CLOSURE/POST CLOSURE PLAN
POND "J" ASH DISPOSAL FACILITY
TENNESSEE VALLEY AUTHORITY
JOHN SEVIER FOSSIL PLANT

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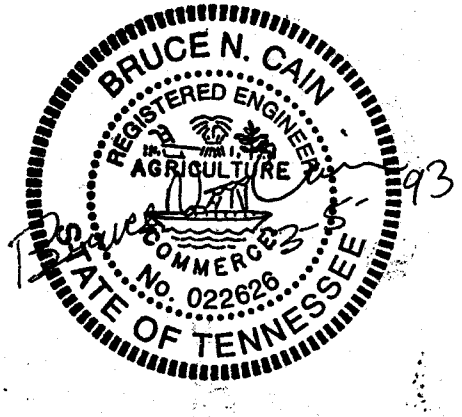
Prepared For:

Tennessee Valley Authority



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T&R Project No. 3822-019
POND-J.WP6

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APPENDIX

I. INTRODUCTION

A. Facility Description

The TVA John Sevier Fossil Plant (JSF) is located on the southern bank of the Holston River at mile 106.3 in Hawkins County, Tennessee. The JSF is approximately three miles southeast of the city of Rogersville. Access to the site is by State Highway 70 and T.V.A. Plant Access Road. Reference is made to Figure I which is an excerpt of the Hawkins County map.

B. Operational History

The JSF produces approximately 160,000 cubic yards of ash per year. Pond "J" was originally operated as a wet sluice pond from 1984-1988. In 1988 Pond "J" was deactivated. In 1990 some additional ash reclaimed from ash disposal area 2, was hauled to Pond "J". Pond "J" has been inactive since this time.

C. Expected Year of Closure

Pond "J" is essentially filled. In order to conserve fill soil, the site will be contoured with a small amount of ash (to obtain finished grade) which will be hauled from the dry ash silos to Pond "J". This will require approximately 50,000 cubic yards of ash. This estimate is based on field surveyed topography dated December 7, 1989.

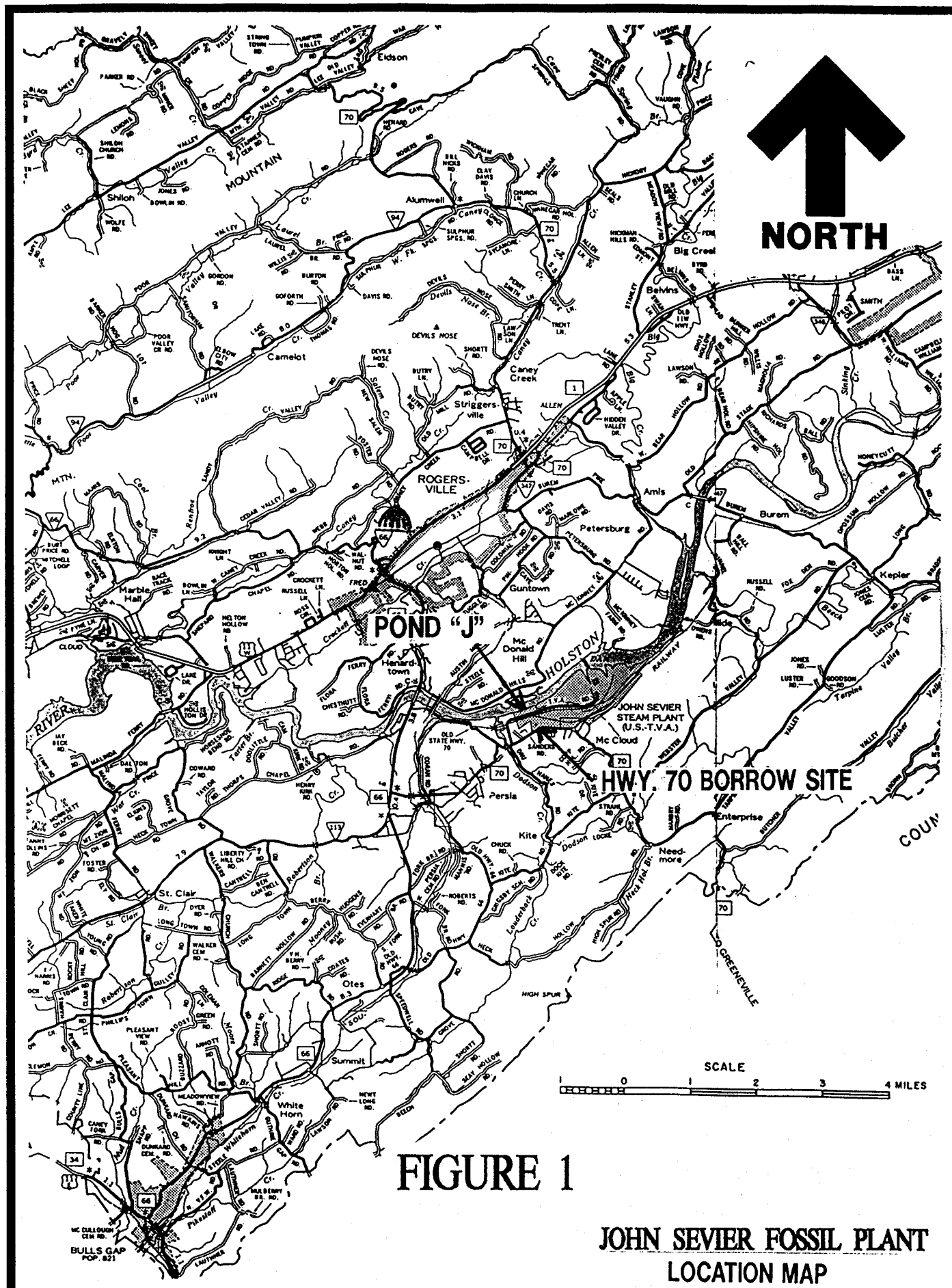

FIGURE 1

JOHN SEVIER FOSSIL PLANT
LOCATION MAP

In accordance with the DSWM solid waste regulations (March 18, 1990) closure of the Pond "J" ash disposal facility will begin no later than March 18, 1994. Closure activities will require approximately one year to complete.

D. Facility Contact

The names, addresses and telephone numbers of the TVA personnel that may be contacted during the post closure care period are listed as follows:

Plant Manager
Tennessee Valley Authority
John Sevier Fossil Plant
P.O. Box 2000
Rogersville, TN 37857
(615)272-8152

As of the date of this report the plant manager is Mr. George H. Pigg, Jr.

II. FACILITY CLOSURE

A. Site Preparation

In order to conserve soil the site will be prepared for final closure by filling and contouring low areas with dry fly ash hauled from the silos. This preparation will involve:

(1) Transporting the ash from the silos by dump trucks to Pond "J".

(2) Spreading the ash with bulldozers to a maximum thickness of 12 inches.

(3) Compacting the ash with a vibratory roller compactor to achieve an in-place density of ninety percent (90%) of its maximum compaction density as determined by the STANDARD PROCTOR COMPACTION TEST (ASTM D-698).

(4) The ash used to contour the surface will be graded to provide approximately a 1-percent minimum slope to provide drainage sufficient to prevent ponding and excess surface infiltration. Since the ash is physically stable, nonputrescible, and is not an attractant for disease or animal vectors, no daily or intermediate earth cover will be required during this period.

(5) Dust will be controlled by utilizing a water tank truck as required on the haul road and Pond "J" surface.

B. 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 disposal facilities.

The potential run-on from surrounding areas will continue to be intercepted in the existing diversion ditching network. These interception ditches direct the surface flow around the ash disposal area to preclude this water from mixing with runoff from the ash disposal area. The handling of this extraneous water assists in stormwater management and erosion control within the ash disposal area.

The run-off from the Pond "J" area will utilize the following method of controlling water. The run-off collection system will consist of maintaining an approximate five-percent slope on top of the site once

final contours are achieved and a perimeter ditch along the inside of the original earth ditches with a minimum one-percent slope. During closure, run-off water will continue to be pumped to the stilling pond, which is located adjacent to the dry ash stacking area, prior to discharge. There will be 3 discharge points from the reclaimed Pond "J" after final closure. One discharge will be through the original spillways to the lake and two new discharges through pipe culverts to an existing ditch around the outside of the original ditches. These ditches discharge to the lake. Modifications of the NPDES permit for the facility will be made as required to cover these changes in discharges.

Collection of any accumulated fly ash that settles in the ditches during the reclamation of Pond "J" will be removed on a regular basis and placed back on the dewatered ash to be covered in the reclamation of the area. As the finished grade of the site is attained the placement of cover material and establishment of vegetative cover will be accomplished as soon as possible. This helps control erosion and maintains an effective drainage system. Past operations at this plant have maintained good attention to detail in this regard. This attention to detail will continue in order to control erosion of ash.

C. Leachate Collection

The Pond "J" ash disposal facility is scheduled to begin closure on or before March 18, 1994 (four years after the effective date of the new regulations). This facility currently does not have a leachate collection system. Monitoring at this site and investigations conducted by TVA at other sites and previously furnished to DSWM indicate very little potential for contamination of groundwater from ash disposal facilities because of the inert characteristics of the material. Closure of this area will further minimize leachate generation.

Therefore, in accordance with the March 18, 1990 regulations (1200-1-7-.04)(1)(b)3. (page .04-1) leachate collection is not required for this facility since the facility currently does not have a leachate collection system and there is no indication of leachate contamination.

D. 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 only waste material which deposited in this facility. Ash is completely composed of the noncombustible mineral components incorporated in the coal during its formation. Ash is inert, noncombustible, nonputrescible, and will not decompose to produce gases.

E. Final Cover

The footprint of the Pond "J" ash disposal area is shown on the drawings prepared by TVA (10W286-58-6) and submitted as part of this Closure/Post-Closure Plan. As has been discussed previously, the disposal facility is an abandoned wet sluice pond that will be closed after recontouring with additional dry fly ash over the existing grade. The recontouring of the site, during its closure, will result in an increase in the vertical dimensions but no increase in the footprint. The site is proposed to be graded to an approximate maximum final elevation of 1110 feet msl. The closure of the Pond "J" ash facility to this grade, as shown on the drawings, will allow recontouring to minimize the amount of relatively flat surface area that will be the final surface of the site. This will facilitate controlling run-off of precipitation and further minimize the generation of leachate or accumulation of moisture within the old ash deposits.

Given the unique characteristics of ash and the results of the modeling studies conducted by TVA the final cap to be utilized on top of the ash will be as follows (from top layer downward):

- Soil suitable for support of vegetation,
  twelve inches

- Soil compacted to achieve a maximum hydraulic conductivity of 1 x 10^{-7} cm/sec, twelve inches

Appendix A is a printout of the HELP model that provides the justification for using this final cap. In summary, the printout is to be used to evaluate the cap design only in regards to the anticipated average annual percolation through the cap. The results indicate that for the 10 years modeled the average annual percolation through the cap is predicted to be 1.2162 inches/year. The proposed cap design will provide sufficient protection from the percolation of water into fly ash stack. This is further supported by the field experiments and analysis conducted by TVA that indicate that the fly ash exhibits strong capillary forces and an ability to store water, also, the moisture content of the dry ash used for recontouring is very low. Reference is also made to the report "Design, Construction and Maintenance of Cover Systems for Hazardous Waste - An Engineering Guidance Document" prepared by the Army Engineer Waterways Experiment Station for EPA, May 1987.

F. Vegetative Cover

The conditioning, fertilizing and seeding of the final cover in order to establish an adequate vegetative cover shall begin immediately upon placement of the 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 applications are included in Appendix B.

G. Groundwater Monitoring

1. Compliance Monitoring Boundary

The compliance monitoring boundary of the Pond "J" area should be the area within the location of the existing monitoring wells.

These well designations are.

Upgradient Well	Well 1
Downgradient Well	Well 17

The location of Well 17 is shown on the drawings submitted as part of this Closure/Post-Closure Plan. Well 1 is located upgradient of all plant facilities and is adjacent to Hwy. 70.

2. Monitoring System for the Existing Facility

As mentioned above, the Pond "J" ash disposal area has a groundwater monitoring system in place which was installed to support studies of the facility. Quarterly monitoring of these wells has been conducted since their installation. Quarterly monitoring data is included in Appendix E.

3. Detection Monitoring Program

a. Sampling and Monitoring Program:

The operator must determine the concentration or value of the following parameters in

groundwater samples in accordance with List I and List II as listed below.

List I

Indicator parameters used for characterizing and tracking the ground water chemistry and changes therein:

I. Ammonia
II. Calcium
III. Chloride
IV. Iron
V. Magnesium
VI. Manganese, dissolved
VII. Nitrate (as N)
VIII. Potassium
IX. Sodium
X. Sulfate
XI. Chemical Oxygen Demand (COD)
XII. Total Dissolved Solids (TDS)
XIII. Total Organic Carbon (TOC)
XIV. pH

List II

Parameters establishing the ground water quality:

I. Arsenic
II. Barium
III. Cadmium
IV. Chromium
V. Cyanide
VI. Lead
VII. Mercury
VIII. Selenium
IX. Silver

However, ammonia, total organic carbon and cyanide are not expected to be present in coal combustion by-products and therefore monitoring of these is unnecessary for this monitoring program.

The operator has established background concentrations and analysis for all List I and List II parameters with the exception of ammonia, total organic carbon and cyanide. Refer to Appendix E for this data.

Beginning with the next routine sampling date following approval of this closure plan, the operator will begin sampling for the 20 groundwater contamination indicator parameters specified below at least once every six months.

Calcium
Chloride
Iron
Magnesium
Manganese, dissolved
Nitrate (as N)
Potassium
Sodium
Sulfate
Chemical Oxygen Demand (COD)
Total Dissolved Solids (TSD)
pH

Arsenic
Barium
Cadmium
Chromium
Lead
Mercury
Selenium
Silver

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° 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". A summary of testing results is included in Appendix C of this Closure/Post-Closure Plan.

Additional procedures to be followed for the Detection Monitoring Program are in TVA's Quality Assurance Procedure - Groundwater Sample Collection Techniques which is included in Appendix D.

b. Recordkeeping and Reporting:

Recordkeeping: Records of all groundwater sampling of Wells 1 and 17 are kept at the facility. Information includes groundwater sampling activities conducted, the sample analysis results and the groundwater surface elevation.

Reporting: All results of ground water sampling and analysis results and groundwater surface elevations of Wells 1 and 17 are submitted to the Tennessee Department of Solid Waste Management within thirty days after completing the analysis.

c. Well Plugging:

Procedure: If it becomes necessary to abandon a monitoring well, the following plugging procedures shall be used to ensure the well will not become an avenue of aquifer contamination. Plugging can also serve to inhibit water loss from artisan aquifers

and to eliminate the physical hazard of an open hole. Proper plugging materials and techniques will vary according to the original well construction and the geohydrology of the site.

The general procedure for plugging shallow monitoring wells completed in water table aquifers includes three steps.

i. Removal of obstructions in the well that could interfere with the plugging operation and thorough flushing of the well to purge residual drilling fluids and other fine detritus,

ii. Removal of the well casing (where practical) to ensure placement of an effective seal - as a minimum when the casing is not properly grouted, the upper 20 feet of casing must be removed,

iii. Sealing of the well with an impermeable filler such as neat cement.

Sealant Materials: Well sealants shall be chemically inert and impermeable. Neat portland cement (with or without bentonite clay additives) and bentonite clay are acceptable sealants. General purpose (Type 1) neat portland cement is acceptable. The cement slurry is to be mixed with five to six

gallons of water for each 94 pound sack of cement. The water of the cement slurry should have a low sulfate content and a total dissolved solids content less than 2,000 parts per million. No aggregate materials are to be included in the slurry.

The neat cement slurry shall be piped to the point of application so that the well is filled upward from the bottom. Free falling of the slurry into the well is unacceptable.

Bentonite clay additives reduce shrinking (and cracking) of the cement while the slurry is setting. Three to five pounds of additive and 6-1/2 gallons of water are to be mixed with each 94 pound sack of cement (the clay and water are to be mixed together before cement is added to form the slurry).

Bentonite clay can be used separately as a well sealant. The clay can be dropped into the well in the form of granules, chunks, pellets, or balls. Where the potentiometric head of an aquifer causes water to rise in the well high above the level of the plug, consideration must be given to the physical form of the bentonite to be used. Adding the bentonite in chunk or pellet form will prolong

the effective period of wetting prior to hydration and allow proper placement of the plug. Bentonite clay can not be used as a sealant where organic contaminants are present in the groundwater unless the bentonite is treated and documentation is presented to show that it is capable of containing organic contaminants.

TABLE 1

CAPACITIES OF WELL CASINGS

Diameter of Hole	Gallons per Lineal Foot	Sacks Cement Per Lin. Foot	Cement Set Volume
2"	0.1632	0.0199	50.2
3"	0.3602	0.0311	32.1
4"	0.6528	0.0791	12.6
5"	1.0200	0.1240	8.0
6"	1.4688	0.1785	5.6
7"	1.9992	0.2430	4.1
8"	2.6112	0.3373	3.2
10"	4.0800	0.4958	2.0
12"	5.8752	0.7140	1.4

Recommended quantities of neat portland cement needed for plugging various diameter wells are shown in the above Table. Quantities are based on the set volume, which is somewhat less than the slurry volume.

(Taken from "Plugging Abandoned Wells" by Donald K. Keech, Ground Water Age, January 1973)

Shallow monitoring wells installed in unconsolidated sediments or consolidated rocks without fractures or dissolution voids are to be filled with a sealant. Backfilling of the screened or uncased section of the well (up to several feet below the casing) with clean, disinfected sand is permissible. Sand with a diameter of 0.025 inches or less (plaster sand or mortar sand) reduces cement penetration/loss. As a minimum, the upper 50 feet of deep monitoring wells shall be plugged with neat cement or bentonite clay.

Consolidated rocks with a high density of fractures or dissolution voids shall be filled completely with neat cement. Sand and clay fill materials are not suitable. The use of bridging materials, such as pea gravel or larger rocks (the diameter of the bridging material should be less than 1/3 of the diameter of the well) below the casing or the placement of a plug at the base of the casing, may be necessary to retain the neat portland cement slurry in the well.

Where several confined aquifers are present in an abandoned monitoring well,

impermeable seals between water bearing sections are required. Flow from artisan wells can cause problems with the installation of neat portland cement. Packers or heavy plugs shall be required to inhibit water flow.

H. Closure Schedule

After the final grading of the site has been completed, closure activities, to include final cap and vegetative cover must be completed as soon as possible but are not to exceed 180 days.

TVA must notify DSWM in writing of completion of closure of the Pond "J" ash disposal facility. Such notification must include a certification by TVA that the Pond "J" ash 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.

I. 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.

J. Post-Closure Care Activities

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 site is controlled and directed off the site, 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.

K. 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.

III. QUALITY ASSURANCE/QUALITY CONTROL

A. General

The purpose of this plan is to establish standards that must be followed by the registered professional engineer or geologist in order to insure that the closure of the facility meets the specifications given in the design documents. The professional engineer or geologist shall use sound judgment when determining what additional procedures may be required in order to further assure the construction quality.

The Quality Assurance/Quality Control shall be performed by a party independent of all other construction contractors involved in closure of the disposal site. The plan will be performed in addition to any Construction Quality Control Programs implemented by construction contractors.

Detailed in this plan are the minimum standards for soil selection, minimum testing programs, minimum construction

standards, and the minimum documentation required to assure that the requirements of the plans and specifications are met.

Throughout this document, the word "clay" is used to mean material of low permeability. This may include soil classified as clay or mixtures of soil with additives as required to meet the specifications.

B. Cap

1. Construction specifications: The one foot of soil in the bottom half of the cap for the Pond "J" ash disposal facility, will meet the following requirements.

- A saturated, vertically oriented hydraulic conductivity no greater than 1×10^{-7} cm/sec, after compaction within the density and moisture content range specified for construction as determined during laboratory testing.
- A classification of CH or CL, as determined by the Unified Soil Classification System, ASTM standard D-2487-69, unless the DSWM approves another classification.
- Any alternative soil proposed to DSWM will include documentation that the soil can be compacted to achieve the hydraulic conductivity and engineering properties of the soil specified above.

2. Clay Source Verification: The clay source will be tested and verified by a registered professional engineer or geologist as meeting the standards specified. Random

samples of the source material will be obtained every 3,000 cubic yards excavated and whenever the texture, color or location of the source of the soil changes significantly. Samples will be tested for the following such that a correlation to permeability may be made:

a. Moisture-density relationship of the soil by the Standard Proctor Test, (ASTM D698);

b. Grain size analysis (ASTM D422);

c. Atterberg Limits (ASTM D4318).

Random samples of the material placed will be obtained a minimum of once every 5 acres to verify the correlations which are made from the previously stated sample testing. Samples will be tested for hydraulic conductivity as specified by the EPA Method 9100 in Test Methods for Evaluating Solid Waste SW-846 or other method approved by the DSWM.

3. Cap Construction: The cap will be constructed as outlined below:

a. Lift thickness of no more than 8 inches, loose lift (prior to compaction).

b. Each lift is thoroughly and uniformly compacted to that density and within that moisture content range determined necessary to achieve a hydraulic conductivity less than 1×10^{-7} cm/sec.

c. Soil will not be compacted at moisture contents less than optimum, nor to less than 95% of

the maximum dry density, as determined by the Standard Proctor Test, ASTM D698.

d. The cap will be continuous and completely keyed together at all construction joints. Where required the previous lift or area of construction shall be scarified to facilitate bonding between lifts.

e. During construction, the clay will be protected from detrimental climatic effects by:

- Protect construction from extraneous surface water, sloped to facilitate drainage;
- Removing all ice and snow prior to placing a lift, and not using frozen soil in any part of cap;
- Recompacting any soil that has been subjected to a freeze and thaw cycle.
- Insuring that the cap is not subject to desiccation cracking by sprinkling the soil with water not less than twice per day, covering or tarping the soil, or other preventative measures;
- By removing soil which has experienced desiccation cracking before compacting the next lift or installing the next cap system component.

- By removing excessively wet soil or areas determined to be not acceptable by the registered professional engineer or geologist.

f. If the construction has areas determined to be not acceptable by the registered professional engineer or geologist remedial actions shall be taken. As a minimum, additional tests may be required to locate the extent of the unacceptable area. It shall be remedied based on the engineer's or geologist's sound judgment. Actions may include recompaction or removal and replacement of unsatisfactory material with new material, compaction and retesting.

Documentation of these procedures shall be provided by the engineer or geologist.

4. Clay Construction Certification: A registered professional engineer or geologist will verify that a compacted cap is constructed in accordance with these criteria by performing all of the following quality control tests.

a. Field density-moisture measurements of the cap immediately after compaction, as specified by ASTM D2922 (nuclear methods), for each 3000 cubic yards placed, with a minimum of 1 test per day of construction of lift of soil. The location of the soil samples will be rotated with each lift to

maximize the coverage of the tests. Field in-place density/moisture content tests will be conducted using a nuclear density gauge, sand cone or drive cylinder. If nuclear density methods are used sufficient numbers of the sand cone or drive cylinder tests will be performed to correlate and verify the nuclear gauge results. The moisture content of the fill materials will be kept within a range which allows the earthwork contractor to achieve the required density and permeability. When, in the opinion of the certifying Engineer or Geologist the moisture content of the fill material is too high or too low, the material will be alternately dried or moistened to facilitate compaction to the specified density.

b. The undisturbed hydraulic conductivity of a soil sample will be conducted at a minimum once per 5 acres of the cap, by the EPA Method 9100 in Test methods for Evaluating Solid Waste SW-846 or by another method per DSWM approval. Permeability samples will be obtained by extracting a Shelby tube sample from the in-place compacted material and returning this sample to the laboratory for testing. The hole left by the Shelby tube will be carefully backfilled with bentonite, hand tamped and compacted into place.