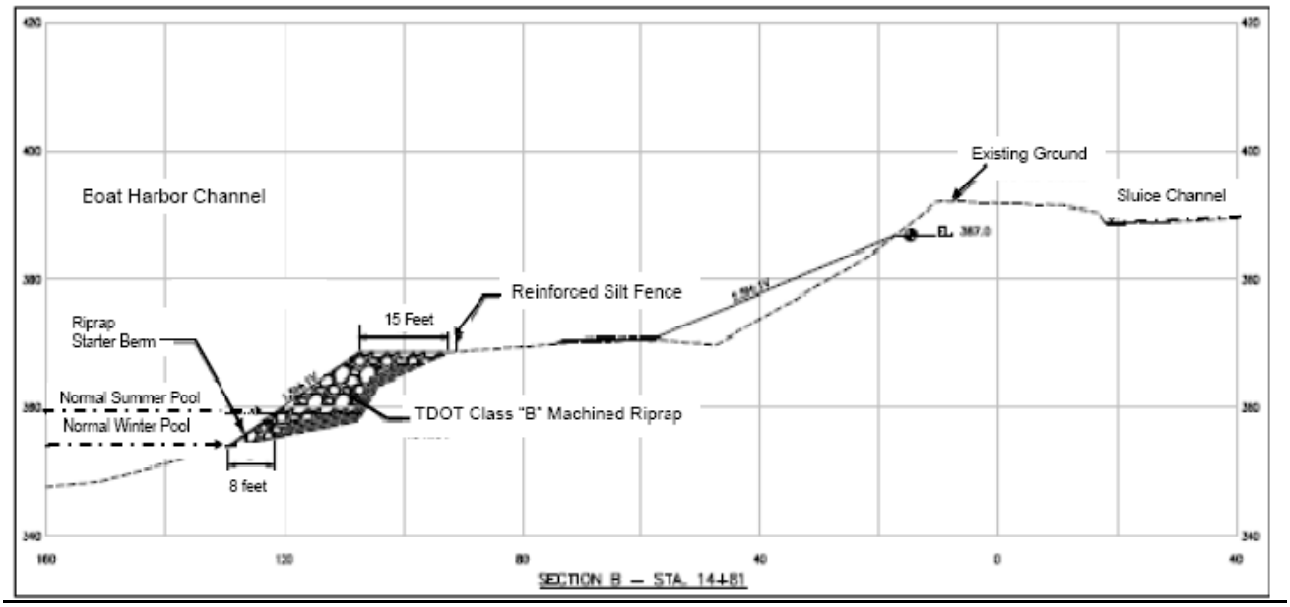

Figure 2. Example Cross-Section View of Dike Properties and Stabilization Actions

Phase I Construction - The first portion of the rock toe buttress to be constructed would be a small riprap berm along the water's edge. It would act as a barrier to prevent the material used to construct the graded filter and rock buttress from sliding into the Boat Harbor Channel during placement. The berm would be approximately 8 feet wide (perpendicular to the shoreline) and approximately 2 feet tall. The riprap would be pressed into the soil by a mechanical excavator to ensure that it holds in place.

The second portion of the buttress to be constructed is the graded filter. Sand would be placed and spread by an excavator and/or by hand to a minimum thickness of 6 inches. This would be followed by a 6-inch layer of Tennessee Department of Transportation (TDOT) #57 aggregate and a 6-inch layer of TDOT #2 aggregate. As stated above, placement of aggregate over the sand would be required on a daily basis before the contractor leaves the site to ensure stabilization.

The third portion of the rock toe buttress to be constructed would be the placement of the remainder of the riprap. The riprap would be set into place by mechanical means until the dimensions shown on the plans have been met. The maximum height riprap would be dropped would be 2 feet to help ensure that rocks would not roll into the water beyond the initial riprap berm.

A reinforced silt fence would be installed adjacent to completed sections of the rock toe buttress immediately after they are finished. Clay fill placement on the dike slope would not begin until the silt fence has been installed immediately below.

Phase II Construction - The second phase of construction would be the placement of clay fill on the dike slope. Fill placement could be performed concurrent with the construction of the rock toe buttress, but a section would not be started until the rock toe buttress was finished immediately below. Prior to placing fill to create the 2.5H:1V slopes, the existing slope would be cleared of vegetation and top soil. All debris from clearing operations would be disposed of at an approved disposal site.

Regrading of the dike slope would begin along the toe of the slope and progress uphill. Shallow slope serrations/benches would be excavated to provide proper bond between the new fill and existing slope. Slope serrations would be backfilled as soon as practical and all slope serrations would be backfilled before the contractor leaves the job site for the day. Backfill would consist of clay material placed in 8- to 10-inch lifts and compacted to a specific density. Material would be placed on the dike until the new 2.5H:1V slope has been achieved. Also, installation of erosion-control blankets would be installed immediately after a section has been completed. Seeding, mulching, and fertilization of disturbed areas would be completed as soon as practical after regrading activities.

Project Maintenance - The newly flattened slopes would be mowed about once every two weeks along with the other perimeter dikes surrounding the ash pond. The rock toe buttress would be maintained by trimming overgrown vegetation or spraying with an approved herbicide. Per TVA's herbicide application guidelines, no herbicide would be allowed to enter surface waters. It is not anticipated that periodic repairs would be required to maintain the flattened dike or the rock buttress.

Other Alternatives Not Considered in Detail

TVA considered the use of sheet piling to enhance the stability of the dike. This activity was deemed dangerous because the vibration generated from the sheet piling driving could reduce the stability of the adjacent dike. The sheet piling alternative would also be more costly than the proposed alternative. Therefore, TVA eliminated the use of sheet piling from detailed consideration in this EA. TVA also considered early closure of the ash storage area in the 2012 time frame. However, some form of stabilization would still be needed for the northeast section prior to closure to be in compliance with USACE safety requirements.

Affected Environment and Evaluation of Impacts

As previously stated, JOF is located near New Johnsonville, which is in west-central Tennessee, approximately 65 miles west of Nashville. The plant is situated on the eastern shore of Kentucky Reservoir. It is approximately 3,000 feet north from the U.S. Highway 70 bridge that crosses Kentucky Reservoir, and 2.5 miles south from the Tennessee River and Trace Creek confluence.

The ash storage area at JOF is situated on a 125-acre island centered approximately 2,000 feet west of the plant's powerhouse. The island is connected to the mainland by a 1,000-foot causeway that supports an asphalt access road and the discharge piping from the plant to the sluice channel in the storage area. The island is surrounded by Kentucky Reservoir to the west and two dredged channels for coal unloading/barge mooring (Boat Harbor Channel) and condenser cooling water (CCW) intake to the east. Figure 1 provides a plan view of the active ash storage area.

The ash storage area is approximately 87 acres in area, and it is enclosed by a dike approximately 10,000 feet in length. The top of the dike supports a gravel access road and is at an elevation of 390 feet, which is 30 to 35 feet above the Kentucky Reservoir summer pool level. The dike slopes average about 25 feet in height and vary in steepness from 1.6H:1V throughout the east side of the storage area to greater than 2H:1V on the Kentucky Reservoir side. The slopes are vegetated with grasses and early successional scrub-shrub plant species. Stands of mature trees exist at various locations around the lower perimeter near the pool level for Kentucky Reservoir. Also, the length of the lower dike on the western perimeter is covered by a 3,500-foot blanket of riprap for wave wash protection.

Aquatic Ecology

Affected Environment

The proposed JOF ash storage site is located within the Interior Plateau ecoregion and within the Kentucky Reservoir impoundment of the Tennessee River, which extends from Kentucky Dam at Tennessee River Mile (TRM) 23 upstream to Pickwick Dam (TRM 207). To maintain the depth required for navigation, the water level in the reservoir is kept at a minimum winter elevation of 354 feet msl. The typical summer target pool elevation is 359 feet msl.

The project site is part of Johnsonville Island, which was initially part of a dike system created by TVA to provide a protected embayment around JOF and was eventually expanded for use as a location to store coal ash. The island has a causeway that extends to the right-descending bank, which allows for vehicle access and transport of coal ash (see Figure 1). The causeway prevents otherwise normal upstream-to-downstream flow along the east side of the island; however, the CCW intake for JOF is upstream of the dike, and the CCW discharge is downstream of the dike, which does provide for some movement of water east of the dike and along the proposed project area. The effluent is warmer than the receiving reservoir waters, and apparently enough flow is created by the effluent to prevent accumulation of deep silt on the riverbed along the southern portion of the JOF project area.

As previously stated, most of the project would take place above the water level and appropriate BMPs would be used to minimize potential impacts to water quality and aquatic ecology. Therefore, there are little to no anticipated impacts to the general water quality or aquatic ecology. However, benthic organisms may be indirectly impacted, particularly mussel species. Therefore, only the affected environment and potential impacts associated with these aquatic resources are discussed further in this EA.

Environmental Consequences

No Action Alternative

Under the No Action Alternative, no immediate changes to environmental conditions would occur, and there would be no immediate effects to aquatic animals and nearby habitat. However, if no action is taken to stabilize and reinforce the dike, there is potential for dike failure in the future because it is currently below the recommended safety factor. Such an event would bury mussels and other benthic organisms in the embayment, as well as cover aquatic habitat used by benthic invertebrates and fish. Should the dike fail, potential adverse impacts to aquatic species and habitat would likely occur.

Action Alternative

Under the Action Alternative, TVA would approve the JOF risk remediation measures requiring clearing of existing cover, reinforcing the dike toe with riprap, and extending the thickness of the dike wall. Nearly all of the proposed actions would be completed in February and March 2010, while the river is below the normal winter pool elevation of 354 feet msl, but three potions of the project area would extend beyond that elevation into the river and would directly impact benthic habitat totaling 3,418 square-feet (Figure 3). However, due to disturbance from wave action and changing conditions along the bank as reservoir levels fluctuate, this habitat probably provides relatively little value as aquatic habitat to fish, mussels, and many invertebrates. Therefore anticipated impacts to these areas would not be major.

Lateral extension of the dike would modify available habitat between the normal winter pool elevation (354 feet msl) and normal summer pool elevation (target of 359 feet msl) between about April and October. Additionally, it is possible that a shift in the effective summer pool bank could alter flow patterns adjacent to the dike that could ultimately alter the benthic habitat near the project. The degree and extent of such changes are unclear, but such changes could affect an area extending the entire length of the project (2,350 feet). Indirect effects could extend from the bank along the existing dike (below 354 feet msl) eastward to the line of barge mooring cells running parallel with the dike approximately 100 feet away. Using ArcGIS (v.9.3) software and Global Positioning System coordinates of the project elements, an estimated area of 238,570 square-feet could be indirectly affected (see Figure 3). Changes in habitat (e.g., flow patterns, water conditions, and substrate composition) could in turn alter the composition and density of mussels and other invertebrates within the area.

Aquatic life could be indirectly affected from storm water runoff resulting from construction and maintenance activities, which could result in elevated levels of suspended solids and sediment deposition. Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of many fish species (Sutherland et al. 2002). Likewise, mussel species and other invertebrates adapted to firm mixtures of sand, gravel, and larger substrate particles composing the river bottom can suffer impairment to respiration, feeding, and reproduction from silt that clogs the gills and buries the animals (Aldridge et al. 1987; Parmalee and Bogan 1998). However, given the use of appropriate BMPs in conjunction with the construction and maintenance methods, as previously described, the effects from sediment runoff should be short-term and generally minor.

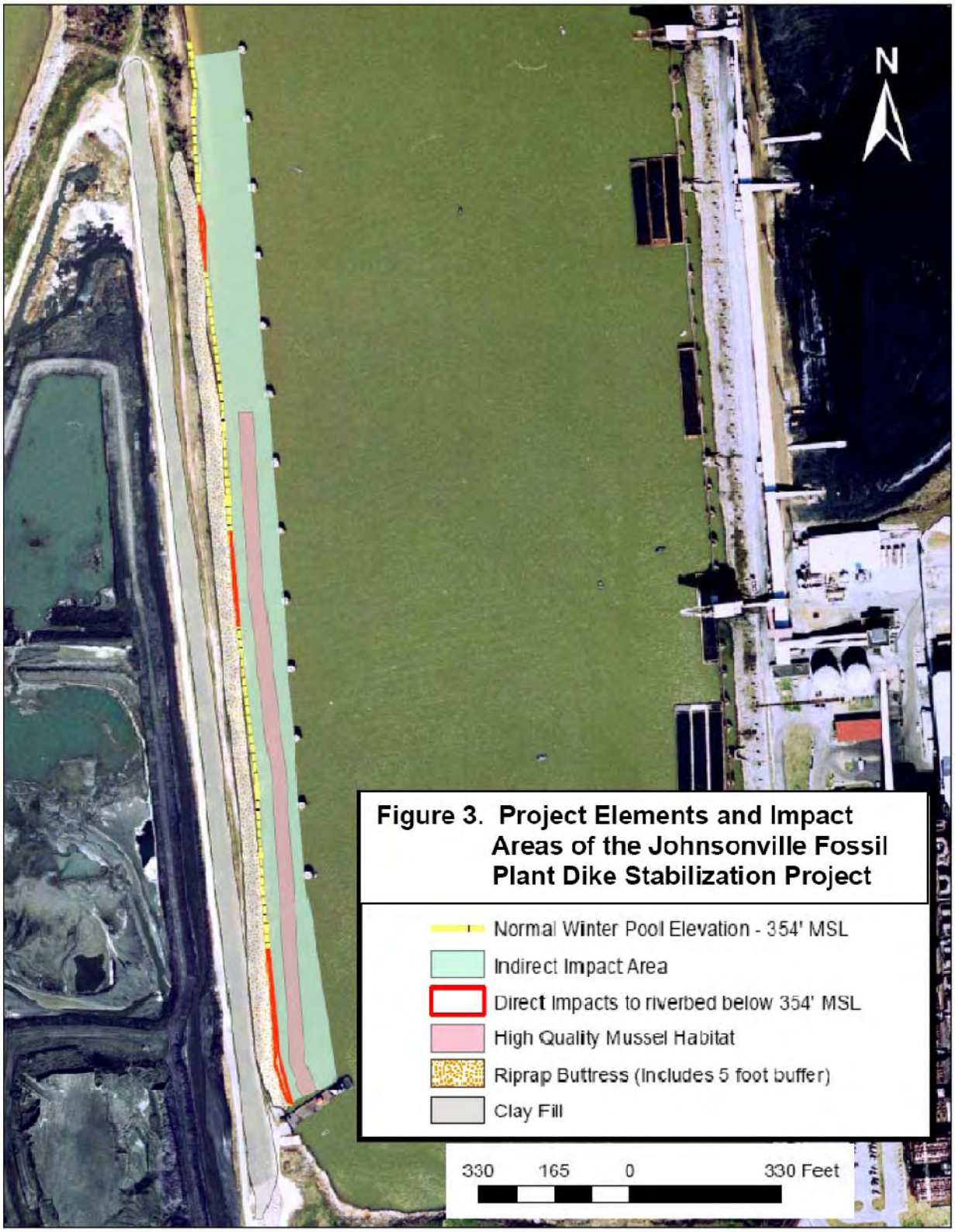

Figure 3. Project Elements and Impact Areas of the Johnsonville Fossil Plant Dike Stabilization Project

Terrestrial Ecology (Animals)

Affected Environment

The project area is characterized by herbaceous vegetation growing through riprap and early successional scrub-shrub vegetation above 354 msl, which is then surrounded by a heavily modified landscape that includes roads, mooring cells (in the embayment), barge terminals, and the coal ash storage site.

Birds typical of shoreline linear vegetative habitat along large bodies of water include wading birds such as great blue heron, red-winged blackbird, belted kingfisher, and several species of sparrow. Mammals sometimes observed in these habitats include common raccoon, eastern cottontail, striped skunk, and rodents such as white-footed mouse and hispid cotton rat. Common reptiles include black racer, black rat snake, eastern garter snake, common snapping turtle, and river cooter. Habitat at the project site is not suitable for amphibians.

The TVA Natural Heritage database indicated that no wading bird colonies and no recorded caves are present within 3 miles of the ash storage area.

Environmental Consequences

No Action Alternative
Under the No Action Alternative, TVA would not stabilize the dike that supports the eastern margin of its ash storage area at JOF. The project area would therefore remain in its current condition, and there would be no direct, indirect, or cumulative impacts on wildlife or wildlife habitat. However, if the dike were to fail, potential adverse impact to wildlife and wildlife habitat could occur because the surrounding area would likely be covered in ash.

Action Alternative
The surrounding landscape is already heavily modified, and the close proximity of the ash storage area decreases the quality of habitat to wildlife in the area. Any terrestrial animals present in the area may move into surrounding similar habitat during construction activities. Therefore, impacts of the Action Alternative to terrestrial animal habitat and wildlife would be minor.

Endangered and Threatened Species

Species listed at the federal level as threatened or endangered are protected under the *Endangered Species Act*, which is administered by the U.S. Fish and Wildlife Service (USFWS). Section 7 of the act requires federal agencies to consult with USFWS in situations where a federal action may adversely affect federally listed species or their habitats.

Aquatic Animals

Affected Environment

A search of the TVA Natural Heritage database indicated 11 federally and state-listed aquatic animal species (Table 1) are recorded from within 10 miles of the JOF project area. One federally listed fish species, pygmy madtom, is an inhabitant of the free-flowing portions of the Duck River system (a tributary to the Tennessee River upstream of the project). Four federally listed mussel species, orangefoot pimpleback, pink mucket, ring pink, rough pigtoe, and one mussel species listed as a candidate for federal listing, slabside

pearlymussel have historically occurred within 10 miles of the proposed project area. All of these species, except for the pink mucket, have not been observed near JOF in at least 25 years. This is likely because these mussels have not adapted well to reservoir habitat conditions since the impoundment of the Tennessee River. They are presumed to be extirpated from the river near the proposed dike stabilization project area. However, the pink mucket is known to occur in the vicinity of JOF and could potentially occur in the proposed project area.

Although four state-listed fish species are known from within 10 miles of the project area, none of these species would be found near the project site due to lack of suitable habitat. Lastly, one state-listed snail, ornate rocksnail, prefers habitat with flowing water conditions and could potentially occur within the proposed project area

Table 1. Federally and State-Listed Aquatic Animals Known to Occur Within a 10-Mile Radius of the Proposed JOF Dike Project Area

Common Name	Scientific Name	State Status[1] (State Rank)[2]	Federal Status
Fishes			
Coppercheek Darter[3]	*Etheostoma aquali*	THR (S2S3)	-
Golden Darter[3]	*Etheostoma denoncourti*	NMGT (S2)	-
Pygmy Madtom[3]	*Noturus stanauli*	END (S1)	END
Saddled Madtom[3]	*Noturus fasciatus*	THR (S2)	-
Slenderhead Darter[3]	*Percina phoxocephala*	NMGT (S3)	-
Mussels			
Orangefoot Pimpleback[4]	*Plethobasus cooperianus*	END (S1)	END
Pink Mucket	*Lampsilis abrupta*	END (S2)	END
Ring Pink[4]	*Obovaria retusa*	END (S1)	END
Rough Pigtoe[4]	*Pleurobema plenum*	END (S1)	END
Slabside Pearlymussel[4]	*Lexingtonia dolabelloides*	TRKD (S2)	CAND
Snails			
Ornate Rocksnail	*Lithasia geniculata*	TRKD (S3)	-

[1] Status codes: END = Endangered; CAND = Candidate for federal listing; TRKD = Tracked by state Natural Heritage program
[2] State Ranks: S1 = Critically imperiled; S2 = Imperiled
[3] There is a lack of recent field information verifying the continued existence of the species in the vicinity of the project and it is considered to be extirpated due to general habitat loss.

Mussel Survey

Kentucky Reservoir is known to support a diverse and abundant native mussel community. Because pink mucket could occur in the project area, a mussel species and habitat survey of the area adjacent to the proposed JOF dike project was conducted in November 2009. The survey served to characterize the mussel species composition (including federally and state-listed species), species distribution, and habitat (see Attachment C). A total of 1,946 mussels representing 16 species were collected in the survey area adjacent to the dike. Several mussel species were collected, but no live federally or state-listed listed mussels were found. However, one relic shell of the federally listed pink mucket was collected in the southern portion of the survey area (Figure 3).

Approximately 81 percent of the mussels collected were between 30 feet and 60 feet from the shoreline along the existing dike (Figure 3). Riverbed substrate composition of the habitat where the mussels were abundant consists of a gravel and clay mixture with some small proportions of silt and sand. Substrate was mostly silt/mud or clay in areas where relatively few or no mussels occurred. The existing substrate conditions adjacent to the dike are the result of natural geomorphology and dike substrate composition, as well as flow patterns that transport (erode or deposit) sediment particles. Water depth in the study area increased with distance from the bank and reached a maximum of 16 feet at about 100 feet off the bank. Water depth also tended to increase along the dike in a north-to-south direction. The water depth where high-quality mussel habitat was found ranged from 6 feet to 14 feet deep (see Attachment C).

The majority of the mussels collected were found within the southern portion of the survey area in an approximately 100 foot area alongside the dike. The mussel density observed in this area is an indicator of high-quality mussel habitat. The high-quality mussel habitat area was delineated by the locations generally containing mussel densities measured in the field (*e.g.,* ≥5 mussels/*cubic-meter (*m^2]) and/or catch-per-hour rates of ≥300 mussels/hour (see Attachment C). A simplified depiction of the high-quality mussel habitat area is shown in Figure 3.

Mussel density in this portion of the survey area was 9.1 mussels/square-yard (yd^2) (10.9 mussels/m^2). But this mussel density estimate is likely subjective because only the substrate surfaces were sampled along transects. So TVA recalculated the density estimate using Tennessee River data from both substrate surface samples and true quantitative samples excavated from a known area. The study results indicated that a more accurate mussel density is often about three times the density estimated from surface samples alone. Based on the study results, the recalculated density estimates indicate that actual mussel density within the high-quality habitat near the JOF dike is 27.3 mussels/yd^2 (derived from 9.1 x 3). Because the size of the high-quality mussel habitat is 5,520 yd^2 (4,615 m^2) TVA estimates that approximately 151,000 mussels inhabit the survey area.

Because rare mussel species, such as pink mucket, tend to be found in areas of high-quality mussel habitat with high-species richness (e.g., ≥15 species) and high density (e.g., ≥8.4 mussels/yd^2 or ≥10 mussels/m^2), TVA has determined that pink mucket would likely occur within the survey area designated as having high-quality habitat (Figure 3).

Environmental Consequences

No Action Alternative

Under the No Action Alternative, no immediate changes to environmental conditions would occur, and therefore there would be no immediate effects to federally or state-listed aquatic animals. However, if the No Action Alternative were adopted and the dike is not stabilized, there would be potential for dike failure in the future because it is currently below the recommended safety factor prescribed. Should the subject dike fail adverse impacts to listed aquatic animal species and their habitat would likely occur by covering the riverbed and permeating the water column with coal ash in the vicinity of the JOF ash storage pond.

TVA estimates that the pink mucket, based on frequency data from this survey and other mussel studies on the Tennessee River, constitutes 0.1 percent of mussels within the high-quality mussel habitat near the project area. Therefore, 0.1 percent of about 151,000 mussels estimated to occur in this bed (or 151 pink mucket mussels) may be present in the

study area. Furthermore, many more individuals of the pink mucket and other mussel species within the Boat Harbor Channel, and potentially Kentucky Reservoir, would likely be impacted by suspended particles of sediment and coal ash, depending on the size of the release spill.

Action Alternative

Under the Action Alternative, the potential to impact the pink mucket would result from long-term mussel habitat modification between the dike and the mooring cells that could result from a shift of the bank toward the Boat Harbor.

An estimated area of 238,570 square-feet in the reservoir could be indirectly affected by the proposed project. Furthermore, survey estimates indicate that approximately 49,670 square-feet of high-quality mussel habitat capable of supporting pink mucket could be indirectly affected by the proposed project. Changes in habitat (e.g., flow patterns, water conditions, and substrate composition) could in turn alter the composition and density of mussels and other invertebrates within the survey area.

Lateral extension of the dike would modify available habitat between the normal winter pool elevation (354 feet msl) and normal summer pool elevation (target of 359 feet msl) between about April and October. Additionally, it is possible that a shift in the effective summer pool bank could alter flow patterns adjacent to the dike that could ultimately alter the benthic habitat in the survey area.

High-quality mussel habitat occurs in a well-defined, narrow band between areas heavily affected by tow wash and flow patterns at the bank. Flow patterns are affected by reservoir levels and flow rates, topography and structures near the project (natural or man-made), and anthropogenic effects on flow from tow propeller wash and effluent from the JOF facility. There is potential for a shift of the effective bank toward that habitat and toward active tow activity. This could have the effect of either displacing the mussel bed away from the bank toward the area disturbed by tow traffic, or (if tow disturbance limits the displacement) reducing the area of suitable habitat available for mussels. Potential impacts associated with nearby tow activity and commercial mussel harvesting on the local mussel community, including pink mucket, are not expected to vary considerably from the range of past and present conditions. These additional factors have been considered when evaluating cumulative effects on pink mucket.

Changes in habitat (*e.g.*, flow patterns, water conditions, and substrate composition) could in turn alter the composition and density of mussels and other invertebrates within the survey area. Pink mucket could be indirectly affected by the proposed project because of the predicted reduction of the amount of high-quality mussel habitat presently available for pink mucket and other mussels in the affected area. Therefore, TVA determined that implementation of the Action Alternative is likely to adversely affect pink mucket by means of indirect long-term habitat alteration. TVA has formally consulted with the USFWS regarding these impacts, and has received an incidental take statement for these adverse effects.

Pursuant to Section 7 of the *Endangered Species Act,* TVA prepared a Biological Assessment (BA) as part of the formal consultation process. The USFWS prepared their biological opinion (BO) based on information provided in the BA dated January 7, 2010. The BO states that the “incidental take” occurring as a result of the proposed federal action

will not result in jeopardy to the species. The BO prescribes reasonable and prudent measures to minimize the impact of the incidental take.

While individuals of the ornate rocksnail (considered sensitive by the state of Tennessee) may occur within the affected area, this species is relatively widespread, and can be locally abundant in the Tennessee River mainstem. This species is much less dependent upon the types of habitat that would be disturbed by this action, and no measureable effects on ornate rocksnail are anticipated to occur as a result of this action.

In order to assess the effects of this project on the existing mussel bed, TVA will be implementing the following measure. TVA will conduct two post-project surveys of the mussel community and habitat adjacent to the project to assess project impacts on the mussel community (including the federally listed pink mucket mussel) and mussel habitat in the project area. The surveys will follow the methods used in the pre-project survey of the site and will be conducted at one and three years after completion of the project (i.e., 2011 and 2013). Reports detailing the survey results, including comparison to the pre-project survey, will be provided to the USFWS Cookeville Office, within 30 days of completing fieldwork for each survey. Further, TVA will adhere to the reasonable and prudent measures identified by the USFWS in the BO to minimize impacts on the federally listed pink mucket mussel.

Terrestrial Animals

Affected Environment

Review of the TVA Natural Heritage database in October 2009 indicated records of four Tennessee state-listed terrestrial animals within 3 miles of the proposed project area (Table 2). Records of one federally listed terrestrial animal species, piping plover, occur within 3 miles of the project area and one federally protected terrestrial animal species, bald eagle, is known from Humphreys County, Tennessee (Table 2). One of the piping plover records is located greater than 1 mile from the project site.

Table 2. State-Listed Terrestrial Animals Known From Within 3 Miles of the Project Area and Federally Listed Terrestrial Animals Known From Humphreys County, Tennessee

Common Name	Scientific Name	Federal Status[1]	State Status[1] (Rank[2])
Birds			
Bald Eagle	*Haliaeetus leucocephalus*	DM	NMGT (S3)
Little Blue Heron	*Egretta caerulea*	--	NMGT (S2)
Piping Plover	*Charadrius melodus*	THR	(S2)
Reptiles			
Western Pigmy Rattlesnake	*Sistrurus miliarius streckeri*	--	THR (S2S3)
Northern Pine Snake	*Pituophis melanoleucus melanoleucus*	--	THR (S3)
Alligator Snapping Turtle	*Macrochelys temminckii*	--	NMGT (S2S3)

[1]Status codes: THR = Threatened; DM = Recovered, delisted, and being monitored; NMGT = In need of management.
[2]State Ranks**:** S2 = Imperiled; S3=- Rare or uncommon

Habitat for western pigmy rattlesnake ranges from dry upland sand hills and mixed deciduous-evergreen forests to low-lying, sometimes flooded, palmetto stands, floodplains, and marshy habitats (Gibbons and Dorcas 2005). Northern pine snake generally inhabits areas with well-drained, sandy soil where it can easily burrow in search of prey. This species can be found in longleaf pine sand hill areas, pine barrens, scrub oak, dry rocky areas in the mountains, and abandoned agricultural fields (Gibbons and Dorcas 2005). No suitable habitat exists in the project area for western pigmy rattlesnake or northern pine snake.

Suitable habitat does exist along the shoreline and in the Kentucky Reservoir for alligator snapping turtle, which is highly aquatic, emerging from water only for nesting or, rarely, basking (NatureServe 2009). Habitat for alligator snapping turtle consists of slow-moving, deep water of rivers, sloughs, oxbows, and canals or lakes associated with rivers, including large impoundments (Ernst et al. 1994). Suitable habitat also is available along the shoreline for little blue heron, which inhabits marshes, ponds, lakes, meadows, mudflats, lagoons, streams, and other bodies of calm shallow water (NatureServe 2009).

The piping plover uses mudflats and sand bars along the Kentucky Reservoir to forage for invertebrates during migration. Many pairs of bald eagles are known from the vicinity of Kentucky Reservoir. The closest extant nesting record is greater than 7 miles away. Bald eagles generally nest near large water bodies that support an adequate food supply. They often nest in large trees, snags, cliffs, rock promontories, rarely on the ground, and with increasing frequency on man-made structures such as power poles and communication towers (USFWS 2007).

Environmental Consequences

No Action Alternative
Adoption of the No Action Alternative is not expected to adversely impact listed or protected terrestrial animal species. The project area would likely remain in its current condition, and there would be no direct, indirect, or cumulative impacts on endangered and threatened terrestrial animal species. Should the dike fail, potential adverse impacts resulting from the failure could occur.

Action Alternative
There is no suitable nesting habitat for bald eagles and the proposed project area does not have appropriate habitat for or piping plover. Although there is adequate habitat for the alligator snapping turtle, no evidence of inhabitation were observed during field surveys. If the species does occur in the project area, the planned construction activities may displace some individuals into nearby areas. The potential displacement of the species would not be expected to measurably affect the overall species' populations because of their mobility, and abundance of suitable habitat in the area. Adoption of the Action Alternative is not expected to result in adverse impacts to federally listed or state-listed terrestrial animal species or their habitats.

Because no recorded wading bird colonies or caves occur within 3 miles of the proposed project area, the proposed action is not expected to impact either of these resources under this alternative.

Floodplains

Affected Environment

The potential area of impact from the proposed stabilization project would extend from about TRM 99.1 to 99.9 on Kentucky Reservoir in Humphreys County, Tennessee. The 100-year floodplain for this reach of the Tennessee River would be the area below elevation 375.0. The TVA Flood Risk Profile (FRP) elevation would also be elevation 375.0. The FRP is used to control flood damageable development for TVA projects and residential and commercial development on TVA lands. At this location, the FRP elevation is equal to the 500-year flood or "critical action" elevation.

Environmental Consequences

No Action Alternative
Under the No Action Alternative, no immediate changes to the 100-year floodplain would occur. However, if no action is taken to stabilize and reinforce the dike, there is potential for dike failure in the future. Should the dike fail, a potential adverse floodplain impact could occur by filling the embayment with coal ash in the vicinity of the JOF ash storage pond.

Action Alternative
Implementation of the Action Alternative would result in the loss of about 9.0 acre-feet of flood control storage. Based on project design information, this amount of riprap is required because it is not only for shoreline stabilization, but its mass helps resist against global shear of the dike. From geotechnical borings collected in the dike, that section of the dike has a factor of safety less than 1.5. The application of this riprap, as described in the project design information, would adequately reinforce the dike, thereby increasing the factor of safety to greater than 1.5, thus stabilizing the dike to prevent potential failure. Therefore, the amount of lost flood control storage has been minimized while achieving the project objective and the project would comply with the TVA Flood Control Storage Loss Guideline. The placement of riprap for stabilization of an existing ash pond dike at the main ash pond for TVA's JOF facility is consistent with Executive Order 11988 for floodplain management, because riprap is considered a repetitive action in the floodplain.

Cumulative Impacts

Adoption of the Action Alternative would result in little to no cumulative impacts to terrestrial ecology and federally listed terrestrial animals. Implementation of the proposed action would result in the loss of about 9.0 acre-feet of flood storage, but because the placement of riprap as described in the project design information, this amount of riprap will not only stabilize the shoreline, but its mass would help resist against global shear of the dike, thereby minimizing the amount of lost flood control storage. Floodplain effects resulting from the proposed action are expected to be minor. Although changes in habitat (e.g., flow patterns, water conditions, and substrate composition) could in turn alter the composition and density of mussels and other invertebrates within the survey area, demands associated with tow activity and commercial mussel harvesting in the vicinity of the high-quality mussel habitat are not expected to vary considerably from present conditions. No other new actions are anticipated near the project area, and potential impacts from other actions, such as recreational activities are not anticipated. Therefore, considering the impacts from past actions and the anticipated effects of present and future actions, cumulative impacts of the proposed action on endangered and threatened species are not anticipated.

Mitigation Measures

In addition to the requirements of any necessary permits, TVA would implement the BMPs and mitigation measures listed below.

Best Management Practices

- Appropriate BMPs would be used in conjunction with the construction and maintenance methods as described in the project description and all EPSC BMPs would be maintained at all times and regularly inspected.

- Appropriate construction BMPs, such as installation and maintenance of perimeter siltation barriers prior to land disturbance activities, would be used to reduce the short-term effects from sediment runoff and minimize impacts to water quality and aquatic ecology.

- Disturbed areas of the bank slope would be stabilized before the contractor leaves the site each day during the banks slope grading phase of the project. Furthermore, to achieve stabilization, placement of aggregate over the sand would be required on a daily basis before the contractor leaves the site.

- Erosion-control blankets would be installed immediately after a section has been completed. Seeding, mulching, and fertilization of disturbed areas would be completed as soon as practical after regrading activities.

- The maximum height riprap would be dropped would be 2 feet to help ensure that rocks would not roll into the water beyond the initial riprap berm.

- Per TVA's Herbicide Application Guidelines, no herbicide would be allowed to enter surface waters.

Mitigation Measures

- All work near the water would be done when the lake level is within 2 feet of normal winter pool (elevation of 354 feet msl). Work would be halted when the pool level is above elevation 356 feet msl or forecasted to be higher during a shift.

- An EPSC Plan would be implemented prior to any land-disturbing activity on the project site. All EPSC BMPs would be maintained at all times and regularly inspected.

- TVA would fund two post-project surveys of the mussel community and habitat adjacent the project to monitor project impacts on pink mucket and its habitat (see Attachment E). The surveys would follow the methods used in the 2009 preproject survey of the site and would be conducted at one and three years after completion of the project (i.e., 2011 and 2013). Reports detailing survey results and providing comparison to the preproject survey would be provided to the USFWS, Cookeville Office, within 30 days of completing fieldwork for each survey. Further, TVA would adhere to the reasonable and prudent measures identified by the USFWS in the Biological Opinion to minimize impacts on the federally listed mussel, the pink mucket.

Preferred Alternative

TVA's preferred alternative is the Action Alternative, under which TVA would stabilize and regrade the dike that supports the northeast side of its ash storage area at JOF.

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United States Army Corps of Engineers

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Attachments

A. Summary of Geotechnical Exploration and Stability Analyses
B. TVA Preliminary CEC No. 21069
C. January 7, 2010, TVA Biological Assessment With Mussel and Habitat Surveys
D. TDEC 401 Water Quality Certification
E. February 1, 2010, USFWS Biological Opinion

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