Tennessee Valley Authority Kingston Fossil Plant Harriman, Roane County, Tennessee	**Perimeter Containment** **North Dredge Cell (Dike C) Segment 1** **Sta. A161+50 to A179+50**
Document Control Number RDP-0113-E *Calculation Package* FPGKIFFESCDX00030020100006	

Exhibit 1
Project Description and Setting

Purpose:

- Provide broad project overview and background.

Methods:

- Narrative description.

Results:

- Narrative description.

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TVA Kingston Fossil Plant
Dredge Cell Closure
Perimeter Stabilization
North Dredge Cell (Dike C) Segment

Project Description and Setting

1. Background

Tennessee Valley Authority (TVA) owns and operates the Kingston Fossil Plant (KIF) in Roane County, near Kingston, Tennessee. The KIF facility is located on Swan Pond Road, at the confluence of the Emory and Clinch Rivers on Watts Bar Reservoir. Construction of the power plant began in 1951 and was completed in 1955.

The Kingston facility has nine coal-fired generating units with a net capacity of 1,456 megawatts. When operating at full power, the KIF plant consumes about 14,000 tons of coal per day. Coal ash produced and captured at the plant over the past five decades has been sluiced as wet slurry to the ash pond complex, located adjacent to the power plant. The ash pond is separated from Watts Bar Reservoir by dikes that were raised by the upstream method of construction. Over the years, the accumulated ash was stacked upward for storage within the Dredge Cell, a wet stack within the footprint of the ash pond. The coal ash at KIF is composed primarily of silt-sized silica particles, occasionally mixed with coarser material.

On Monday, December 22, 2008, about 5.4 million cubic yards of coal ash spilled from the Dredge Cell into the Swan Pond Embayment and the Emory River. At the time of the failure, the Dredge Cell contained about 16.2 million cubic yards of ash and associated dikes. About 60 acres of ash in the 127-acre containment area were displaced by the dike failure. The released ash covered about 300 acres, filling the Swan Pond Embayment on the north side of the KIF property adjacent to the failed Dredge Cell. Ash also entered the channel and overbank areas of the adjacent Emory River.

TVA is conducting a cleanup of the spilled ash, and closing the former Dredge Cell and adjacent Ash Pond under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. The U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC) are providing regulatory oversight of the cleanup. Ash in the river has been retrieved and is being transported offsite for disposal. Ash in the embayment is being retrieved by TVA and is being placed as a dry-stacked embankment within the area of the former Dredge Cell and Ash Pond.

2. Project Description

This package of exhibits documents engineering analyses and other technical details in support of the design for one segment of a new, stabilized perimeter containment around the site of the former Dredge Cell and Ash Pond at KIF.

The new perimeter will follow the general alignment of the dike system that previously contained the dredge cell materials. The new perimeter containment will consist of a grid of cement-stabilized soil walls that will be constructed in place by deep mixing. An earthen berm built atop this stabilized foundation will surround the new ash landfill (dry ash stack). Recovered ash, at a controlled moisture content, will be placed and compacted in the landfill behind the new perimeter berm.

The purpose of the perimeter stabilization is to prevent offsite release of ash from the closed ash landfill, for both long-term static conditions and during seismic loading. The closure design will mitigate the factors that contributed to failure of the former Dredge Cell. However, the critical design condition is seismic. The design earthquake is expected to cause extensive liquefaction within the deeper, saturated ash deposits and the natural alluvial sands.

3. Design Segment

Under the current plan, closure of the KIF Dredge Cell will be accomplished with ten design packages. As depicted schematically in Figures 1 through 3, the design packages are divided by stage of construction and area of the site:

- Ash Stacking – three design packages
- Perimeter Stabilization – four design packages
- Final Cover – three design packages

For construction of the perimeter containment around the site periphery, the design drawings use two project baselines (A and B). The perimeter has been divided into five segments measured along these baselines, as identified in Table 1. The current project plan will involve design and construction in the sequence indicated.

This calculation package supports the design of the first segment of the perimeter, identified as the North Dredge Cell (Dike C) segment. This segment is 1900 feet in length, and closes the area where the 2008 failure swept away the previous dike. This area is currently covered with thick deposits of loose, saturated ash that extend out into the Swan Pond Embayment area.

Table 1. Planned Design Segments for the KIF Dredge Cell Perimeter Containment

Planned Sequence of Construction	Segment	Start Station	End Station
1	North Dredge Cell (Dike C)	A161+50	A179+50
2	Lateral Expansion	A144+21	A161+50
3	Swan Pond Road	A179+50	A205+00
4	Ball Field	A205+00	A105+23
5	Ash Pond	B300+00	B328+76

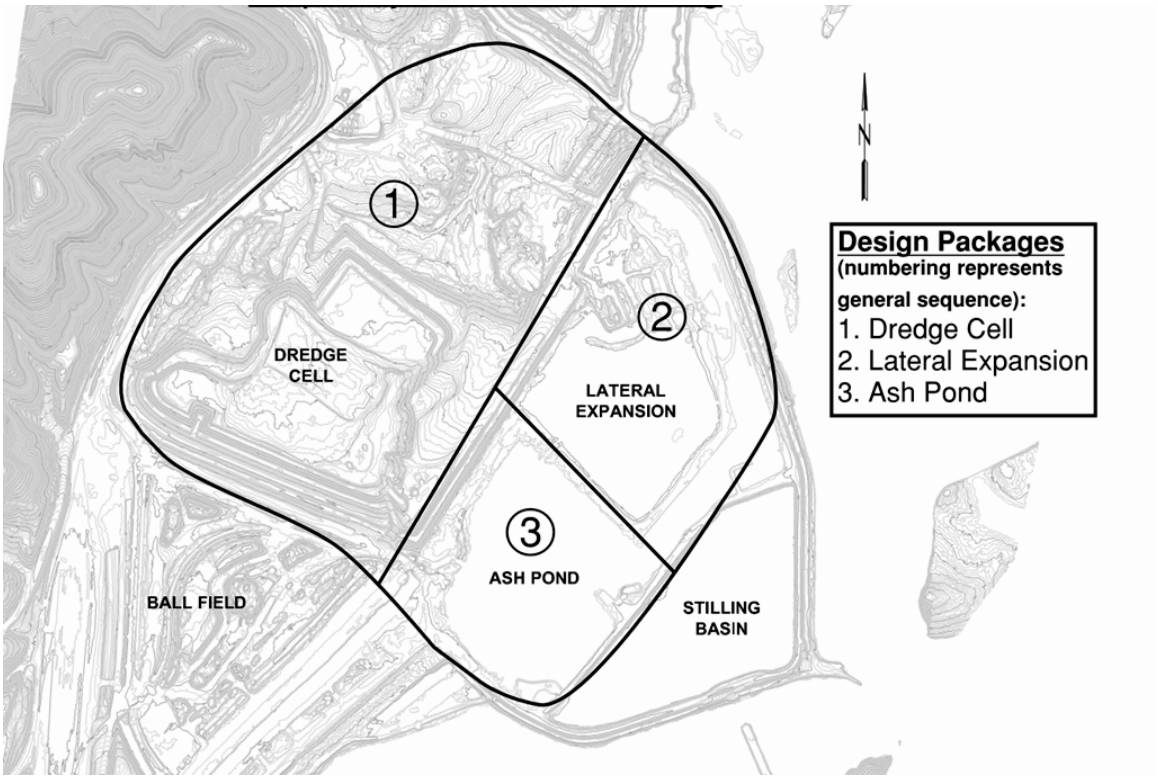

Figure 1. Planned Design Packages for Ash Stacking.

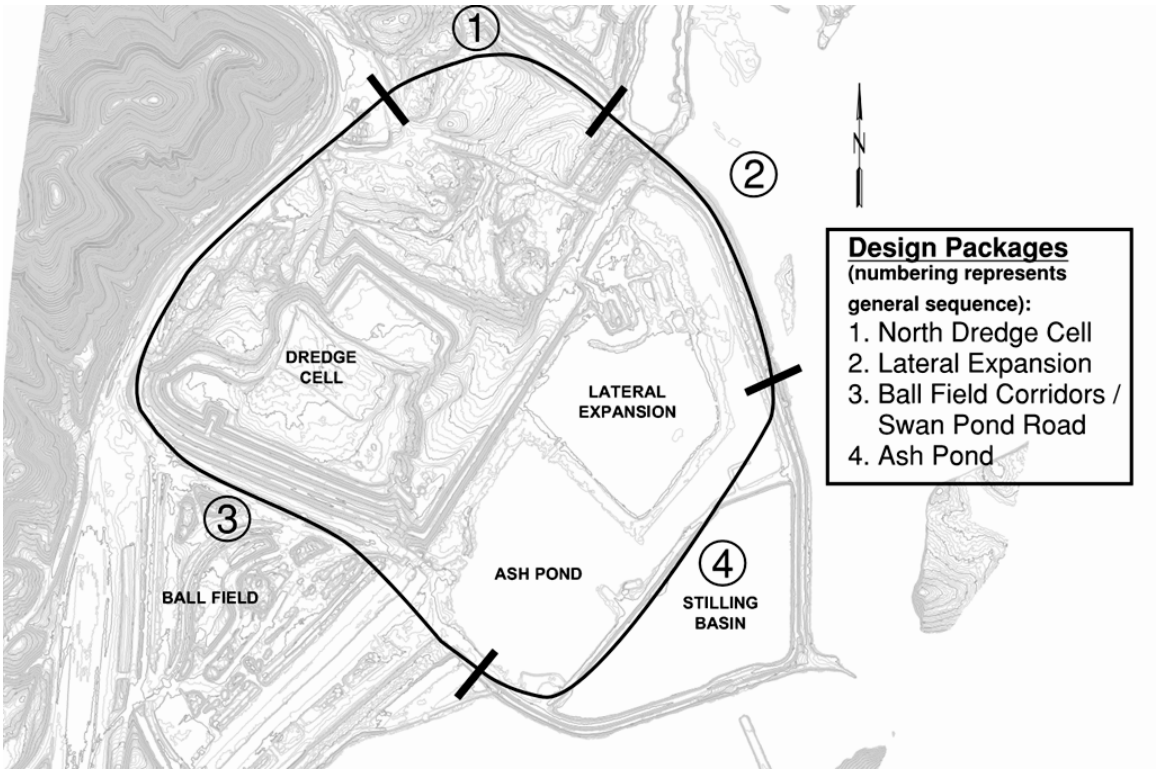

Figure 2. Planned Design Packages for Perimeter Stabilization.

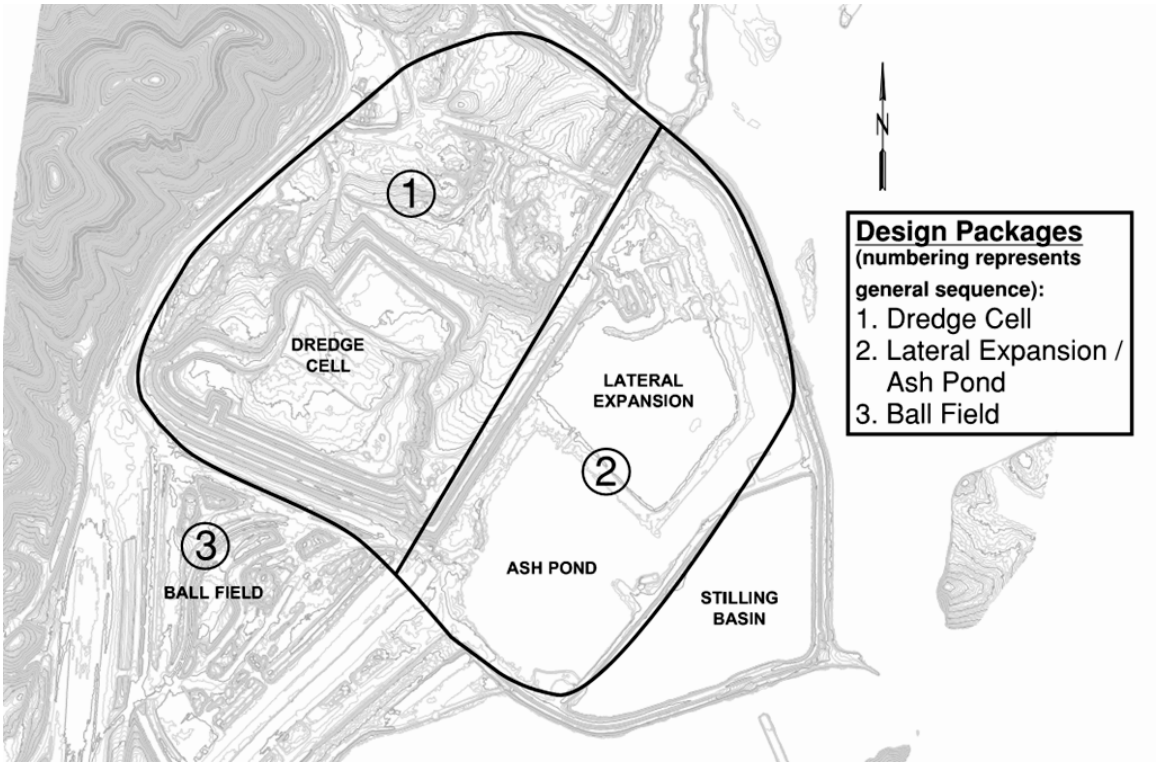

Figure 3. Planned Design Packages for Final Closure.

4. List of Exhibits

This calculation package is divided into sections as listed below.

- Exhibit 1 Project Description and Setting
- Exhibit 2 Design Basis and Criteria
- Exhibit 3 Geology and Project Materials
- Exhibit 4 Infiltration Rate Through Final Cover
- Exhibit 5 Long-Term Groundwater Levels
- Exhibit 6 Predicted Saturation Above the Phreatic Surface
- Exhibit 7 Seismic Hazard Analysis
- Exhibit 8 Geophysical Test Results
- Exhibit 9 Soil Stiffness Properties
- Exhibit 10 Ground Response Analyses
- Exhibit 11 Liquefaction Analysis
- Exhibit 12 Liquefaction Above the Phreatic Surface
- Exhibit 13 Soil Strength Properties
- Exhibit 14 Properties of Soil-Cement and Stabilized Foundation
- Exhibit 15 Limit Equilibrium Stability Analyses
- Exhibit 16 Reliability Analysis for Soil-Cement Strengths
- Exhibit 17 Strength of Shale Bedrock
- Exhibit 18 Analysis for Rock Embedment
- Exhibit 19 Bearing Capacity Analysis
- Exhibit 20 Stability of Drainage Pipe Excavation
- Exhibit 21 Structural Analyses for Stabilized Foundation
- Exhibit 22 3D Analysis for Equivalent 2D Stiffness
- Exhibit 23 Dynamic Analysis for Earthquake Loading
- Exhibit 24 Drainage Prior to Closure
- Exhibit 25 Buckling Analysis for Shear Walls
- Exhibit 26 Deformation of Rock Berms
- Exhibit 27 Stability of Buttressed Perimeter Wall