II. FACILITY CLOSURE

A. Partial Closure Steps

This section is for the purpose of explaining the steps that will need to be followed should the Ash Disposal facility be closed prior to the projected closure date discussed in Section I Subsection C, Expected Year of Closure. A basic premise for partial closure of the disposal facility is that this facility, if closed before the projected closure date, will result in final grades that are less than the proposed final grades shown on the plans submitted as part of this Closure/Post-Closure Plan. If such a partial closure is implemented, TVA will be required to submit revisions to the Closure/Post-Closure Plan (to include drawings and narrative). The specific items that may need to be modified are listed in Section II Subsection B, Complete Closure Steps. Each item in Section II Subsection B, Complete Closure Steps should be addressed even if the response would be that no change is necessary.

B. Complete Closure Steps

1. Facility Operation

The ash handling procedure consists of:

(1) Bottom ash and fly ash are pumped through a series of pipes to a point southwest of the active ash pond. At that location the ashes travel in separate sluice channels to the active ash pond. The heavier bottom ash settles out of the flow along the course of the bottom ash channel. The bottom ash is removed by dragline and pans on a continuous basis to be used to construct the dredge cells. Lighter fly ash continues to be sluiced to the active fly ash pond through a lined channel. This channel is presently synthetically lined but is gradually being replaced with rip rap lining.

(2) The fly ash and bottom ash waters continue into the active ash pond area. In this area a series of divider dikes and spillway skimmers separate the sluicing water from the transported ash. It is primarily fly ash that is deposited in the active ash pond.

(3) The sluicing water continues on through the stilling pool before it is discharged into the river. Within the stilling pool the water is treated with lime as needed to control the pH.

(4) The dredge cell dikes are constructed out of bottom ash material collected from the bottom ash sluice channel. This ash is collected and transported by pans to the dredge cell area. Pans, dozers, backhoe/loaders, front-end loaders and dump trucks are then used to shape and construct the dikes in accordance with the drawings included with this plan.

(5) During normal operation, material is then periodically dredged from the active ash pond and is hydraulically deposited to the interior of the dredge cell dikes.

(6) The disposal process is an essentially continuous incremental procedure. No daily earth cover will be required. Intermediate cover may be placed in areas of the dredge cell dike that do not achieve final contours and vegetated during inactive phases of operation. The ash is physically stable, nonputrescible, and is not an attractant for disease or animal vectors.

(7) The dredge cell side-slopes will continue at 3:1 with intermediate benches for erosion control and surface water drainage.

(8) Dust is controlled by utilizing a water tank truck as required on the haul roads and dikes.

(9) The ash disposal area dikes are formally inspected each spring.

2. Drainage System

The surface water drainage system will be operated with the same concepts as have proven to be historically successful during the operation of other TVA ash facilities.

The potential run-on from surrounding areas will continue to be intercepted in the existing diversion ditching network. The handling of this extraneous water assists in stormwater management and erosion control within the ash pond area.

The run-off from the dredge cell area will utilize the following method of controlling water. The run-off collection system will utilize side slope benches to control run-off by directing the water downslope along circuitous berm ditches on approximately one-percent (1%) slopes. These slopes and berm ditches will aid in controlling velocities and erosive forces while facilitating the deposition of ash that may accumulate in the run-off. Where the berm ditches are drained to the bottom of the dike area, scour will be controlled by lining the ditches with rock. The ditching from the dredge cell area flows to the active ash pond for additional sediment control. Discharge from the active ash pond is to an existing stilling pool on the site. This stilling pond is an NPDES permitted facility that provides surface water quality control and discharge of all ash dredge pond water used at the KIF (NPDES Permit No. TN0005452 DSN001).

Collection of any accumulated fly ash that settles in the ditches, settling pool or other areas will periodically be removed and placed within the dredge cell for disposal. As the height of the dredge cell dikes is raised on the 3 to 1 side slopes, the placement of intermediate cover material and establishment of vegetative cover will be accomplished as soon as possible. Past operations have maintained good attention to detail in this regard. This attention to detail will continue in order to keep the ash under erosion control and to prevent dusting.

3. Leachate Collection

This facility currently does not have a leachate collection system. Based on monitoring and model simulation at this facility as contained in the Hydrogeologic Report (Appendix D; *Hydrogeologic Evaluation of Ash Pond Area*), a leachate collection system is not required.

4. Gas Collection

Gas collection for ash disposal facilities is not applicable as so stated in DSWM Policy Memorandum SW-91-2. Ash produced from the combustion of coal is the principle waste material which will be deposited in this facility. Ash is completely composed of the noncombustible mineral components incorporated in the coal during its formation. Ash is basically inert, noncombustible, nonputrescible, and will not decompose to produce gases.

5. Final Cover

Final cover will be applied to the ash disposal area after dredging operations have been completed. The final cap to be utilized on top of the ash will be one of the following (from top layer downward):

- Soil suitable for the support of vegetation (12")
- Impervious liner (12" of clay compacted to achieve a maximum hydraulic conductivity of 1 x 10^{-7} cm/sec)

or

- Soil suitable for the support of vegetation (12")
- Drainage layer (geonet bonded with geotextile with a permeability of 1 x 10^{-1} cm/sec)
- Impervious liner (geosynthetic clay liner with a permeability of 1 x 10^{-9} cm/sec)
- Earthen liner (12" of clay compacted to achieve a maximum hydraulic conductivity of 1 x 10^{-6} cm/sec)

The footprint for the ash disposal area to receive final cover is shown on drawing 10W426-2. The footprint of the dredged ash stacking area is shown in detail on the 10W425 drawing series. These drawings are submitted as part of this Closure/Post-Closure Plan.

The continued use of the dredge cells until their closure will result in an increase in the vertical dimensions but no increase in the footprint. The dredged embankment of ash is proposed to be constructed to an approximate maximum final elevation of 866 msl. The closure of the dredge cell area to this grade, as shown on the drawings, will allow the area of 3 to 1 side slopes to be maximized while minimizing the amount of relatively flat surface area that will be the final top of the area. This final grading will facilitate controlling run-off of precipitation and further minimize the generation of leachate or accumulation of moisture within the ash.

6. Intermediate Cover

Intermediate cover consisting of 6-12 inches of compacted soil suitable for the support of vegetative

cover is to be placed on areas that have not achieved final grades and will not receive ash for extended periods. During subsequent stages in the development of the area this cover may be removed and used elsewhere if practical.

7. Vegetative Cover

The conditioning, fertilizing and seeding of the intermediate and/or final cover in order to establish an adequate vegetative cover shall begin immediately upon placement of the intermediate and/or final cover. The applicable seeding methods and types to be used for vegetation will be selected in consideration of seasonal and other factors. TVA specifications for seed mixture application are included in Appendix A.

8. Groundwater Monitoring

(1) Compliance Monitoring Boundary

The compliance monitoring wells designated for the ash pond area as follows:

Upgradient Well - well 16A
Downgradient Wells - wells 4B, 6A, and 13B

The location of these wells are shown in Appendix D, Figure 1. The upgradient well (16A) is located on the north side of Swan Pond Road, northwest of the line separating dredge cells 1 and 3. Downgradient well 4B is located on the perimeter of the dike north of dredge cell 2; well 6A is located on the southeast corner of the perimeter dike near the stilling pool; and well 13B is located south of the toe of the dike near the fly ash sluice channel.

The compliance monitoring boundary of the facility will be defined by the segment of the ash pond area perimeter lying between the three down-gradient monitoring wells.

(2) Monitoring System for the Existing Facility

A groundwater monitoring system is in place and was installed to support assessment and permitting activities at Kingston. An evaluation of the monitoring data collected to date is included in Appendix D, Hydrogeologic Evaluation of Ash Pond Area, Kingston Fossil Plant, June 1995.

(3) Detection Monitoring Program

a. Sampling and Analysis Plan

Unfiltered groundwater samples will be collected semiannually from wells 4B, 6A, 13B and 16A. The groundwater samples will be analyzed for the constituents listed in Table 1.

Water surface elevations will be obtained on the same day on the Kingston reservation prior to sampling.

At the end of 8 sampling events, based on the data, TVA may request a variance from this plan to eliminate constituents that consistently show at or below method detection limits.

Table 1. Chemical Analyses for Groundwater Samples

Field Analyses

Acidity	Alkalinity
Conductivity	Depth to Water
Dissolved Oxygen	ORP
pH	Temperature

Laboratory Analyses, Filtered Samples

Antimony	Chromium	Lead	Silver
Arsenic	Cobalt	Mercury	Thallium
Barium	Copper	Nickel	Vanadium
Beryllium	Fluoride	Selenium	Zinc
Cadmium			

All sample analysis will be performed in accordance with US EPA SW 846 methods.

Monitoring for volatile organic compounds (VOC's) (listed in DSWM Solid Waste Regulations Appendix I) will not be necessary for this facility since these VOC's are not known or suspected to be constituents of coal fly ash. If any of these constituents were present in the coal, which is unlikely, the high temperatures of the combustion process (greater than 2,000 degrees F) would be expected to decompose or drive off all volatile constituents. TVA has conducted tests of fly ash for the presence of VOC's and the

results indicated the VOC's were "nondetectible". These data are available for review in Appendix B.

b. Record Keeping and Reporting

A project field notebook will be maintained by the sampling survey leader to record pertinent information and observations. The survey leader will record all physical measurements, field analyses, and any pertinent observations in the project field note book. Auxiliary data that may prove useful in the interpretation of the water quality results will be recorded, e.g. the observation of gas bubbles in the sample line, rapid development of turbidity or color in the sample, equipment problems, and weather conditions. All field and laboratory data will be archived in STORET and reported to the project engineer.

Monitoring data will be reported in writing to the DSWM within 30 days after the completion of the analyses, beginning with the next routine sampling data following approval of this closure plan.

c. Well Plugging

Wells 5A, 5B, and 6B will be closed according to proper well abandonment procedures. Those consist of grouting the well casing by trimie methods with a high-swell bentonite grout, removing the upper 5 feet of well casing and compacting soil in the lifts above the abandoned well.

9. Closure Schedule

Upon determination that the closure of the facility is forthcoming a notification of TVA's intent to close the facility must be sent to DSWM sixty (60) days prior to the closure date.

After the final grade of ash has been reached, closure activities to include final grading and vegetative cover must be complete as soon as possible but are not to exceed 180 days.

TVA must notify DSWM in writing of completion of closure of the Ash Pond Area. Such notification must include a certification by TVA that the disposal facility has been closed in accordance with the approved Closure/Post-Closure care plan. Within 21 days of the receipt of such notice DSWM is supposed to inspect the facility to verify that closure has been completed and is in accordance with the approved plan. Within 10 days of such verification, DSWM is supposed

to approve the closure in writing to TVA. Closure shall not be considered final and complete until such approval has been made by DSWM.

10. Notice in Deed to Property

TVA is required to ensure that within 90 days of completion of final closure of the facility and prior to sale or lease of the property on which the facility is located, there is recorded, in accordance with State law, a notation on the deed to the property or on some other instrument which is normally examined during title search that will in perpetuity notify any person conducting a title search that the land has been used as a disposal facility.

11. Post-Closure Care Activities

During the post-closure care period, the operator must, at a minimum, perform the following activities on closed portions of his facility:

1. Maintain the approved final contours and drainage system of the site such that precipitation run-on is minimized, erosion of the cover/cap is minimized, precipitation on the stack is controlled and directed off the stack, and ponding is eliminated.

2. Ensure that a healthy vegetative cover is established and maintained over the site.

3. Maintain the drainage facilities, sediment ponds, and other erosion/sedimentation control measures (if such are present at the disposal site), at least until the vegetative cover is established sufficiently enough to render such maintenance unnecessary.

4. Maintain and monitor the ground water monitoring system. The monitoring system and sampling and analysis program established in the previous sections shall be continued during the post-closure care period, unless the Closure/Post-Closure plan is modified to establish a different system or program. Monitoring data must be reported in writing to the DSWM within 30 days after the completion of the analysis.

12. Cost Estimate/Financial Assurance

TVA is an agency and instrumentality of the United States created by the TVA Act of 1933, 16 U.S.C. 831-

831dd (1988). TVA is not required to provide financial assurance in accordance with DSWM Solid Waste Regulations rule 1200-1-7-.03 (1)(b)(3) page .03-1. If requested, TVA will provide DSWM a copy of its cost estimate for the closure after the project is authorized for construction.

13. Dredge Cell Stability

The stability of the proposed dredge cell slopes was tested by using the UTEXAS3 computer program. Several methods for computing the factor of safety are available in the program. The Spencer method was chosen for this analysis since it satisfies both the force and moment balance for static equilibrium. The program can also perform two stage analyses to simulate undrained loading after a period of consolidation, which is pertinent for a pseudostatic seismic stability analysis.

Both a static analysis and a pseudostatic seismic analysis were performed on the proposed dike configuration with 3H:1V slopes and berms. The static analysis for long term conditions using R-bar strengths yielded a factor of safety of 1.75. The critical shear surface from the long term static analysis was used as the failure surface in the pseudostatic analysis. The maximum horizontal equivalent acceleration (MHEA) was calculated at the base of the critical shear surface and this value was input to UTEXAS3 for the seismic factor. The simulation yielded a factor of safety of 1.17 for the pseudostatic seismic case. A yield factor (K_y) of 0.11g was then calculated using the static critical shear surface. The maximum acceleration (K_{max}) at the base of the critical shear surface and the period (T_0) were calculated using the WESHAKE site response analysis program. These values were used in the Makdisi & Seed deformation chart (Figure 4 in "Technical Guidance Document, Tennessee Division of Solid Waste") to calculate a displacement of 2.3 to 7.6 inches at the base of the critical shear surface. The dredge cells have no liner or leachate collection system with which to compare the deformations, but the deformations are less than one-half of the thickness (2 feet) of the proposed cover system.