TENNESSEE VALLEY AUTHORITY

# KINGSTON FOSSIL PLANT

# OPERATIONS MANUAL
# DREDGE CELL LATERAL EXPANSION

## VOLUME 2

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Prepared By

Tennessee Valley Authority
Fossil Engineering Services

# APPENDIX E

## Hydrogeologic Evaluation of Ash Pond Area

**TENNESSEE VALLEY AUTHORITY**
River System Operations & Environment
Research & Technology Applications
Environmental Engineering Services - East

# KINGSTON FOSSIL PLANT

# HYDROGEOLOGIC EVALUATION OF COAL-COMBUSTION BYPRODUCT DISPOSAL FACILITY EXPANSION

**WR2004-2-36-130**

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**SUMMARY**

The expansion of Class II coal-combustion byproduct (CCB) disposal facilities proposed within the existing Ash Disposal Area of Kingston Fossil Plant (KIF) was evaluated for two possible disposal options. The first (Option A) would involve future codisposal of coal ash and gypsum derived from flue-gas desulfurization. Under Option B the facility would receive only coal ash. Hydrogeological evaluations of the proposed facilities associated with both options were performed to examine their suitability relative to the appropriate standards of the Tennessee Department of Environment and Conservation (TDEC) Rule 1200-1-7. Evaluations addressed effects of proposed disposal facilities on local groundwater and surface water resources during both the operational and post-closure periods. Comparisons of water quality impacts for facility designs with and without a constructed three-foot geologic buffer were also provided as the basis for an alternative to an artificial geologic buffer.

Recent site investigations supporting these evaluations included 12 soil borings, installation and monitoring of three piezometers, and field hydraulic conductivity (K) testing at two sites and laboratory K testing of two ash samples. A survey of private water wells and public water supplies within two miles of the site was also conducted to determine current water use. Additional hydrogeologic data was obtained from previous studies in the existing Ash Disposal Area, and included 25 soil borings, water level data for 16 monitoring wells, 7 field aquifer tests in soil and bedrock wells, and lab K measurements for 10 soil and ash samples.

The Lower Conasauga Group and the Rome formation comprise bedrock beneath the proposed disposal area, and consist primarily of shale with thin, interbedded limestone, siltstone, and conglomerate. Drilling within the Conasauga and Rome in and around the disposal site revealed no evidence of karstification. A mantle of predominantly alluvial soils consisting of clay, silt, and sand with occasional gravel lies above bedrock. Thickness of the alluvium is highly variable, ranging from about 5 to 65 ft. Ash and ash-soil fill materials ranging up to 83 ft in thickness are present above the alluvium. Ash deposits are composed almost entirely of fly ash, with bottom ash comprising less than 10% of the ash fill. The first occurrence of groundwater below the area is generally within the existing ash fill. Groundwater movement at the site generally follows topography with groundwater flowing eastward from Pine Ridge toward Swan Pond Creek embayment, the Emory River, and the plant intake channel. An exception occurs in the Ash Dredge Cell area where mounding of the water table produces localized groundwater movement toward an on-site drainage feature that flows northeastward along the base of Pine Ridge. All groundwater originating on, or flowing beneath, the proposed disposal site ultimately discharges to the reservoir without traversing private property.

The proposed CCB disposal facilities would be developed entirely on existing ash deposits. Laboratory testing indicates the ash would not meet the hydraulic conductivity requirements of TDEC Rule 1200-1-7-.04 or Policy Memorandum SW-93. The environmental benefit of constructing an artificial 3-ft clay buffer at the base of the Phase 2 and 3 disposal areas was examined by numerically simulating leachate seepage from these disposal facilities with and without a clay buffer. The evaluation focused on the effects of ash and gypsum leachate on stream water quality, since leachate from proposed disposal facilities would ultimately discharge to the Emory River. Estimates of maximum in-stream concentrations were performed for selected CCB-related constituents under low stream flow conditions.

Hydrogeologic conditions at the proposed disposal site appear to satisfy geologic and hydrologic standards for Class II disposal facilities. Key findings and recommendations are summarized as follows:

- A survey of water use in May 2004 identified 13 residential wells and one public water supply spring located within approximately one mile of the proposed disposal facility boundary. Neither the public spring nor any of the residential wells is located downgradient of the proposed facility. Furthermore, there is no potential for future development of groundwater supplies downgradient of the facility since all property between the disposal site and surface water boundaries lies within the plant reservation.

- Modeling results indicate that construction of an artificial 3-ft clay buffer, having a hydraulic conductivity of $10^{-6}$ cm/s or less, beneath the Phase 2 and 3 disposal areas would not provide a substantial environmental benefit. During the operational phase, predicted leachate seepage rates for the no-buffer and buffer designs for Option A differed by 38% or less. Similar comparisons for Option B showed differences of 28% or less. Following facility closure, differences in seepage rates would be less than 1% due to the infiltration-limiting effect of the $10^{-6}$ cm/s clay cap. On this basis, construction of an artificial clay buffer is not recommended.

- Evaluation of CCB leachate seepage effects on local stream water quality further supports the suitability of the site for the proposed disposal options without an artificial geologic buffer. Under Option A, maximum cumulative COC stream loadings predicted for the Emory River during low flow conditions would not produce in-stream concentrations exceeding the drinking water standards maximum contaminant limit (MCL) or aquatic life criteria for either the buffer or no-buffer cases. Predicted COC concentrations for the Emory River under disposal Option B were below drinking water and aquatic life standards for all COC except ammonia. Worst-case $NH_3$-N concentrations of 0.58 and 0.47 mg/L estimated for the no-buffer and buffer designs pose no threat to human health, but could exceed the criteria continuous concentration (CCC) under coincident conditions of extreme pH, temperature, and low flow in the Emory River. Historical data suggest the joint probability of such an occurrence would be less than 0.3%. The potential risk associated with ammonia under Option B can be addressed by future monitoring. Periodic sampling of ash ammonia content and groundwater downgradient of the facility would be performed to assure ammonia levels remain within the limits assumed in this evaluation.

- There is no evidence of Holocene-age faulting within the required 200-ft facility exclusion zone. In addition, there are no indications of karstification or other geologic features which might adversely affect facility containment.

- No streams, springs or lakes are located within 200 ft of the site, and facility would lie entirely above the projected 100-year flood stage of the Emory and Clinch Rivers.

# 1. INTRODUCTION

## 1.1 Background

The proposed coal-combustion byproduct (CCB) facility at TVA's Kingston Fossil Plant (KIF) is located on the west bank of the Emory River (mile 2 to 2.5) in Roane County, Tennessee (Figure 1-1). The disposal site encompasses approximately 244 acres and is located within the existing Ash Disposal Area. Land surface across the disposal site ranges from elevation 760 to 805 ft (above mean seal level), and is entirely above the 100-year flood stage of elevation 748 ft.

The facility Part II Permit Application, submitted to TDEC on June 10, 2004, considers two options for future CCB disposal at KIF. The first option (referred to in this report as Option A) proposes codisposal of coal ash and flue gas desulfurization (FGD) derived gypsum. If approved, a total of 12.4 million cubic yards (CY) of fly ash and bottom ash and 7.20 million CY of gypsum would be deposited in the area between 2004 and 2029. Under Option B the facility would receive only coal ash. A total of 21.4 million CY of fly ash and bottom ash would be deposited in the facility between 2004 and 2048.

## 1.2 Purpose and Scope

The objective of this report is to evaluate the suitability of the proposed CCB disposal facility in terms of the hydrogeologic features of the site and compliance with the design standards of TDEC Rule 1200-1-7. The potential effects of the facility on local groundwater and surface water resources are addressed for both the operational and post-closure periods. The focus is on stream water quality effects since shallow groundwater originating on, or flowing beneath, the site ultimately discharges to streams without traversing off-site property. Numerical models were used to estimate leachate generation rates from each disposal area. Leachate seepage estimates were used along with CCB leachate chemical compositions in predicting worst-case in-stream concentrations of selected constituents under low stream flow conditions. Separate evaluations were performed for Options A and B. Additionally, comparisons of water quality impacts for facility designs with and without a constructed 3-ft geologic buffer are provided for each disposal option. Hydrogeologic data used to support the analysis were derived from recent geotechnical investigations at the site conducted by MACTEC Engineering and Consulting, Inc. (2004) and from several previous site investigations (described in Section 1.3). A survey of private water wells and public water supplies within two miles of the site was conducted to establish local water use.

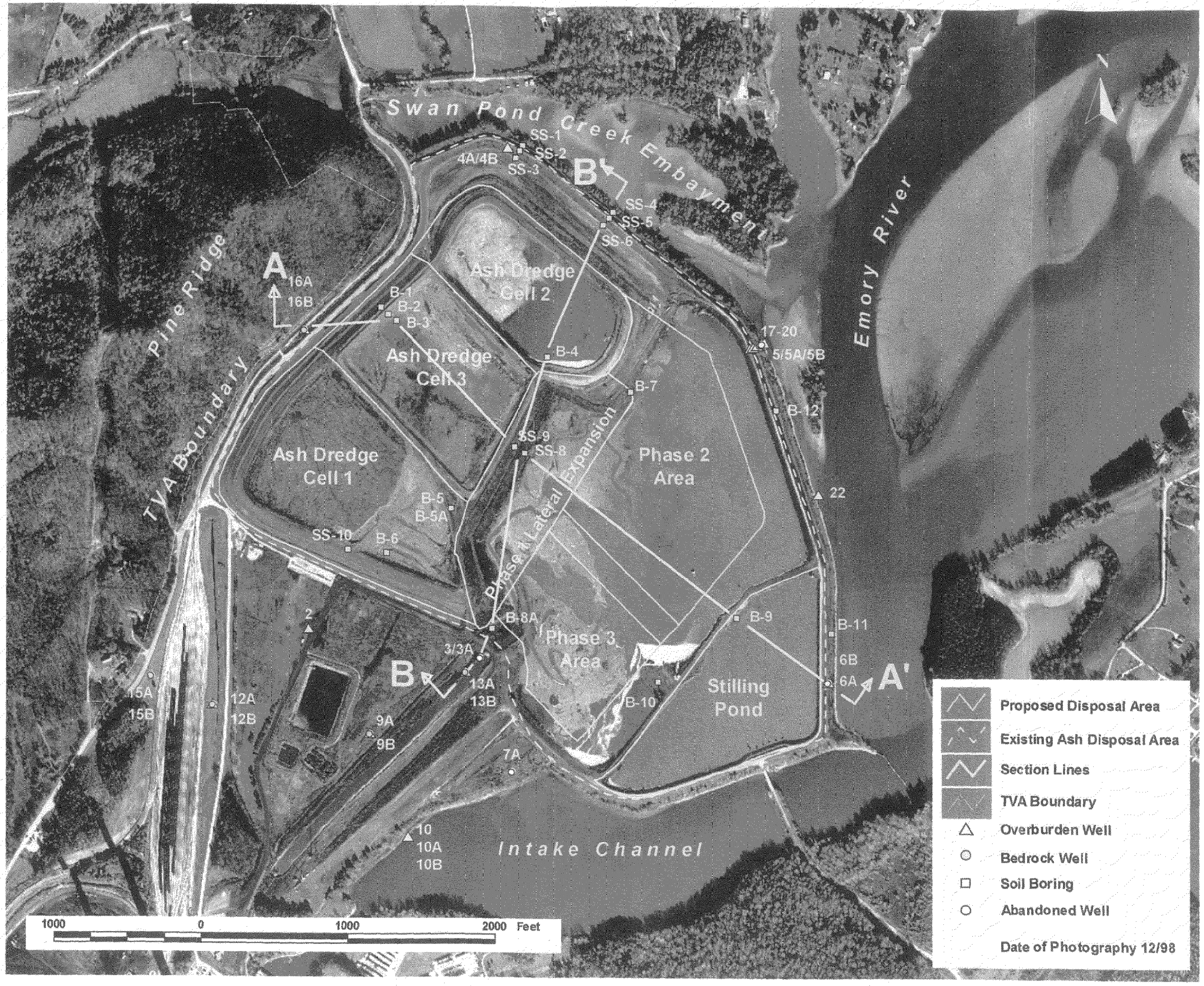



Figure 1-1. Site Location Map Showing Soil Borings and Monitoring Wells

Results of recent geotechnical investigations supporting disposal facility design and the hydrogeological evaluation are reported in MACTEC Engineering and Consulting, Inc. (2004). Investigations included 12 geotechnical borings (B-1 through B-12) drilled to refusal at locations in and around the proposed site to characterize overburden stratigraphy and to acquire samples for laboratory testing (Figure 1-1). Sample collection and standard penetration resistance testing were performed at 5-ft intervals. Appendix A contains lithologic logs for these borings and a description of soil sampling methods. Laboratory hydraulic conductivity tests were performed on two remolded ash samples collected from the existing Ash Dredge Cell Area. Three additional auger borings were completed at existing ash deposits for in-situ hydraulic conductivity testing (designated B-1A, B-1B, and B-2A). Three piezometers were installed adjacent to borings B-1 through B-3 for periodic water level monitoring. These piezometers are located on the northwest-facing slope of Ash Dredge Cell 3. Cone penetrometer soundings were performed at 11 locations within the proposed disposal site to supplement boring data. Complete descriptions of sampling and testing procedures used in these investigations are presented in MACTEC (2004).

## 1.3 Previous Investigations

The hydrogeologic data used in the present evaluation are partially based on three previous investigations at the KIF site. The first was an EPA-sponsored study by Milligan and Ruane (1980) to examine the effects of coal ash leachate on groundwater quality. This study was initiated in 1976 with core sampling and monitoring well construction at eight sites, J1 through J8 (Figure 1-1). (Note that the "J" well prefix was dropped in later investigations and does not appear on figure well labels in the present report.) Soil samples were collected using a 2-inch diameter split-spoon sampler through a 12-inch outer diameter hollow-stem auger. Fourteen, four-inch diameter PVC wells, screened over the lower 1.5 ft, were installed through the auger following core sampling. Wells were installed either singly or in staged multiple-well clusters. Lithologic logs for these wells are presented in Appendix A. In addition, laboratory permeameter measurements of the horizontal and vertical components of hydraulic conductivity were performed on selected core samples. Soil column studies were also performed to examine the potential for geochemical attenuation of ash-related contaminants, particularly trace metals.

Velasco and Bohac (1991) performed a site-wide assessment of groundwater conditions at the KIF reservation. Single-well or multiple-well clusters were installed at eight additional sites (sites 9 through 16) in 1988 as part of the investigation. Wells were constructed with 2-inch PVC casing and were screened over the lower 10 ft. Lithologic logs for these wells are included in Appendix A along with a description of sampling methods. Well construction diagrams are presented in Appendix B. These wells, and those installed in 1976, were sampled six times between 1988 and

1990 to examine spatial and temporal trends in groundwater quality at the plant site. Constant-rate injection tests were performed at eight wells to determine bulk hydraulic conductivities of the overburden and shallow bedrock materials. These data were used in development of a groundwater flow model of the site. In addition, their investigations included an evaluation of the potential of geochemical attenuation of ash-related contaminants. Mineralogical analyses were conducted on 20 soil samples collected adjacent to monitoring wells 1 through 6 (Figure 1-1). X-ray diffraction analysis indicated clay minerals predominantly consisted of kaolinite and illite with trace amounts of other minerals, all of which tend to adsorb cations present in groundwater. Iron oxides were detected at contents of 0.33 to 0.60%, and are also known to adsorb several metals, e.g. arsenic, chromium, and zinc. Soil cation exchange capacities ranging from 6.6 to 34 meq/100 g were reported. Application of the MINTEQ geochemical speciation model using site soils data and representative chemical data for ash leachate indicated significant adsorption of arsenic, lead, and zinc. Attenuation of barium, chromium, and iron were predicted to occur by precipitation reactions (Velasco and Bohac, 1991).

Singleton Laboratories (1994) performed drilling and sampling investigations in the Ash Dredge Cell area at 10 locations (SS-1 through SS-10). Two-inch split-spoon and three-inch Shelby tube samples were collected for laboratory geotechnical testing. Top-of-rock and groundwater level elevations were established at each site. Boring logs are included in Appendix A.

A hydrogeologic evaluation was prepared by Boggs et al. (1995) for closure of the existing Ash Disposal Area on which the proposed CCB facility would be developed. The evaluation focused on the long-term impacts of the Ash Disposal Area on local groundwater and surface water resources following facility closure. The study was initiated with an examination of local hydrogeologic conditions, groundwater quality, and groundwater use in the site vicinity. Hydrogeologic and water quality data were derived from previous groundwater investigations at the plant site. Local groundwater use was established by a survey of residents within a two-mile radius of the disposal site. A water budget simulation of the closed facility was performed to quantify ash leachate production rates during a 30-year post-closure period. The ultimate impact of the closed facility was evaluated using the predicted leachate discharge in conjunction with leachate chemical characteristics and groundwater flow patterns in the site vicinity.

## 2. HYDROGEOLOGIC CONDITIONS

### 2.1 Geology and Soils

Kingston Fossil Plant resides within the Valley and Ridge physiographic province, a region characterized by narrow, subparallel ridges and valleys trending northeast-southwest. The controlling structural feature of the region is a series of northeast-striking thrust faults which have forced older rocks from the southeast over younger units. Bedrock units of the Rome Formation (lower Cambrian age), the Conasauga Group (middle to upper Cambrian), and the Knox Group (upper Cambrian to Ordovician) subcrop beneath the site in northeast-trending bands (Figure 2-1). These units generally dip to the southeast at angles averaging 45 to 50 degrees (Benziger and Kellberg, 1951). The band of Rome on the northwest side of the site, along with the overlying Conasauga and Knox formations, represent a thrust fault block which has been forced over the Knox outcrop to the northwest. The two major faults associated with this thrust block, shown on Figure 2-1, constitute the two closest faults to the proposed disposal site. Both faults are located in excess of 1000 ft from the proposed disposal area, placing them outside of the 200-ft exclusion zone required by Rule 1200-1-7-.04(1)(u). Foundation exploration in the plant powerhouse area indicated bedrock jointing but no evidence of faulting (Benziger and Kellberg, 1951). Drilling of the overlying Quaternary age alluvium there and elsewhere on the reservation has showed no evidence of faulting in these sediments.

The site lies within the Eastern Tennessee seismic zone (ETSZ), a 300-km long, northeast-trending seismic feature running through the lower mid-Atlantic and southeastern United States (Powell et al., 1994). With the exception of the New Madrid seismic zone, the rate of earthquake activity in the ETSZ has been the highest of any area east of the Rocky Mountains. However, the mean focal depth of recorded earthquakes within the ETSZ is 15 km, placing earthquakes in crystalline basement rocks and not in the overlying sedimentary rocks. Thrust faulting in the region was associated with the Applachian Orogeny which ended in late Permian time, i.e., at least 250 million years ago. Further movement along these faults is improbable. The areas specifically proposed for future CCB disposal are underlain by the Lower Conasauga Group, with the exception of a narrow band along the northwestern side of the proposed site which is underlain by the Rome formation (Figure 2-1). The Nolichucky, Maryville, Rogersville, Rutledge, and Pumpkin Valley formations make up the Lower Conasauga Group, whereas the Maynardville formation is associated with the Upper Conasauga. Total aggregate thickness of these units is unknown but estimated to be approximately 1500 ft (Harris and Foxx, 1982). These units

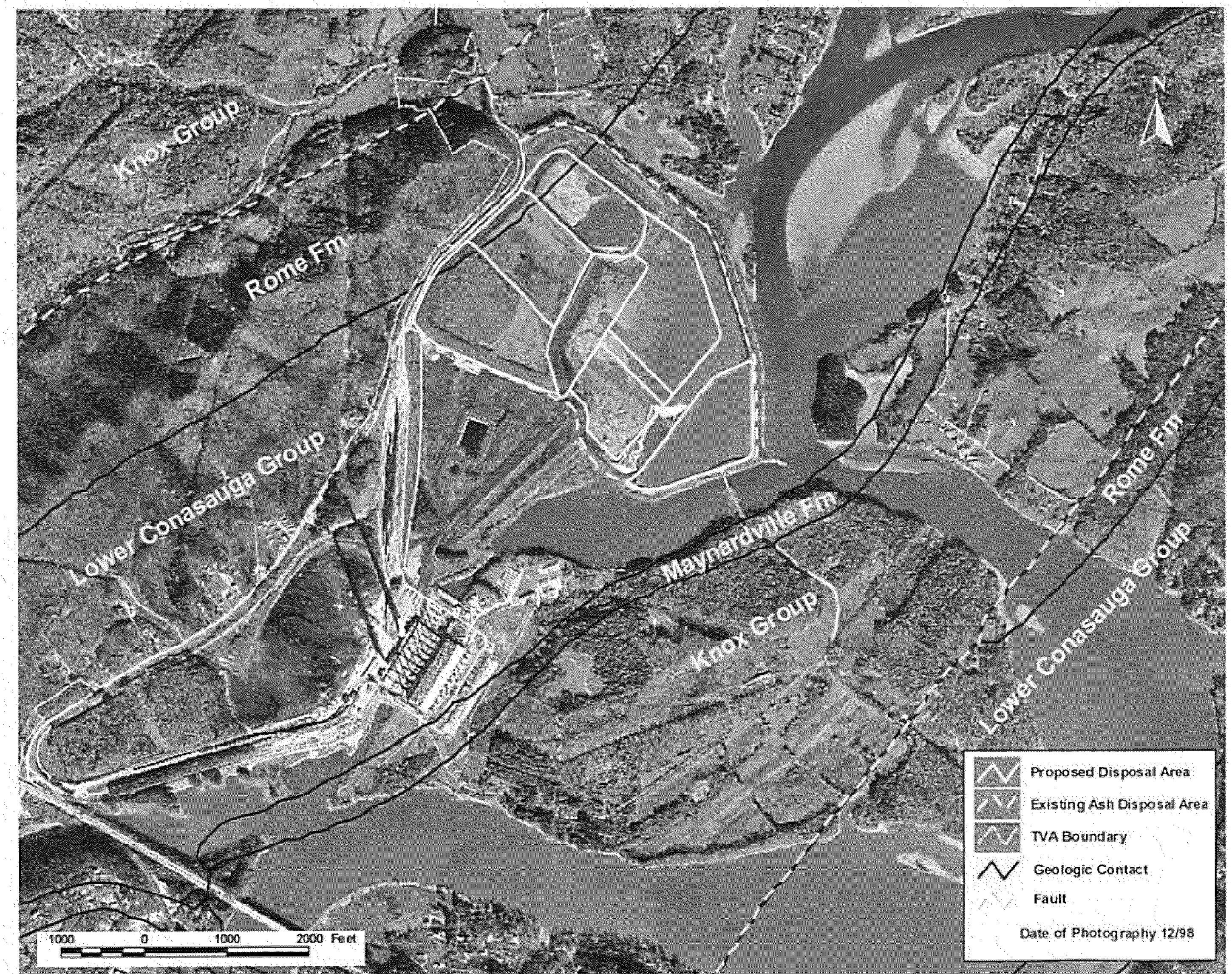



Figure 2-1. Site Geologic Map

predominantly consist of shale with interbedded siltstone, limestone, and conglomerate, and are locally of low water-producing capacity. Extensive rock coring of the Conasauga in the plant powerhouse area indicates that limestone accounts for only about 20% of the total cored material, and is present in relatively thin beds ranging from an inch to several feet in thickness (Benziger and Kellberg, 1951). This accounts for the absence of local evidence of karstification in areas underlain of the Lower Conasauga. The Rome formation which lies beneath the northwestern edge of the proposed disposal area consists of interbedded shale, sandstone, and siltstone.

The elevation of the top of rock directly beneath the proposed disposal area is relatively uniform, ranging from approximately 700 to 715 ft and averaging about 705 ft (Figure 2-2). Outside this area the bedrock surface rises steeply to the west and southwest. The lower bedrock terrace corresponding to the disposal area apparently represents an erosion surface associated with the ancestral Emory River. The upper few feet of bedrock generally consists of weathered fissile shale with occasional limestone fragments.

A mantle of predominantly alluvial soils (Quaternary age) generally lies above bedrock in the ash pond area as indicated in the hydrogeologic profiles presented on Figures 2-3 and 2-4 and the soil isopachous map of Figure 2-5. Soil thickness is highly variable, ranging from about 5 ft along a portion of the northern perimeter of the site to a maximum of 65 ft on the western boundary. The alluvial deposits are unconsolidated and heterogeneous mixtures of clay, silt, sand, and gravel that typically grade coarser with depth. Laboratory testing of recently collected alluvial soil samples from the site typically fall into the CL and SM classifications (MACTEC, 2004). A thin, discontinuous layer of residuum, composed of clay and silt with weathered shale fragments, is present directly above bedrock.

The ash and ash-soil fill present above the alluvial/residual soils range up to 83 ft in thickness. Ash deposits consist almost entirely of fly ash, with bottom ash comprising less than 10% of the ash fill. Particle size analysis indicates the existing ash is generally composed of silt and sand size particles with lesser amounts of clay and gravel size material (MACTEC, 2004). Ash pond dikes are constructed of mixtures of fly ash, bottom ash, and silty clay soil. The phreatic surface generally lies within the ash deposits.


Figure 2-2. Top-of-Rock Elevation Map

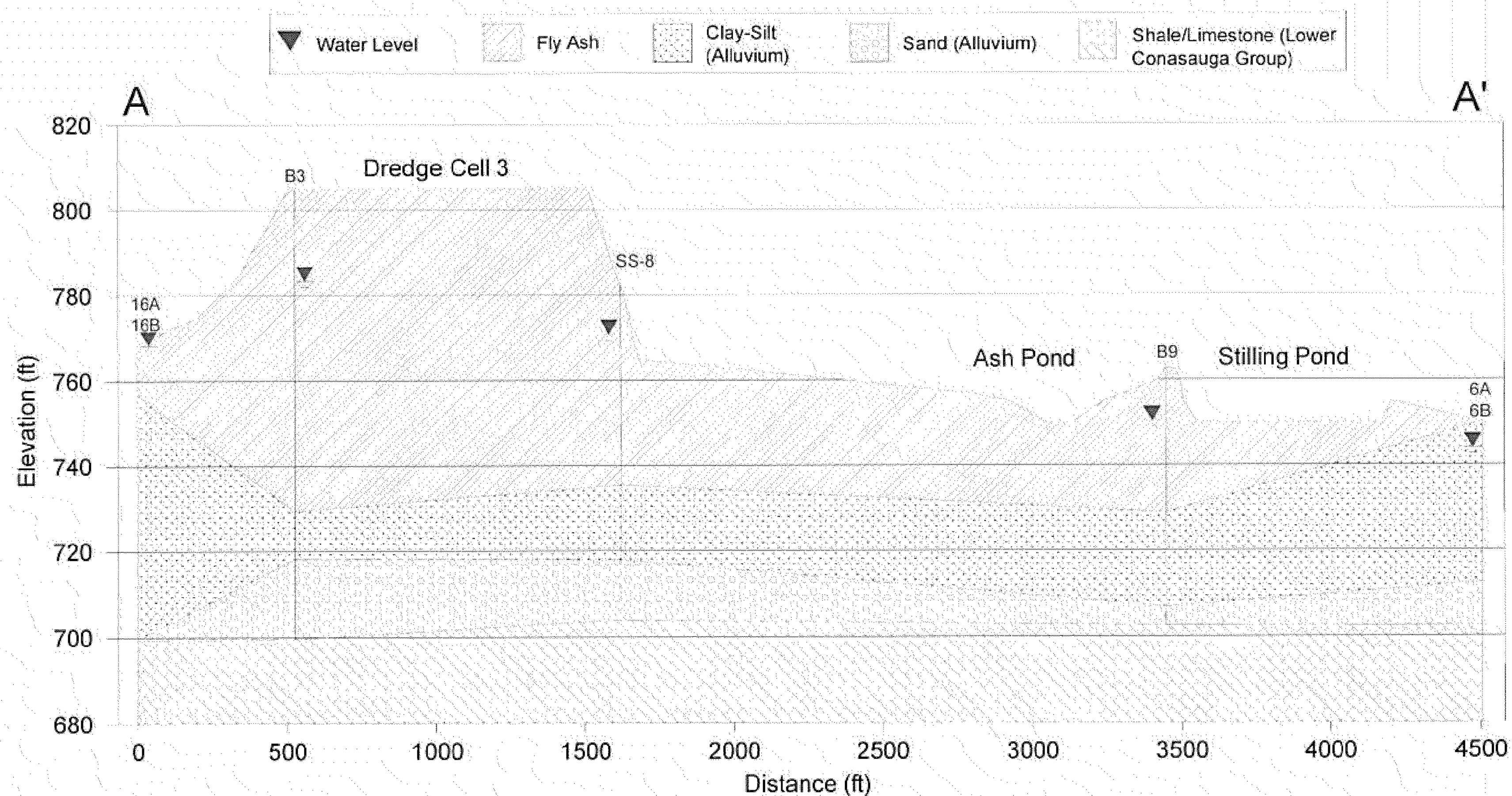



Figure 2-3. Hydrogeologic Section A-A'

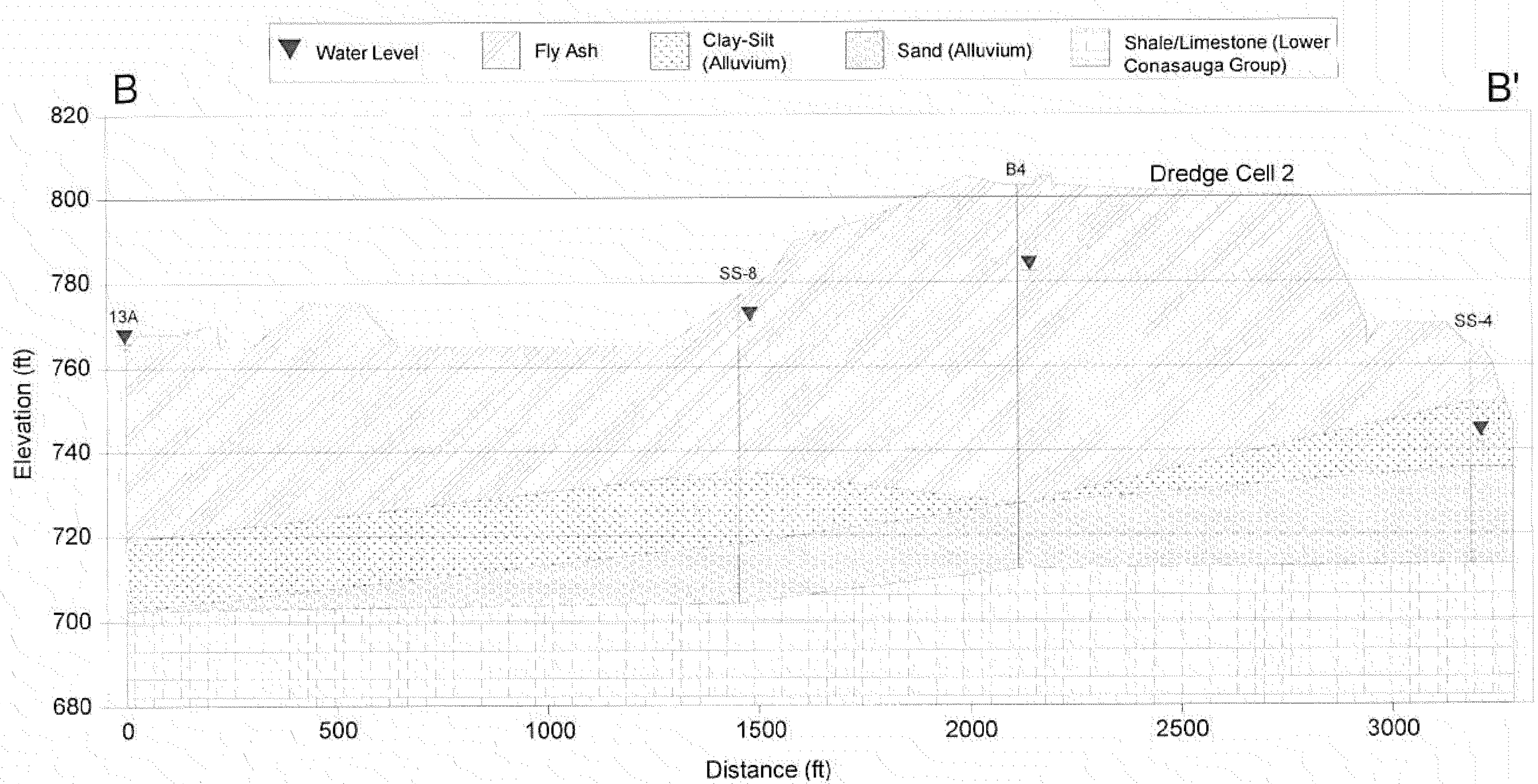



Figure 2-4. Hydrogeologic Section B-B'

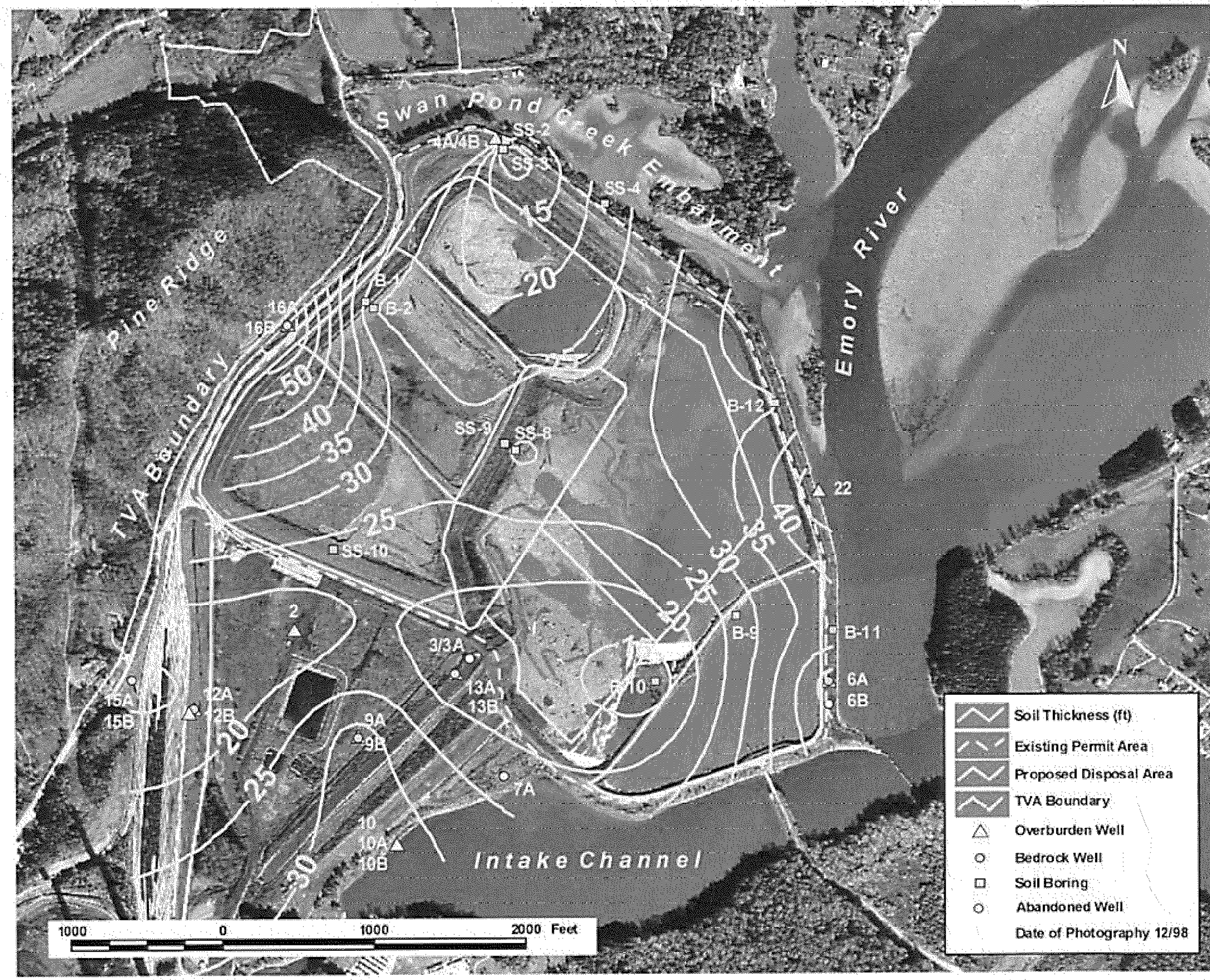



Figure 2-5. Alluvium-Residuum Thickness Map

Appendix C provides a compilation of grain-size data for unconsolidated soil and ash samples associated with several previous investigations. Atterberg limits and natural moisture content data are included where available along with a description of laboratory testing procedures.

While the number and density of soil borings and rock coreholes in some areas may be below the minimum requirements of the Division of Solid Waste Management's (DSWM's) Hydrogeologic Guidance Document, we believe the available data are sufficient to characterize subsurface conditions at the proposed CCB disposal site. A total of 30 soil borings have been completed within and immediately around the footprint of the proposed site in the unconsolidated ash and underlying alluvial deposits. Drilling has been limited by necessity to locations along perimeter dikes bounding the existing ash pond, stilling pond, and dredge cells. Characterization of the unconsolidated overburden should be adequate because coal ash, which comprises the upper 20 to 80 ft of overburden and represents the "natural" geologic buffer, exhibits a high-degree of homogeneity requiring fewer borings/samples for adequate characterization. In addition, available information indicates the thickness of the underlying alluvium and top-of-rock surface elevation to be relatively uniform, reducing the need for further exploratory drilling. Only two coreholes (i.e., 13B and 16B) have penetrated the underlying bedrock to depths ranging from 7 to 17 ft. However, three additional coring sites (9B, 12B, and 15B) are located within about a 1000 ft of the proposed disposal site, and extensive coring data are available from foundation studies in the plant powerhouse situated approximately 0.5 mile to the southwest.

## 2.2 Groundwater Occurrence

The first occurrence of groundwater below the proposed CCB disposal areas is generally within the existing ash fill. Under present conditions, groundwater is derived from infiltration of precipitation, seepage from various ash-related impoundments, and from lateral inflow along the western boundary of the reservation. Groundwater movement, as inferred from potentiometric maps developed from water-level measurements in shallow monitoring wells primarily located outside of existing ash disposal areas, is generally eastward from Pine Ridge toward Swan Pond Creek embayment, the Emory River and the plant intake channel (Figure 2-6). However, continuous recharge by ash sluice water in the active ash pond and dredge cells produces local mounding of the water table that is largely undetected by peripheral monitoring wells. Accounting for the measured water surface levels in Ash Dredge Cell 2, the ash pond, and stilling pond results in the alternative potentiometric surface shown on Figure 2-7. This figure indicates radial movement of groundwater away from the surface impoundments, including movement from Cell 2 toward Pine Ridge. Groundwater movement from the dredge cells toward Pine Ridge converges with groundwater flowing down slope. Groundwater entering the region of convergence either discharges into the ephemeral drainage feature paralleling Swan Pond Road on the northwest side,

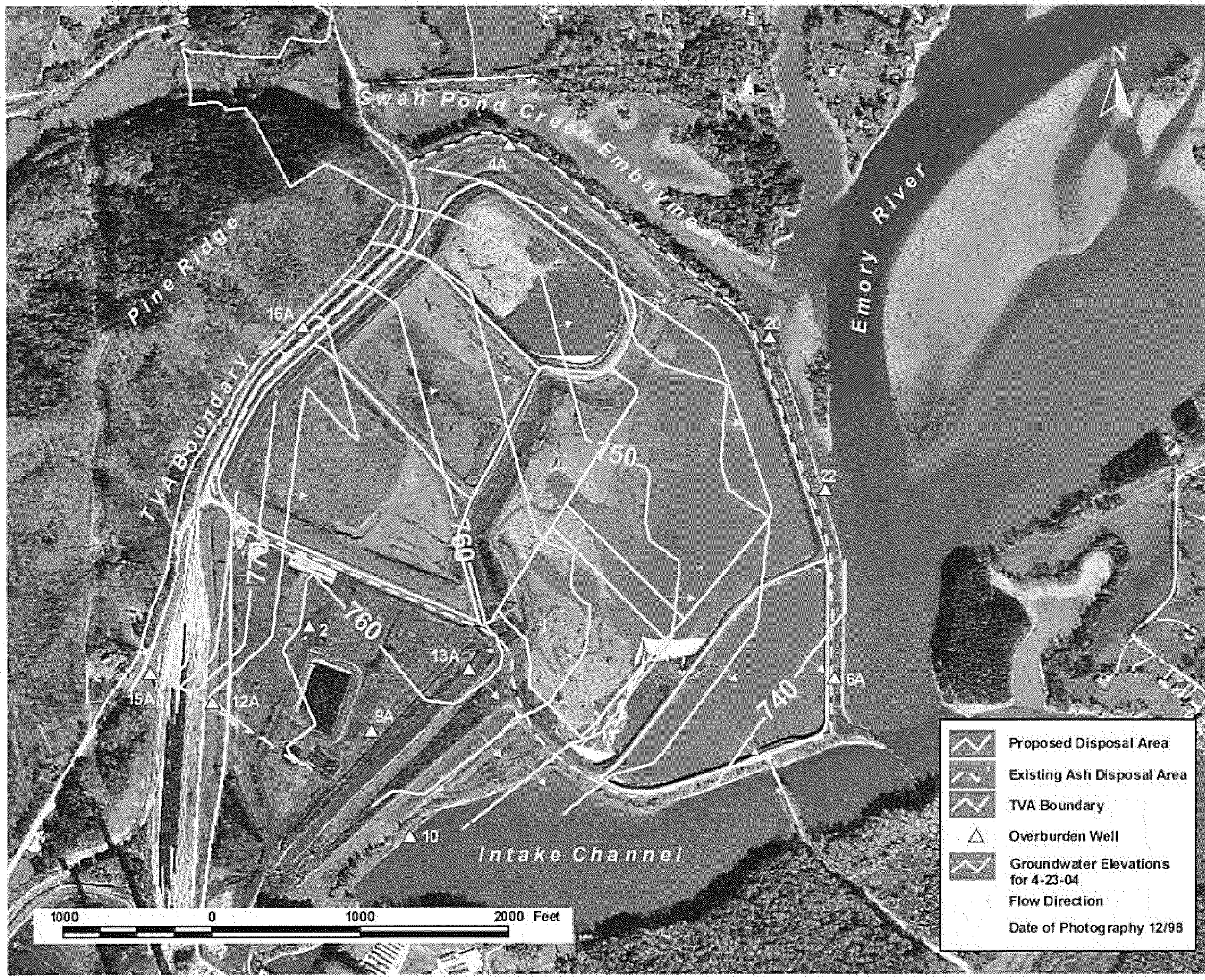



Figure 2-6. Groundwater Potentiometric Surface on April 23, 2004

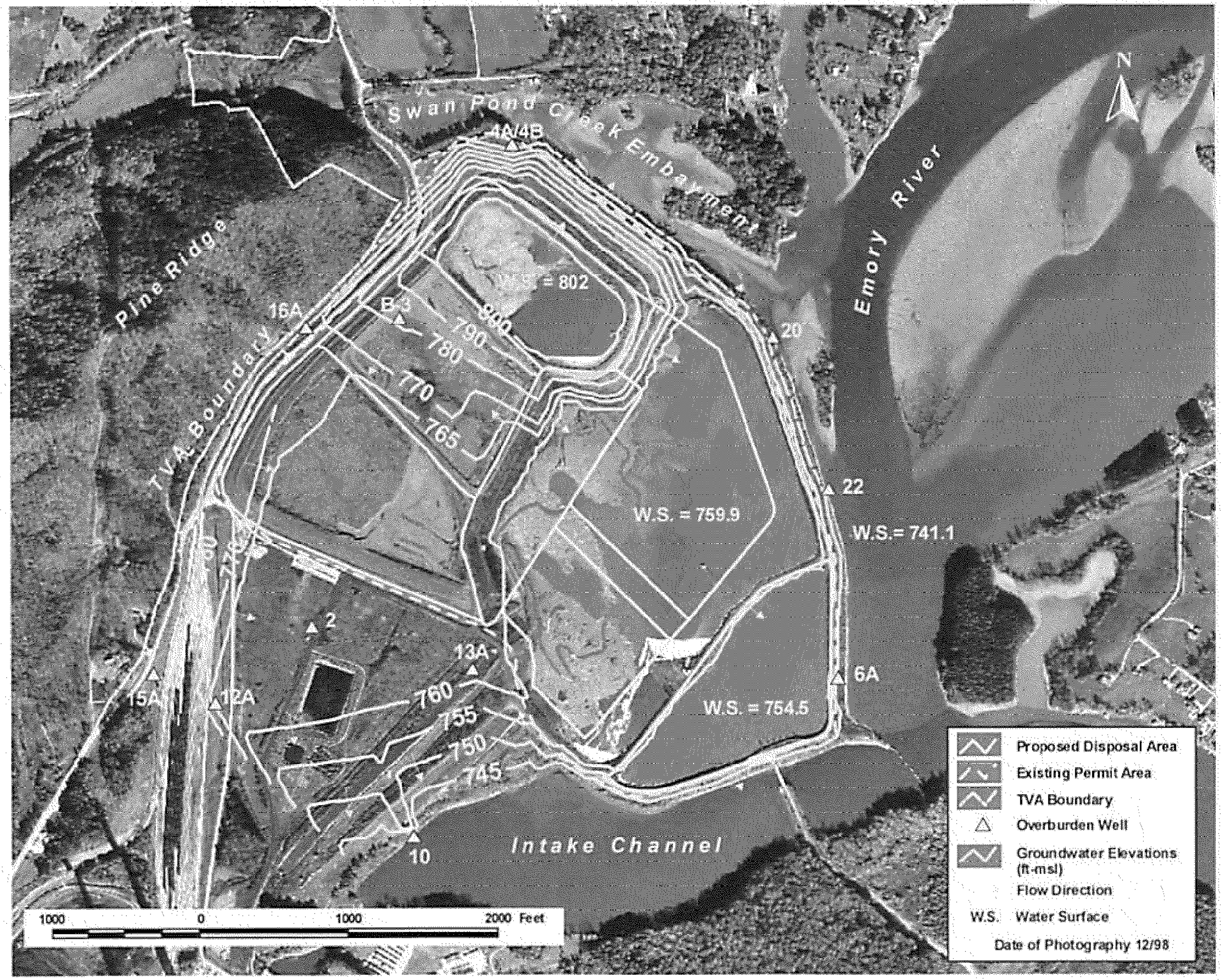



Figure 2-7. Groundwater Potentiometric Surface for April 23, 2004 Accounting for Surface Impoundments

or flows around the dredge cells to the northeast or southwest. Since the drainage paralleling Swan Pond Road lies on the KIF reservation, off-site movement of groundwater appears unlikely. In general, all groundwater originating on, or flowing beneath, the proposed disposal site ultimately discharges to the reservoir without traversing private property.

Long-term hydrographs for 10 monitoring wells surrounding the disposal site are presented on Figures 2-8(a) and 2-8(b). Groundwater level data used in these figures are tabulated in Appendix D. Natural seasonality in groundwater level trends is not discernable, due in part to the infrequency of the measurements, i.e., only four or fewer observations were made per year. However, the close proximity of most monitoring wells to the active ash pond, dredge cells, and/or the reservoir, suggests that these surface water features may largely control local groundwater levels. For example, the upward water level trends observed over the past 5 to 6 years in wells 16A and 13B, both of which are situated near ash disposal areas but away from the stabilizing influence of the reservoir, can be attributed to increasing impoundment heads in the existing Ash Pond and Ash Dredge Cells 1-3.

Short-term hydrographs for piezometers B-1 through B-3 are given on Figure 2-9 with data tabulated in Appendix D. These piezometers were installed along the northwestern slope of Ash Dredge Cell 2 in April 2004, and were monitored frequently over a three-month period. The relatively high potentiometric heads observed at these wells compared to neighboring wells (e.g., 4A, 16A) reflect mounding of the water table in the Ash Dredge Cell area created by sluice water recharge. Overall differences in the potentiometric head elevations in the three wells (i.e., highest at B-3 and lowest at B-1) can be attributed to differences in topographic position of piezometers on the dredge cell slope. Decreasing water levels were observed for all piezometers over the period, probably due to pumping from a recently installed toe drain on the northwest side of Cell 3 and perhaps to limited rainfall during the period (Appendix D).

Determination of the seasonal high water table for the proposed disposal site is problematic due to the artificial influence of multiple surface water impoundments on local groundwater levels. As noted earlier, shallow groundwater levels observed in local monitoring wells are largely controlled by reservoir stage and by recharge from adjacent impoundments. Consequently, natural variability of groundwater levels produced by seasonal differences in precipitation and evaporation is generally not discernable in temporal groundwater level records. Nevertheless, Figure 2-10 provides an estimate of the seasonal high water table based on the maximum water level observed in each monitoring well during the period of record (see Appendix D). There is little noticeable difference between overall groundwater levels and gradients indicated for the seasonal high water table configuration compared to that shown for the recent water table snapshot presented on Figure 2-7.

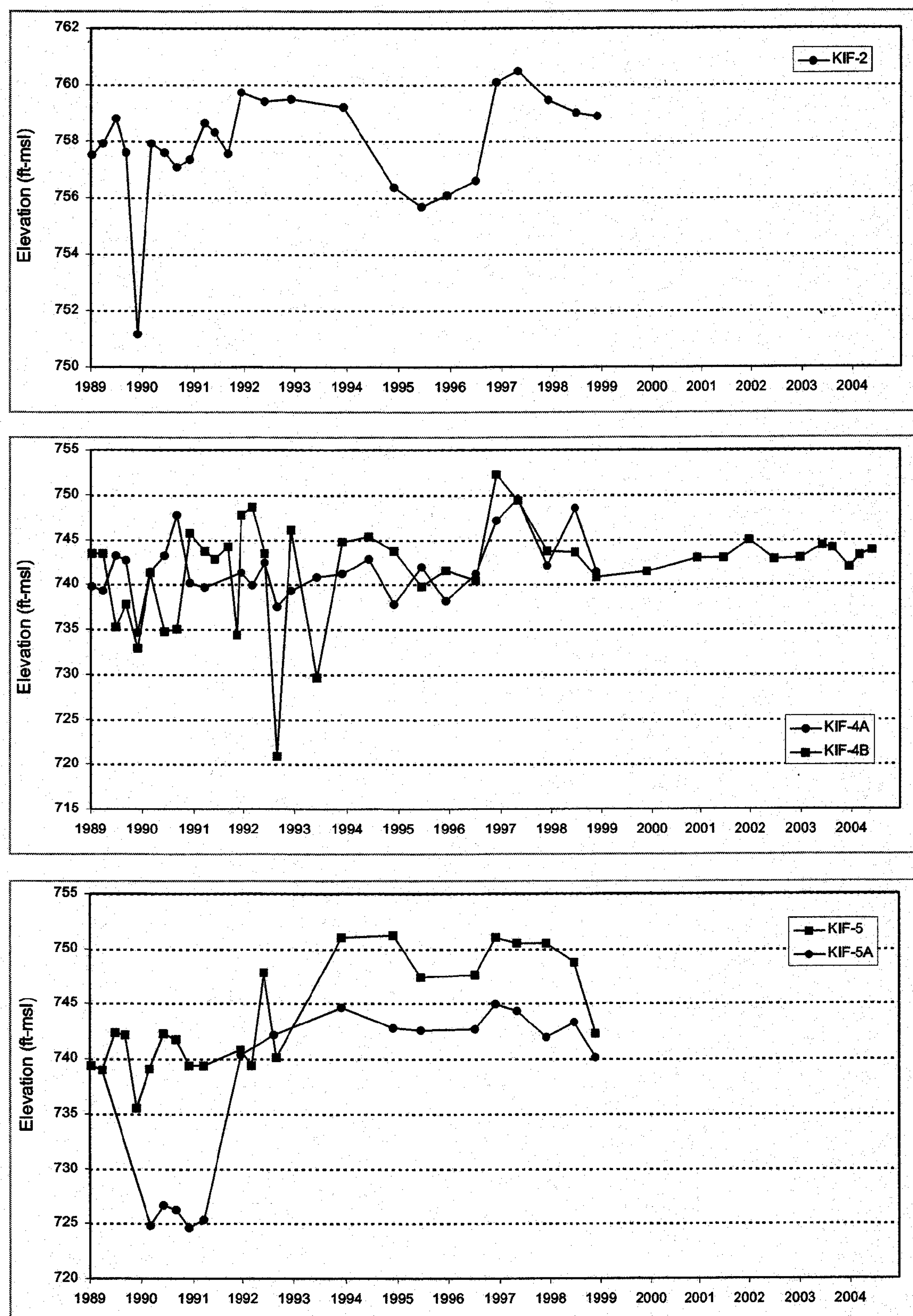



Figure 2-8(a). Long-Term Groundwater Hydrographs for Selected Monitoring Wells

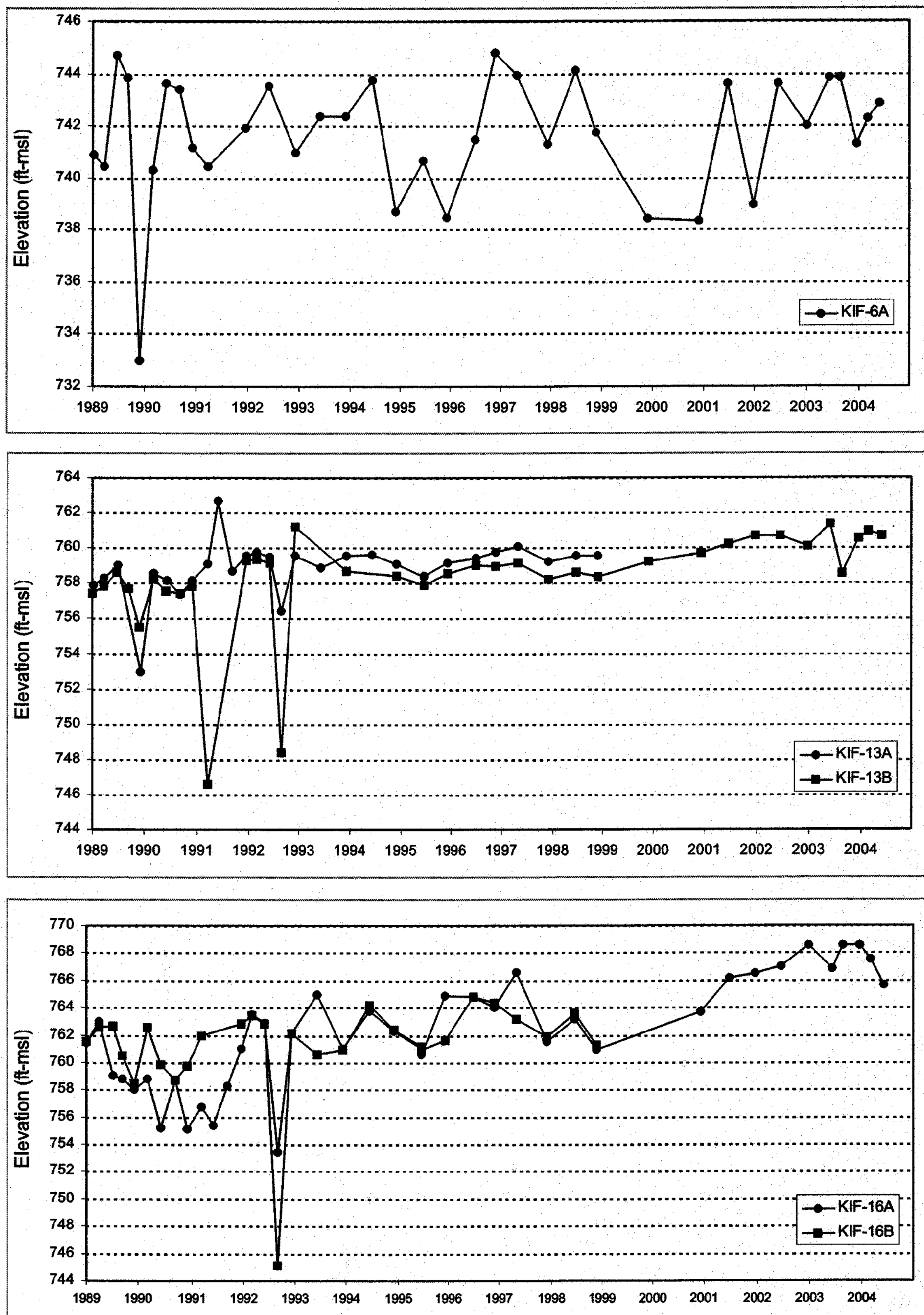



Figure 2-8(b). Long-Term Groundwater Hydrographs for Selected Monitoring Wells

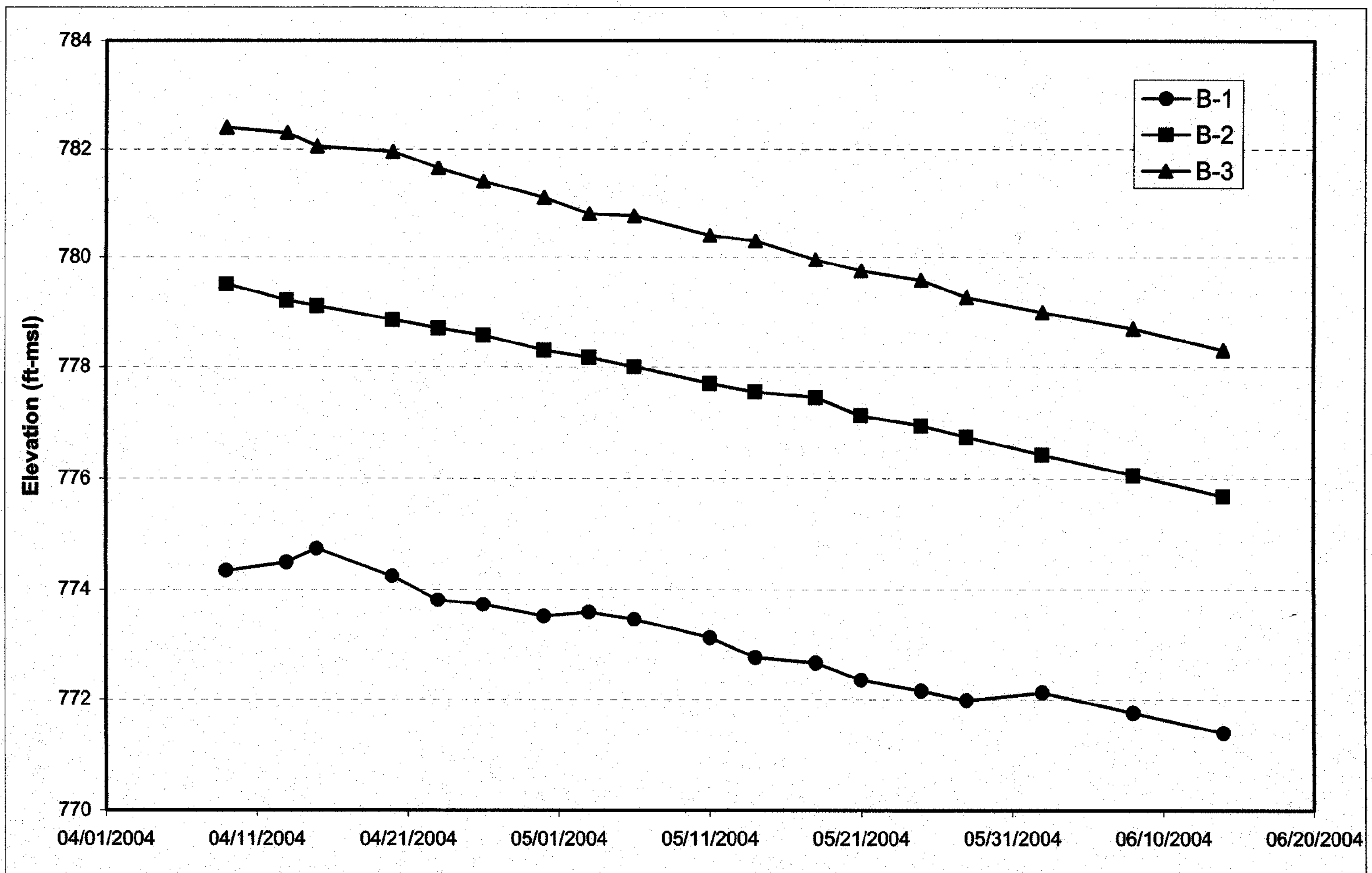



Figure 2-9. Short-Term Groundwater Hydrographs for Piezometers B1 – B3

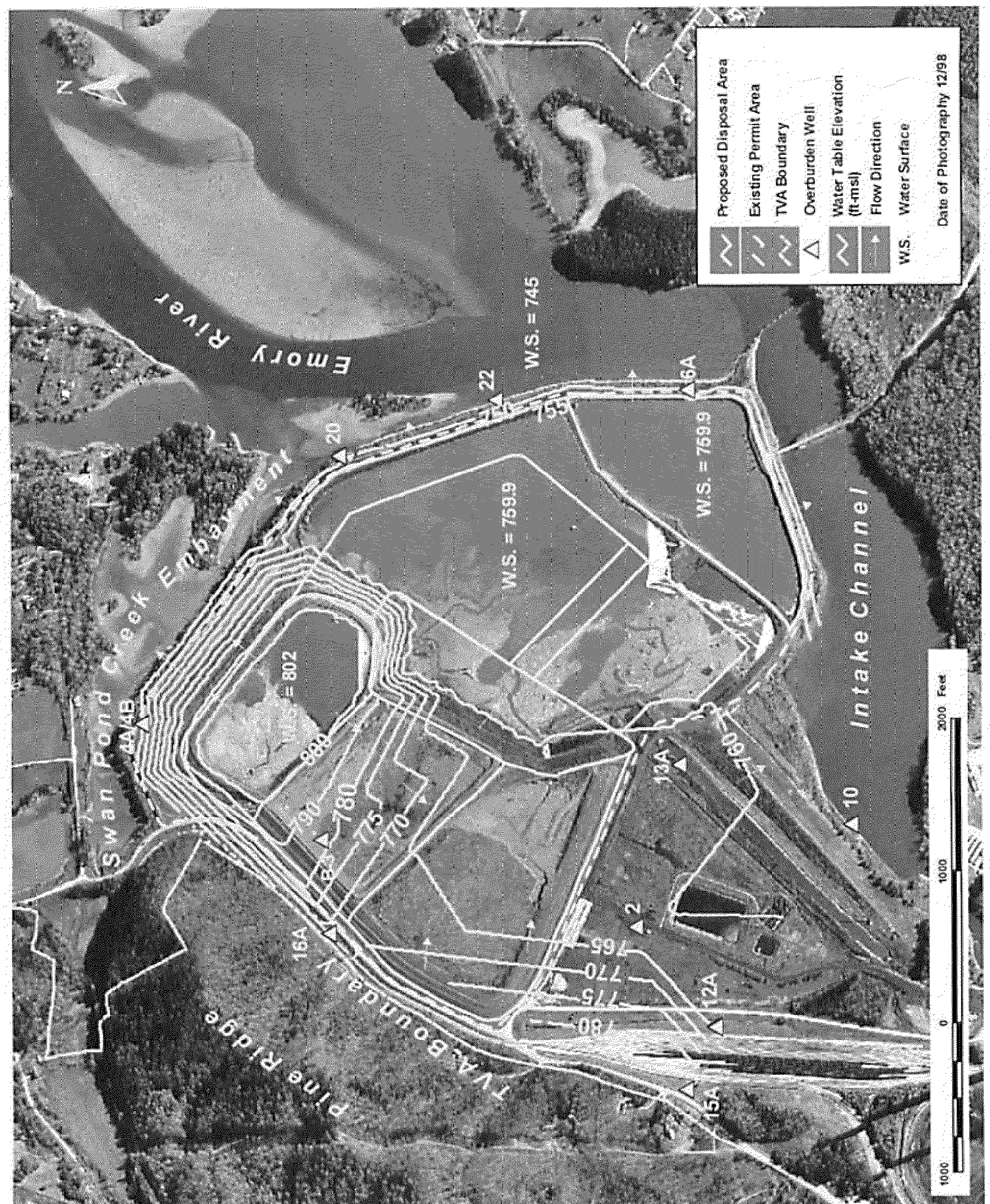



Figure 2-10. Estimated Seasonal High Water Table Map

## 2.3 Hydraulic Properties

A summary of field and laboratory measurements of hydraulic conductivity for ash, alluvial soils, and shallow bedrock derived from previous site investigations is presented in Table 2-1. References for the laboratory or field methods are also given in the table. Vertical hydraulic conductivities ($K_v$) for nine fly ash samples range from $3.6x10^{-6}$ to $8.3x10^{-5}$ cm/s and exhibit a median value of $2.0x10^{-5}$ cm/s. The two field measurements of fly ash horizontal conductivity ($K_h$) generally fall within the range of data reported for $K_v$. Laboratory-derived $K_h$ and $K_v$ data for alluvial clay-silt samples show little difference and average about $5x10^{-7}$ cm/s. Field measures of $K_h$ for this unit are about an order of magnitude higher, averaging approximately $7x10^{-6}$ cm/s. The difference reflects the larger measurement scale associated with field tests as well as the tendency for higher K values in the horizontal direction. Field testing performed in three wells completed in the upper Conasauga shale yielded $K_h$ values averaging $2x10^{-5}$ cm/s.

The "natural" geologic buffer material below the proposed CCB disposal area would largely consist of fly ash (see hydrogeologic sections on Figures 2-3 and 2-4). As indicated in Table 2-1, hydraulic conductivity measurements of fly ash are limited to laboratory analysis of seven samples and two Boutwell field tests. Although the number of hydraulic conductivity measurements is below the recommended requirements of the DSWM Hydrogeologic Guidance Document, these data are considered sufficient in view of the high-degree of homogeneity of fly ash.

The hydraulic conductivity data presented in Table 2-1 do not include data for remolded samples of landfill cap and geologic buffer materials. The source of the cap and buffer materials has not been identified. Prior to construction of either the cap or buffer, TVA will solicit bids for cap/buffer materials having specified geotechnical properties. These specifications will include a requirement that the cap/buffer materials are compacted in accordance with ASTM D-698 or D-1557, and that hydraulic conductivity be measured according to ASTM D-5084. Hydraulic conductivities equal to or less than $10^{-6}$ cm/s (at design compaction) will be required of buffer materials.

Clay cap material will require hydraulic conductivities equal to or less than $10^{-7}$ cm/s. Test results will be presented to the State for approval prior to construction of the cap or buffer.

**Table 2-1. Summary of Site Hydraulic Conductivity Data**

| Media | Location | $K_h$ (cm/s) | $K_v$ (cm/s) | Test Method | Reference |
|---|---|---|---|---|---|
| Fly Ash | Ash Dredge Cell 1 | -- | 8.3E-05 | ASTM D-5084 | Law, 1995 |
| Fly Ash | Ash Dredge Cell 3 | -- | 3.4E-05 | ASTM D-5084 | Law, 1995 |
| Fly Ash | B-1 | 1.4E-05 | 5.1E-06 | ASTM D-6391 | Mactec, 2004 |
| Fly Ash | B-2 | 3.7E-06 | 3.6E-06 | ASTM D-6391 | Mactec, 2004 |
| Fly Ash | B-2A | -- | 1.67E-05 | ASTM D-5084 | Mactec, 2004 |
| Fly Ash | B-1A, 1B | -- | 1.87E-05 | ASTM D-5084 | Mactec, 2004 |
| Fly Ash | -- | -- | 2.0E-05 | ASTM D-2434-68 | EPRI, 1993 |
| Fly Ash | -- | -- | 2.1E-05 | ASTM D-2434-68 | EPRI, 1993 |
| Fly Ash | -- | -- | 2.2E-05 | ASTM D-2434-68 | EPRI, 1993 |
| Bottom Ash | (?) | -- | 9.3E-03 | ASTM D-5084 | Law, 1995 |
| Alluvial Clay-Silt | Well 2 | 7.4E-08 | 6.3E-08 | (note 1) | Milligan & Ruane, 1980 |
| Alluvial Clay-Silt | Well 4 | 6.6E-08 | 2.8E-07 | (note 1) | Milligan & Ruane, 1980 |
| Alluvial Clay-Silt | Well 5 | 2.8E-07 | 4.0E-07 | (note 1) | Milligan & Ruane, 1980 |
| Alluvial Clay-Silt | Well 6 | 2.5E-06 | 4.4E-07 | (note 2) | Milligan & Ruane, 1980 |
| Alluvial Clay-Silt | Well 2 | 9.1E-06 | -- | (note 2) | Velasco&Bohac, 1991 |
| Alluvial Clay-Silt | Well 4B | 6.1E-06 | -- | (note 2) | Velasco&Bohac, 1991 |
| Alluvial Clay-Silt | Well 5 | 9.1E-06 | -- | (note 2) | Velasco&Bohac, 1991 |
| Alluvial Clay-Silt | Well 13A | 3.0E-06 | -- | (note 2) | Velasco&Bohac, 1991 |
| Conasauga Shale | Well 9B | 6.1E-06 | -- | (note 2) | Velasco&Bohac, 1991 |
| Conasauga Shale | Well 13B | 2.1E-05 | -- | (note 2) | Velasco&Bohac, 1991 |
| Conasauga Shale | Well 15A | 3.0E-05 | -- | (note 2) | Velasco&Bohac, 1991 |

*Notes:*

*1. Laboratory constant-head test of undisturbed sample in triaxial cell; exact method unknown.*

*2. Field constant-rate pumping test in single well.*

## 2.4 Precipitation

In the absence of long-term precipitation records for the KIF site, precipitation data were obtained for the National Oceanic and Atmospheric Administration (NOAA) station in Oak Ridge, Tennessee, located some 20 miles northwest of the site. A continuous 20-year period (1968-87) of daily precipitation data was selected. Annual precipitation for the period ranged from 38.8 to 76.3 inches and averaged approximately 52.9 inches.

# 3. LOCAL GROUNDWATER USE

A survey of local groundwater use within an approximate two-mile radius of the center of the ash pond area was conducted in March 1995 (Boggs et al., 1995). The survey included interviews with local residents and utility district managers. Water well records maintained by the State of Tennessee were also examined for wells within the survey region. This survey identified a total of 22 residential wells. A listing of these wells and their coordinate locations is given in Table 3-1. Note that wells were numbered 1 through 23 with no well 15. One spring (Spring 1) was identified which provides untreated water for 10 to 12 residences along Swan Pond Road and for several residents of the Kingston Heights subdivision. The spring emanates from aquifers of the Knox Group. This spring appeared to be the only spring in the survey region used for water supply. Other residents within the survey region were served by one of the four local water utilities listed in Table 3-1. These utilities provide treated water from intakes on Watts Bar Lake or the Emory River.

This area was re-surveyed in May 2004 to determine whether changes in local water use had occurred. The survey relied on interviews with local utility district managers, a drive-by inspection to identify new residences, and examination of current State well records. Six new residential wells identified, i.e., wells 24 through 29 (Figure 3-1) located east of the proposed disposal area on the opposite side of the Emory River. There was no change in public water supplies in the site vicinity.

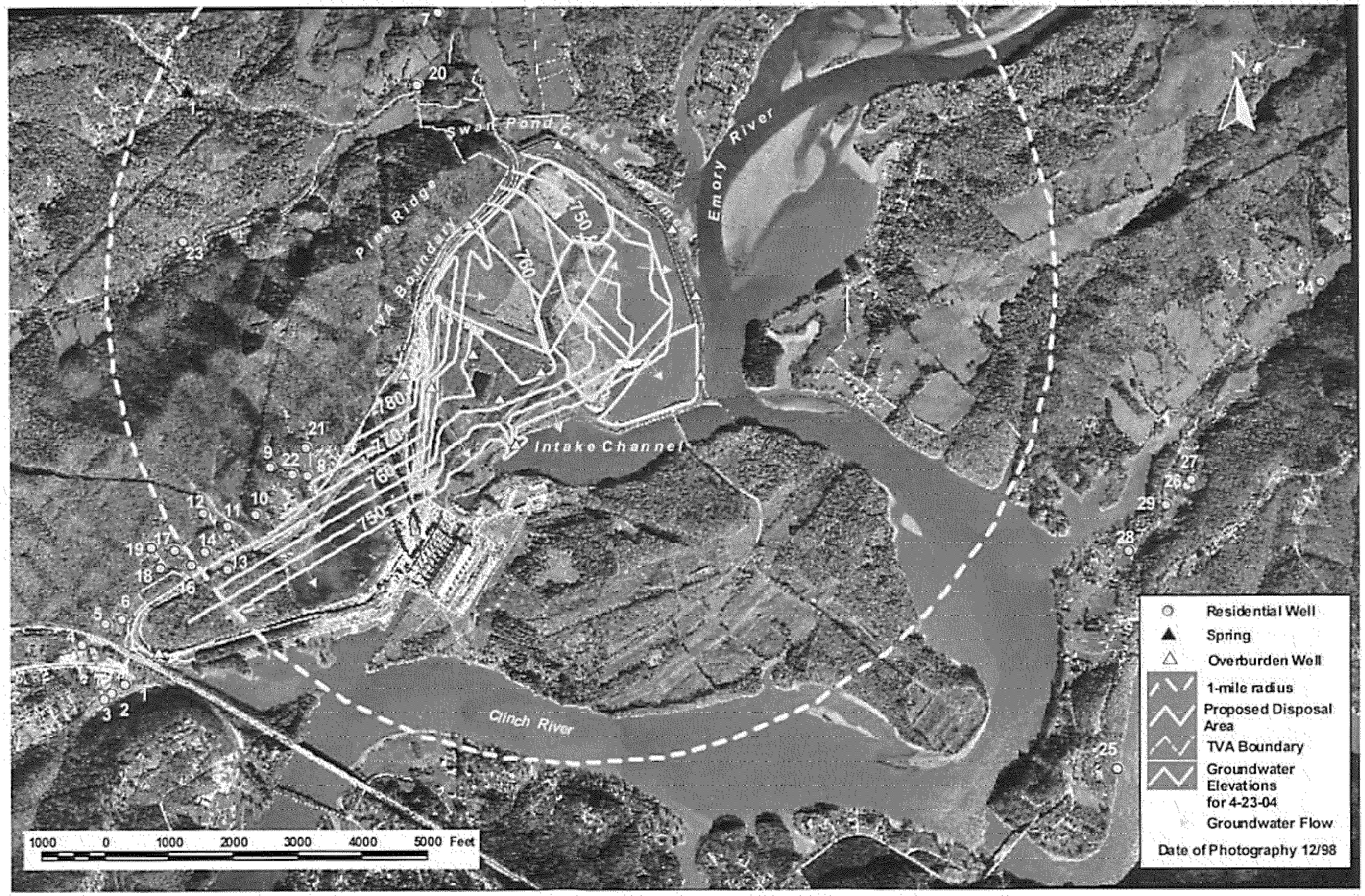



Figure 3-1. Private Water Wells and Springs in Site Vicinity

## Table 3-1. Off-Site Wells, Springs, and Public Water Supplies

| Location Identifier | Location Description | Longitude (dg-mn-sc) est | Latitude (dg-mn-sc) est | Inside 1 mile radius | Outside 1 mile radius | Comment |
|---|---|---|---|---|---|---|
| Well 1 | Swan Pond Rd south of Hwy 70 | 35-53-35 N | 84-32-05.5 W | | X | |
| Well 2 | Swan Pond Rd south of Hwy 70 | 35-53-34 N | 84-32-09 W | | X | |
| Well 3 | Swan Pond Rd south of Hwy 70 | 35-53-33 N | 84-32-10.5 W | | X | |
| Well 4 | North of Hwy 70, South of I-40 | 35-53-41.5 N | 84-32-14 W | | X | |
| Well 5 | Swan Pond Rd north of Hwy 70 | 35-53-44.5 N | 84-32-09.5 W | | X | |
| Well 6 | Swan Pond Rd north of Hwy 70 | 35-53-45 N | 84-32-06 W | | X | |
| Well 7 | Swan Pond Circle north of Swan Pond Rd | 35-55-18 N | 84-31-04.5 W | X | | |
| Well 8 | Swan Pond Rd north of Hwy 70 | 35-54-06 N | 84-31-31 W | X | | |
| Well 9 | Swan Pond Rd north of Hwy 70 | 35-54-07 N | 84-31-37 W | X | | |
| Well 10 | Swan Pond Rd north of Hwy 70 | 35-54-00.5 N | 84-31-41 W | X | | |
| Well 11 | Swan Pond Rd north of Hwy 70 | 35-53-58.5 N | 84-31-46 W | X | | |
| Well 12 | Swan Pond Rd north of Hwy 70 | 35-54-00.5 N | 84-31-50.5 W | X | | |
| Well 13 | Swan Pond Rd north of Hwy 70 | 35-53-52 N | 84-31-47 W | X | | |
| Well 14 | Swan Pond Rd north of Hwy 70 | 35-53-55 N | 84-31-50 W | X | | |
| Well 16 | Swan Pond Rd north of Hwy 70 | 35-53-53 N | 84-31-53 W | | X | |
| Well 17 | Swan Pond Rd north of Hwy 70 | 35-53-55 N | 84-31-56 W | | X | |
| Well 18 | Swan Pond Rd north of Hwy 70 | 35-53-52 N | 84-31-58.5 W | | X | |
| Well 19 | Swan Pond Rd north of Hwy 70 | 35-53-56 N | 84-32-00 W | | X | |
| Well 20 | Swan Pond Rd west of Swan Pond circle | 35-55-06.5 N | 84-31-09 W | X | | |
| Well 21 | Swan Pond Rd north of Hwy 70 | 35-54-11 N | 84-31-31.5 W | X | | |
| Well 22 | Swan Pond Rd north of Hwy 70 | 35-54-05 N | 84-31-05 W | X | | |
| Well 23 | Hassler Mill Rd west of Swan Pond Rd | 35-54-43 N | 84-31-54 W | X | | |
| Well 24 | Sugar Grove Valley Road | 35-54-34N | 84-28-19W | | X | |
| Well 25 | Sugar Grove Valley Road | 35-54-20N | 84-28-59W | | X | |
| Well 26 | Sugar Grove Valley Road | 35-54-03N | 84-28-45W | | X | |
| Well 27 | Sugar Grove Valley Road | 35-54-04N | 84-28-44W | | X | |
| Well 28 | Sugar Grove Valley Road | 35-54-53N | 84-28-56W | | X | |
| Well 29 | Sugar Grove Valley Road | 35-54-00N | 84-28-49W | | X | |
| Spring 1 | Near intersection of Swan Pond Rd and Frost Hollow Rd (used for portion of municipal supply by City of Kingston) | 35-55-07 N | 84-31-54 W | X | | |
| City of Kingston | Intake off Hwy 58 south of Kingston on Watts Bar Lake | n/a | n/a | | | Outside 2-mile radius |
| Swan Pond U. D. | Purchase water from City of Harriman | n/a | n/a | | | Outside 2-mile radius |
| Midtown Utilities | Purchase water from City of Rockwood | n/a | n/a | | | Outside 2-mile radius |
| Town of Harriman | Intake on Emory River Near Mile 13 | n/a | n/a | | | Outside 2-mile radius |
| City of Rockwood | Intake on Watts Bar Lake near Post Oak Creek | n/a | n/a | | | Outside 2-mile radius |

# 4. EVALUATION OF POTENTIAL WATER QUALITY IMPACTS

The potential impacts of proposed future coal-combustion byproduct (CCB) disposal on local groundwater and surface water resources are examined in this section. The focus of the evaluation is on the potential effect of disposal activities on stream water quality since all shallow groundwater originating on, or flowing beneath, the site ultimately discharges to streams without traversing private property. Separate evaluations are performed for future codisposal of ash and gypsum (Option A) and disposal of ash only (Option B). Comparisons of water quality impacts for facility designs with and without a constructed 3-ft geologic buffer are provided for each disposal option.

## 4.1 Contaminants of Concern

Representative chemical data for fly ash and flue-gas desulfurization (FGD)-derived gypsum leachate are presented in Table 4-1. The gypsum data represent average constituent concentrations for five leachate samples collected from the gypsum pond and slurry tank at Cumberland Fossil Plant (CUF) (Appendix E). Fly ash data were obtained from a single leachate sample collected from WP21 located in the KIF active ash pond on June 7, 2004.

Eight contaminants of concern (COC) were selected for evaluation including ammonia, arsenic, cadmium, copper, mercury, nickel, selenium, and zinc. These constituents exhibit mean concentrations that are significantly above primary drinking water MCL (e.g., As, Cd, Hg, Ni, and Se) or have potential aquatic toxicity (e.g., Cd, Cu, Ni, and Zn). Ash produced after May 2004 may contain a maximum of 226 mg/kg ammonia as a result of the recently installed NOx reduction system. Ammonia forms a residue on ash particle surfaces which is expected to be highly soluble. Residual ammonia dissolved by either sluice water or infiltrating precipitation would likely be in the form of the ammonium ion ($NH_4^-$). Interstitial water remaining in sluiced ash after mixing of ammoniated-ash with sluice water is estimated to contain 2.64 mg/L $NH_3$-N (TVA, 2002). The same ammonia content is conservatively assumed to apply to dry "dipped" ash (i.e., ash dredged from the ash pond and hauled by truck to the disposal site). Incident precipitation infiltrating through dry stacked fly ash would form leachate-containing ammonia as well as other ash-related constituents. The $NH_3$-N concentration of the dry ash leachate is estimated to be approximately 733 mg/L assuming complete leaching of ammonia from a unit volume of ash by one pore volume of infiltrating water. On entering the groundwater system beneath the disposal area, ammonia may be transformed by biological nitrification to nitrate and/or nitrite.

**Table 4-1. Fly Ash and Gypsum Leachate Data**

| | Units | MCL | CCC | KIF Ash Leachate[1] | CUF Gypsum Leachate[2] |
|---|---|---|---|---|---|
| Aluminum | µg/L | 200 | 150 | <50 | 280.0 |
| Antimony | µg/L | 6 | | <3 | 9.3 |
| Arsenic | µg/L | 50 | | 750 | 1.0 |
| Barium | µg/L | 2000 | | 40 | 77.5 |
| Beryllium | µg/L | 4 | | <1 | 1.0 |
| Boron | µg/L | | | 730 | 42,500.0 |
| Cadmium | µg/L | 5 | 0.25 | 2 | 11.9 |
| Chloride | mg/L | 250 | | 7.9 | 1,300.0 |
| Chromium | µg/L | 100 | 100 | <1 | 2.3 |
| Cobalt | µg/L | | | <1 | 9.5 |
| Copper | µg/L | 1300 | 9 | <10 | 5.5 |
| Fluoride | mg/L | 4 | | 0.57 | 13.1 |
| Iron | µg/L | 300 | | 16000 | 205.0 |
| Lead | µg/L | 15 | 2.5 | <1 | 1.0 |
| Magnesium | µg/L | | | 11 | 535.0 |
| Manganese | µg/L | 50 | | 580 | 1,490.0 |
| Mercury | µg/L | 2 | 0.77 | 0.1 | 3.4 |
| Nickel | µg/L | 100 | 52 | 3 | 106.5 |
| Selenium | µg/L | 50 | 5 | <1 | 137.0 |
| Silver | µg/L | 100 | 3.2 | <10 | 5.2 |
| Sodium | mg/L | | | 5.7 | 19.5 |
| TDS (180 deg) | mg/L | 500 | | 400 | 6,800.0 |
| Strontium | µg/L | | | 460 | 4,500.0 |
| Sulfate | µg/L | 250 | | 130 | 3,020.0 |
| Thallium | µg/L | 2 | | <2 | <2 |
| Vanadium | µg/L | | | <10 | <10 |
| Zinc | µg/L | 5000 | 120 | <10 | 715.0 |

[1]*Data for filtered water sample from wellpoint WP-21 completed in Ash Pond.*
[2]*Average concentrations for 4 gypsum leachate samples given in Appendix E.*

## 4.2 Methods

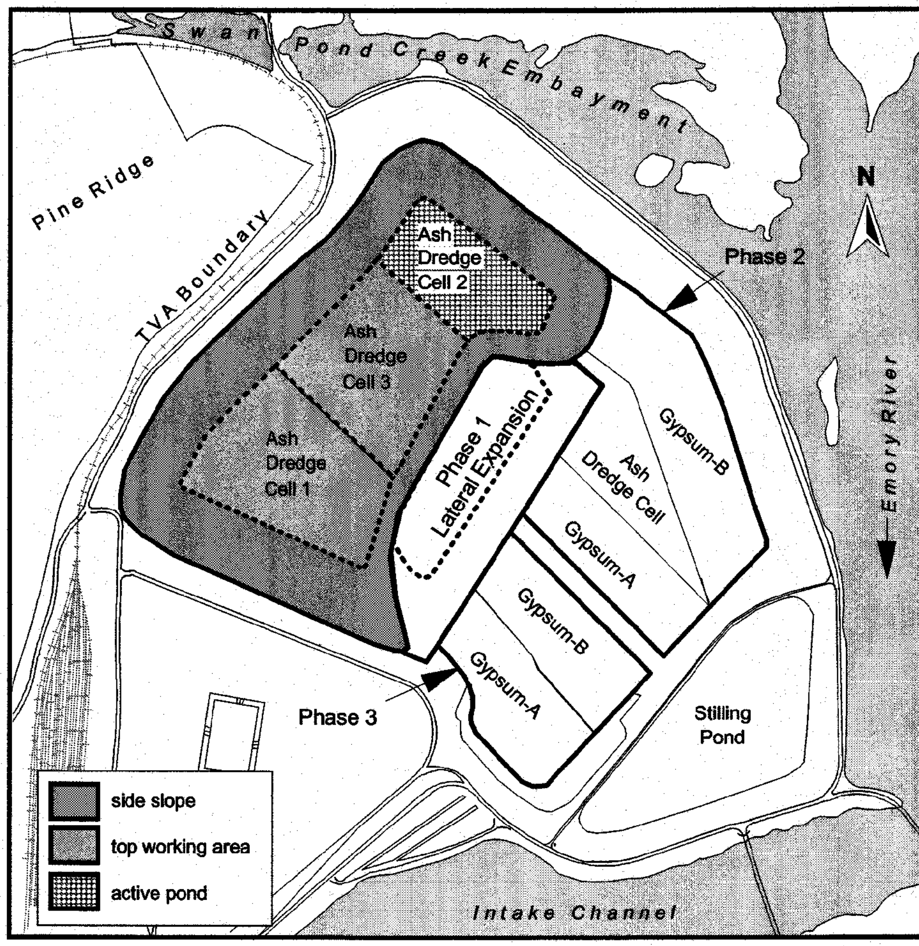
### 4.2.1 Leachate Seepage Estimation

The potential impacts associated with each of the proposed CCB disposal areas during the period of active disposal operations were assessed individually since these facilities generally involve different wastes, spatially distinct areas, and will operate over different timeframes. The HELP landfill hydrologic water budget model (Schroeder et al., 1989 and 1994) was used to estimate CCB leachate seepage rates from landfill-type facilities not involving waste impoundments (e.g., dry ash stacks, inactive ash dredge cells, and inactive gypsum rim-ditch disposal operations). Typically, individual landfills were divided for purposes of HELP simulations into subregions based on waste thickness, surface cover, and surface slope. For example, Figure 4-1 shows the subregion and stratigraphic profile associated with the proposed Phase 1 addition of sluiced ash to existing Ash Dredge Cells 1-3. Subsequent stages of Phase 1 development of Cells 1-3 (e.g., capping with dipped ash and final closure) involved additional modeling steps. Subregion and profile diagrams for these models are given on Figures F-2 and F-3 of Appendix F.

Seepage estimates for CCB impoundment facilities (e.g., active ash dredge cells and gypsum sedimentation ponds) were performed by modeling a typical section through the disposal area using the USGS MODFLOW-2000 groundwater flow model (Harbaugh et al., 2000) in conjunction with the Visual MODFLOW modeling interface (Waterloo Hydrogeologic, Inc., 2004). The average steady-state seepage rate from the base of the facility along the section was then integrated over the full area of the facility to estimate total leachate seepage.

The various CCB disposal areas associated with Option A involved modeling of 25 separate landfill and impoundment subregions. Diagrams similar to Figure 4-1 describing the individual facility models for Option A are provided in Appendix F. Likewise, Appendix G contains diagrams of facility subregions associated with Option B. Note that proposed Phase 1 disposal facilities are the same for both Options A and B.

***HELP Simulations*** – Hydraulic properties used in the HELP simulations are presented in Table 4-2. Fly ash data represent average characteristics derived from laboratory testing of three Kingston fly ash samples (Young et al., 1993). The bottom ash hydraulic conductivity given in Table 4-2 is based on test results for a KIF bottom ash sample reported by MACTEC (2004). All other bottom ash parameters are based on lab testing of a sample of CUF bottom ash (D.B. Stephens, 1991). Since no gypsum has yet been produced at KIF, average properties for two gypsum samples from Shawnee Fossil Plant (SHF) were used (D.B. Stephens, 1991). The values for top soil were those presented by Schroeder et al. [1989] for a soil loam. The field capacity, wilting point, and porosity for the clay cap and clay buffer were those given by Schroeder et al. [1989] for a soil liner.



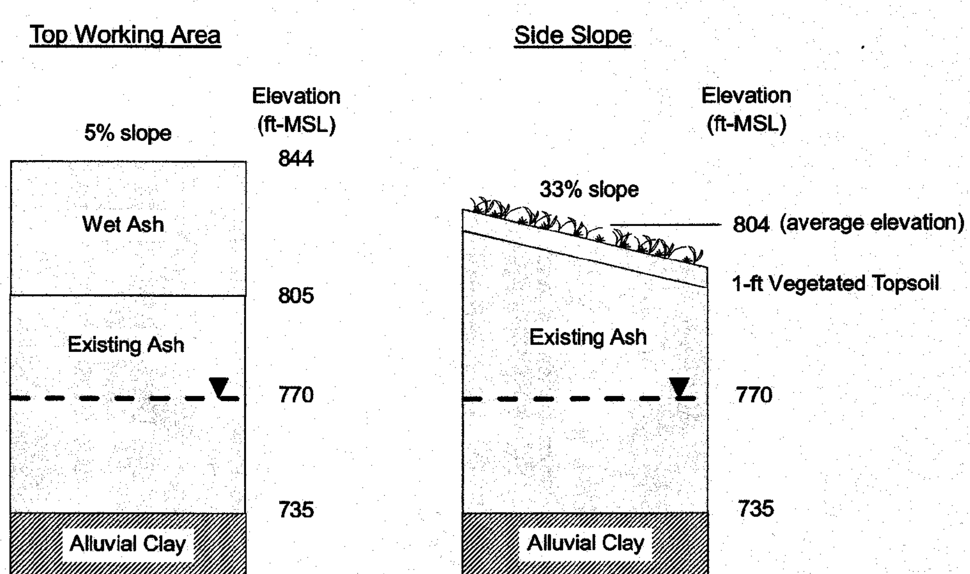




Figure 4-1. Conceptual Model of Ash Dredge Cells 1-3

**Table 4-2. Hydraulic Properties Applied in HELP Simulations**

| Media Type | Total Porosity | Field Capacity[1] | Wilting Point[2] | Initial Volumetric Moisture Content (%) | Hydraulic Conductivity (cm/s) |
|---|---|---|---|---|---|
| Top Soil | 0.46 | 0.23 | 0.12 | 0.23 | $3.7 \times 10^{-4}$ |
| Clay Cap | 0.43 | 0.37 | 0.28 | 0.37 | $1.0 \times 10^{-7}$ |
| Fly Ash | 0.47 | 0.40 | 0.12 | 0.22 - 0.32 | $2.0 \times 10^{-5}$ |
| Gypsum | 0.68 | 0.54 | 0.28 | 0.50 | $5.1 \times 10^{-5}$ |
| Bottom Ash | 0.53 | 0.15 | 0.06 | 0.10 | $9.3 \times 10^{-3}$ |
| Geologic Buffer | 0.43 | 0.37 | 0.28 | 0.37 | $1.0 \times 10^{-6}$ |

[1]Moisture content at pressure head of -0.33 bar.
[2]Moisture content at pressure head of -15 bars.

The design maximum hydraulic conductivity of the clay cap is $10^{-7}$ cm/s while that of the clay buffer is $10^{-6}$ cm/s. Initial volumetric moisture contents for the top soil, clay buffer, and clay cap were arbitrarily set at field capacity for all simulations involving these materials. The design moisture content of dry-stacked fly ash at the time of emplacement will be 0.22, whereas an initial moisture content of 0.26 was applied to existing fly ash. Initial moisture contents for gypsum and bottom ash were estimated from in situ data measured at SHF and CUF.

Soil Conservation Service curve numbers (CN), used by HELP to estimate surface runoff, were determined on the basis of vegetative cover and soil texture relationships provided by Schroeder et al. (1994, Figure 7, p. 39). CN values of 90 were used for bare fly ash and gypsum surfaces. Temporary cover consisting of top soil and a fair grass cover was assigned a CN of 80 and a leaf area index (LAI) of 2.2. Final cover applied at facility closure and consisting of top soil with a good grass cover was assigned a CN of 80 and an LAI of 3.3.

Evaporation parameters required by HELP include the evaporation coefficient and the evaporation depth. Foust and Young (1993) demonstrated by laboratory experiments and numerical simulations using fly ash from TVA's Kingston and Colbert Plants that the evaporation depth can approach several feet. For HELP simulations involving bare fly ash surfaces, a conservative evaporation depth of 30 inches was used. The measured evaporation coefficient of 14.6 mm/day$^{0.5}$ for KIF fly ash reported by Foust and Young (1993) was used for bare fly ash surfaces. For bare gypsum surfaces, an evaporation depth of 18 inches was assumed in conjunction with an evaporation coefficient of 8 mm/day$^{0.5}$ derived from a 15-month field lysimeter study involving SHF gypsum (Boggs et al., 1990). All cases involving top soil cover assumed 12-inch evaporation depths and an evaporation coefficient of 5.1 mm/day$^{0.5}$ in accordance with guidance provided by Schroeder et al. (1994).

Meteorological data was compiled from a NOAA station located in Oak Ridge, Tennessee. This station was selected because of its close proximity to KIF and because high quality data was available for a continuous 20-year period. The data include daily rainfalls and mean daily temperatures from 1968 to 1987. In order to provide 30 years of rainfall/temperature data for the water budget simulation, data for years 1968-77 were added to the end of the 1968-87 record. Daily solar radiation values were generated using a HELP subroutine that incorporates several factors including latitude and daily rainfall.

***MODFLOW Simulations***-- Steady-state leachate seepage from the gypsum and ash ponds were obtained from two-dimensional profile models oriented normal to the river as shown in the example on Figure 4-2. The figure depicts the finite difference model grid, subsurface hydrogeologic units, and constructed waste layers associated with the initial Phase 2 gypsum/ash impoundments. The upper model shown in Figure 4-2 represents an impoundment design without a geologic (clay) buffer, while the lower model represents an impoundment which incorporates a geologic buffer. In this example, constant-head boundary conditions of 765 ft and 740 ft are applied at the left and right model boundaries, respectively, to represent the approximate pre-impoundment ambient hydraulic gradient toward the river. The lower boundary represents approximate top of bedrock elevation and is assigned zero flux. Constant heads of 784 ft are assigned to model cells representing the upper surface of the impoundment to represent an assumed 4-ft water depth. Perimeter drains indicated in the bottom ash drainage layers were assigned fixed heads equal to the average elevation of the layer. Stratigraphic units, including the existing fly ash, alluvial clay, and alluvial sand, were assigned uniform average thicknesses based on available boring data. Table 4-3 provides the media hydraulic properties assigned to the models. In order to estimate the total steady rate of seepage through the base of the entire impoundment, the computed average flux rate across the lower side of the lowest drainage blanket for the 2D model was multiplied by the total surface area of the impoundment.

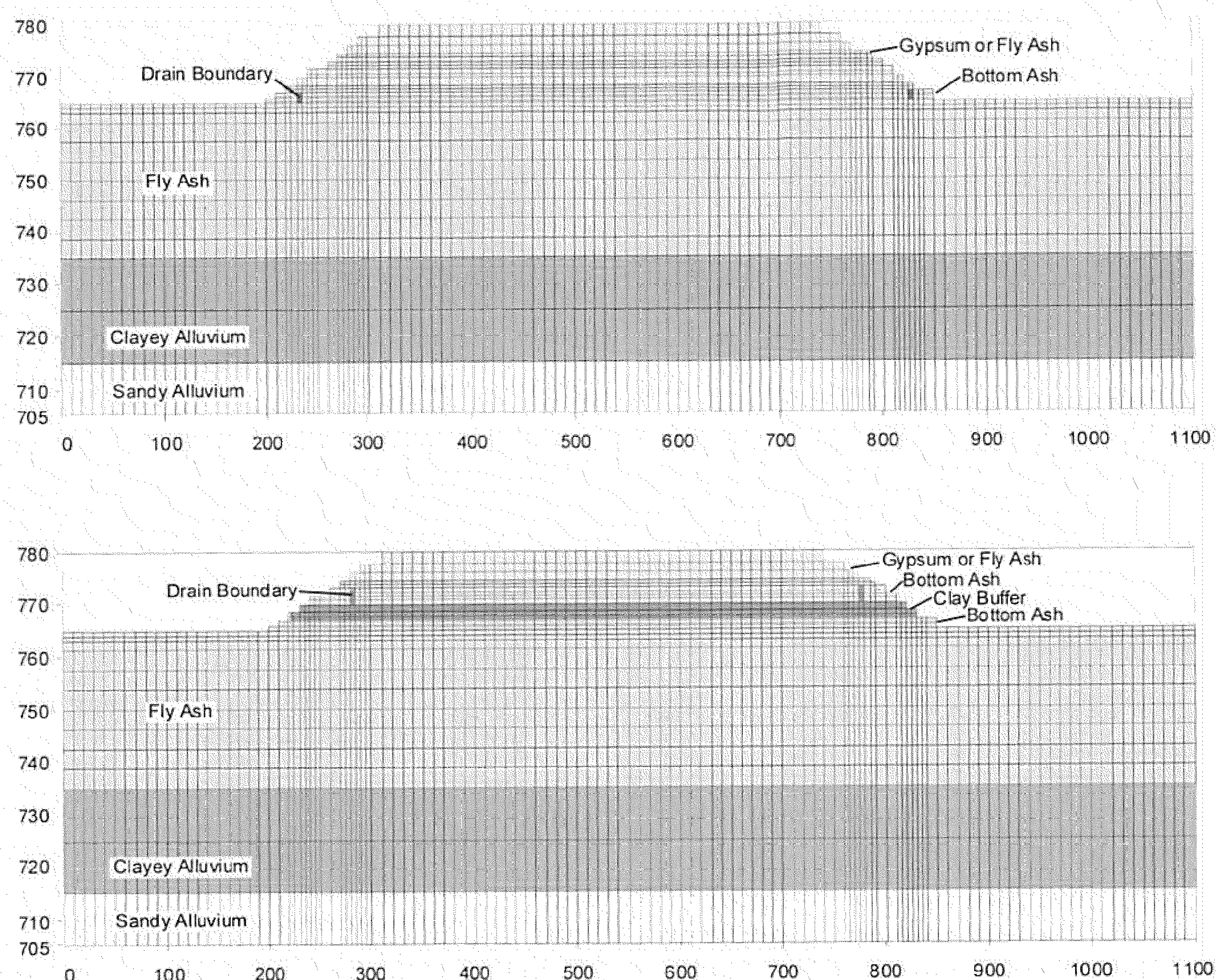



Figure 4-2. Profile View of MODFLOW Models Used for Pond Seepage Estimation

**Table 4-3. Hydraulic Properties Applied in MODFLOW Simulations**

| Media Type | Thickness (ft) | Vertical Hydraulic Conductivity (cm/s) | Horizontal Hydraulic Conductivity (cm/s) |
|---|---|---|---|
| New Fly Ash | (varies) | $2.0 \times 10^{-5}$ | $1.0 \times 10^{-4}$ |
| New Gypsum | (varies) | $5.1 \times 10^{-5}$ | $5.1 \times 10^{-4}$ |
| Bottom Ash | 2.0[a], 3.0[b] | $9.3 \times 10^{-3}$ | $1.0 \times 10^{-2}$ |
| Geologic (Clay) Buffer | 3.0 | $1.0 \times 10^{-6}$ | $1.0 \times 10^{-5}$ |
| Existing Fly Ash | 30.0 | $2.0 \times 10^{-5}$ | $1.0 \times 10^{-4}$ |
| Alluvial Clay | 20.0 | $4.0 \times 10^{-7}$ | $9.0 \times 10^{-6}$ |
| Alluvial Sand | 10.0 | $1.0 \times 10^{-4}$ | $1.0 \times 10^{-3}$ |

[a]Thickness of bottom ash drainage layer above fly ash base

[b]Thickness of bottom ash drainage layer above geologic (clay) buffer

### 4.2.2 Stream Loading Estimation

Depending on their location and mode of disposal (i.e., either landfill or impoundment), leachate seepage from the CCB disposal areas will be transported by shallow groundwater to SPC embayment, Emory River, or the plant intake channel. Groundwater flow patterns based on water levels measured in shallow monitoring wells shown on Figure 2-6 indicate that, in the absence of sluicing to Ash Dredge Cells 1-3, leachate emerging from the base of Cells 2, 3, and most of Cell 1 would be transported by ambient groundwater flow to SPC. Leachate seepage from Phase 1 Lateral Expansion Area and from the Phase 2 and 3 Areas would ultimately discharge in the Emory River or the intake channel. The presence of impoundment disposal facilities during different phases of disposal operations would to some extent alter groundwater flow patterns and ultimate leachate discharge points. For example, incorporating the potentiometric heads associated with active Cell 2, ash pond, and stilling pond (Figure 2-7) indicates leachate seepage to SPC would be limited to Cell 2, while leachate from the remaining cells would discharge to the river and intake channel. For conservatism, all leachate seepage produced from Ash Dredge Cells 1-3 is assumed to ultimately discharge to SPC, whereas leachate from all other areas discharges to the Emory River.

In estimating worst-case in-stream COC concentrations, no credit was taken for mixing and dilution of leachate by ambient groundwater during transport or for geochemical attenuation. The mean leachate seepage rate estimated using HELP or MODFLOW for each facility during the active disposal period, along with the initial COC concentrations given in Table 4-1, were used to compute the mass loading (in kg/day) to the stream for each COC. To estimate COC concentrations in the stream, complete mixing of predicted mass loadings with the appropriate low stream flow was assumed. The 7Q10 stream flow was applied to in-stream concentration estimates for ammonia, whereas the 1Q10 was used for other COC constituents in accordance with TDEC guidance. Note that estimates of the maximum COC in-stream concentrations for the Emory River account for the cumulative contributions of COC mass loadings from multiple CCB disposal areas and from tributary SPC. On the other hand, the existing Ash Dredge Cells 1-3 represent the only area contributing COC mass to SPC. In this case the maximum concentrations for SPC were estimated using the highest stream load predicted for any future operational phase at Cells 1-3, including the post-closure phase.

Because no historical stream flow data are available for SPC, 1Q10 and 7Q10 low flows were estimated on the basis of continuous flow data (1935-70) for Whites Creek near Sharps Chapel, Tennessee. Whites Creek watershed (above the gauging station) is approximately 2.7 $mi^2$ and is closest in size of any of the gauged streams in the region to the 4.1 $mi^2$ watershed area of SPC. The 1Q10 and 7Q10 for Whites Creek are reported to be 0.216 and 0.240 cfsm (cubic feet per second per square mile). Applying the Whites Creek unit flows to the SPC watershed yields 1Q10 and 7Q10 estimates of 0.89 and 0.96 cfs.

Emory River 1Q10 and 7Q10 flows of 0.40 and 0.68 cfs are reported for the USGS gauging station at Oakdale located approximately 16 miles upstream of KIF (Flohr et al., 1993). However, flow of the Emory River in the immediate vicinity of KIF is controlled by upstream releases from Melton Hill Dam and plant intake withdrawals which average approximately 2200 cfs. Numerical flow-temperature simulations indicate that under worst-case low flow conditions (i.e., low natural inflow from the Emory River upstream and no releases from Melton Hill Dam) the flow toward the plant intake from the upstream reach of the Emory adjacent to the ash pond is approximately 84 cfs (personal communication, 5/6/02, Ming Shiao of the TVA Hydrothermal Team). The plant-controlled low flow of 84 cfs was used in stream loading analyses instead of the traditional 1Q10 and 7Q10 flows.

## 4.3 Option A - Future Codisposal of Coal Ash and FGD-Derived Gypsum

### 4.3.1 Facility Description

Figure 4-3 provides the schedule of CCB disposal operations proposed under Option A. Phase 1 operations will involve sluiced fly ash disposal in the existing Ash Dredge Cells 1-3 and in the Phase 1 Dredge Cell Lateral Expansion Area between 2004 and 2015. Approximately 4.034 million CY will be deposited in these areas bringing the grade elevation to approximately 844 ft in Cells 1-3 and to elevation 810 ft in the Lateral Expansion Area. Between 2015 and 2017 approximately 951,200 CY of dipped ash will be placed atop Cells 1-3 raising the final grade to a maximum elevation of 858 ft.

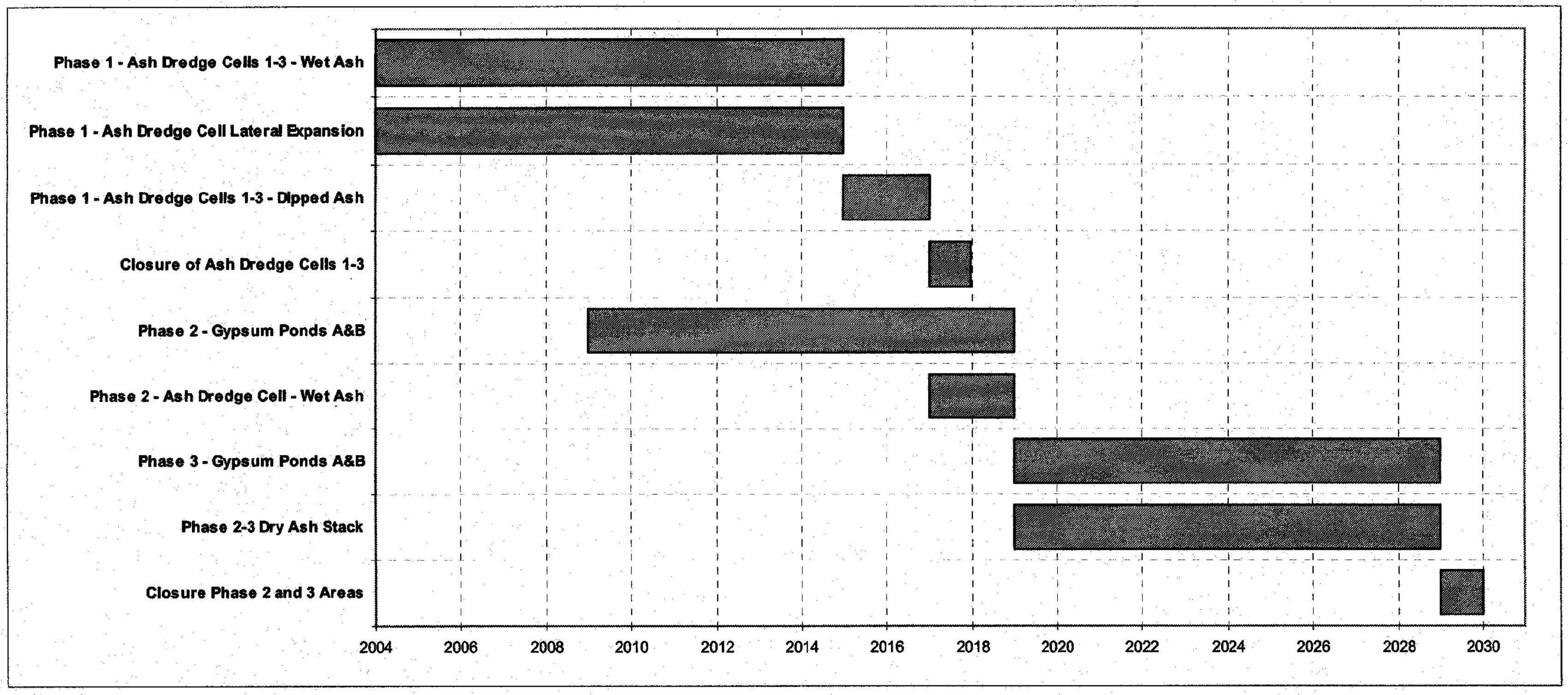



Figure 4-3. Option A – Schedule of Facility Operations

Dredge Cells 1-3 will be partially closed in 2017 by construction of a 1-ft thick clay cap having maximum hydraulic conductivity of $10^{-6}$ cm/s followed by 1 ft of vegetated top soil. The cap will extend over the entire Cells 1-3 area with the exception of the southeast-facing side slopes which will be left uncovered to allow for subsequent contiguous Phase 2 and 3 disposal operations. Maximum surface elevation of the closed facility will be approximately 860 ft.

Gypsum byproduct disposal in the Phase 2 area is expected to begin in 2009 when flue-gas scrubbers are scheduled for operation. Wet gypsum will be alternately sluiced to rim-ditch systems in Ponds A and B until 2019 when the stack reaches elevation 870 ft. At that point, gypsum byproduct will be directed to rim-ditch systems in the Phase 3 area. Stacking of dry fly ash in the region between the Phase 2 and 3 areas will also begin in 2019. Gypsum disposal in the Phase 3 area is expected to continue until 2029 when the stack reaches elevation 870 ft. Total volumes of gypsum deposited in the Phase 2 and 3 areas are estimated at approximately 3.27 million CY and 3.60 million CY, respectively.

Dry fly ash stacking will continue above the gypsum stacks until approximately 2029. The total volume of dry ash deposited in the Phase 2 and 3 areas will be approximately 5.7 million CY. Closure of the Phase 2 and 3 areas will involve placement of a clay cap and vegetated top soil over the entire area. Design of the cap and cover will be the same as that applied to the Phase 1 area.

### 4.3.2 Leachate Seepage Results

Average leachate seepage estimates for each of the proposed disposal facilities considered under Option A are presented in Table 4-4. Detailed seepage data for all disposal facility subregions are given in Appendix H, along with information regarding estimation methods.

The mean leachate seepage rate during the period (2004-14) of wet sluicing of ash to Dredge Cells 1-3 is estimated at approximately 425,000 liters per day (Lpd) (Table 4-5). This estimate conservatively assumes active ash sluicing to Cell 2 (closest to SPC embayment) and exposure of working surfaces of inactive Cells 1 and 3 to incident precipitation. Approximately 37% of the total seepage is derived from seepage below the assumed impoundment in Cell 2 as estimated with MODFLOW (Appendix H). Seepage from the remaining area was estimated using the HELP model. The average seepage rate outside of Cell 2 represents approximately 22% of average precipitation, and reflects the relatively high infiltration rates associated with exposed ash surfaces and the interim topsoil on side slope areas. Capping and closure of Dredge Cells 1-3 in 2018 is predicted to reduce the average seepage rate by 32 % to approximately 287,400 Lpd.

**Table 4-4. Option A – Facility Leachate Seepage Estimates**

| Facility | Start Date | End Date | Waste | Mean Leachate Seepage (Lpd) | Seepage Difference Buffer vs. No Buffer |
|---|---|---|---|---|---|
| Phase 1 - Ash Dredge Cells 1-3 | 2004 | 2014 | wet ash | 425,135 | NA |
| Phase 1 - Ash Dredge Cells 1-3 | 2015 | 2016 | dipped ash | 243,499 | NA |
| Closure of Ash Dredge Cells 1-3 | 2017 | 2046 | mixed ash | 287,409 | NA |
| Phase 1 - Dredge Cell Lateral Expansion Area | 2004 | 2014 | wet ash | 56,936 | NA |
| Phase 2 - Gypsum Ponds A&B - NO BUFFER | 2009 | 2018 | gypsum | 62,287 | |
| Phase 2 - Gypsum Ponds A&B - BUFFER | 2009 | 2018 | gypsum | 41,506 | 33% |
| Phase 2 - Ash Dredge Cell - NO BUFFER | 2009 | 2018 | wet ash | 21,844 | |
| Phase 2 - Ash Dredge Cell - BUFFER | 2009 | 2018 | wet ash | 17,370 | 20% |
| Phase 3 - Gypsum Ponds A&B - NO BUFFER | 2019 | 2028 | gypsum | 60,733 | |
| Phase 3 - Gypsum Ponds A&B - BUFFER | 2019 | 2028 | gypsum | 37,798 | 38% |
| Phase 2&3 Dry Ash Stack - NO BUFFER | 2019 | 2028 | dry ash | 10,268 | |
| Phase 2&3 Dry Ash Stack - BUFFER | 2019 | 2028 | dry ash | 8,243 | 20% |
| Closure of Phase 2&3 Areas - NO BUFFER | 2029 | 2058 | ash/gypsum | 179,456 | |
| Closure of Phase 2&3 Areas - BUFFER | 2029 | 2058 | ash/gypsum | 177,878 | 1% |

**Table 4-5. Option A - Predicted Worst-Case Stream Loadings and In-Stream Concentrations**

| Constituent | MCL | CCC | Swan Pond CreekEmbayment | | Emory River - No Buffer Case | | Emory River - Buffer Case | |
|---|---|---|---|---|---|---|---|---|
| | | | Maximum Loading (kg/day) | Maximum Concentration (mg/L) | Maximum Loading (kg/day) | Maximum Concentration (mg/L) | Maximum Loading (kg/day) | Maximum Concentration (mg/L) |
| Ammonia-N | 10/1 | (**) | 4.24E-01 | 0.15221 | 5.14E+01 | 0.25018 | 5.10E+01 | 0.24800 |
| Arsenic | 0.05 | 0.15 | 1.57E-03 | 0.00061 | 6.38E-02 | 0.00031 | 6.32E-02 | 0.00031 |
| Cadmium | 0.005 | 0.00021 | 4.25E-04 | 0.00016 | 1.88E-03 | 0.00001 | 1.59E-03 | 0.00001 |
| Copper | 1.3 | 0.0072 | 1.08E-02 | 0.00414 | 9.55E-03 | 0.00005 | 9.28E-03 | 0.00005 |
| Mercury | 0.002 | 0.00077 | 2.55E-04 | 0.00010 | 6.28E-04 | 0.00000 | 5.04E-04 | 0.00000 |
| Nickel | 0.1 | 0.0422 | 1.98E-02 | 0.00763 | 2.92E-02 | 0.00014 | 2.46E-02 | 0.00012 |
| Selenium | 0.05 | 0.005 | 4.25E-04 | 0.00016 | 1.72E-02 | 0.00008 | 1.33E-02 | 0.00006 |
| Zinc | 5 | 0.0957 | 8.89E-02 | 0.03424 | 1.60E-01 | 0.00078 | 1.29E-01 | 0.00063 |

***See Table 4-6*

Leachate seepage rates from the Phase 2 and 3 Gypsum and Ash Disposal Areas were conservatively estimated for the maximum sedimentation pond surface areas which occur during the early stage of disposal operations. A working surface elevation of 780 ft was assumed for the gypsum and ash disposal areas. Net seepage from Phase 2 Gypsum Ponds A and B is estimated to be approximately 62,300 Lpd for the no-buffer case and 41,500 Lpd for the buffer design, indicating a 33% overall reduction in seepage provided by the clay buffer. The Phase 3 Gypsum Disposal Area showed similar results with the buffer providing a 38% reduction in seepage generation. Incorporating artificial clay buffers below the Phase 2 Ash Dredge Cell and the dry ash stack situated between the Phase 2 and 3 areas decreased seepage by approximately 20% in both cases.

Average leachate seepage rates predicted during 30-year post-closure simulations of the combined Phase 2 and 3 areas were approximately 179,500 Lpd for the no-buffer design and 177,900 Lpd with a clay buffer (Table 4-4). The 1-ft, $10^{-6}$ cm/s clay cap constructed over the disposal area at closure would largely control net infiltration through the CCB materials. Since the hydraulic conductivity of the clay cap and buffer would be the same, the buffer would provide essentially no (i.e., less than 1%) additional containment of leachate seepage. Overall, results indicate that while modest seepage reductions of 20 to 38% could be expected by the addition of a clay buffer during active disposal operations, the long-term benefit of a buffer would be negligible.

### 4.3.3 Predicted COC Concentrations in Swan Pond Creek Embayment

The only disposal area that would contribute COC-containing leachate to SPC would be Ash Dredge Cells 1-3, as discussed in Section 4.2.2. Except for ammonia, future ash leachate generated from this area is expected to be chemically similar to current leachate. Therefore, future loadings of COC other than ammonia would not be expected to differ significantly from current loadings to SPC.

Estimates of the mass loading of each COC produced by leachate seepage from future disposal operations are presented in Table H2 (Appendix H). These estimates are subsequently used in estimating the cumulative COC loadings to SPC and the Emory River shown on Figures 4-4 and 4-5, and worst-case in-stream COC concentrations presented in Table 4-5. To illustrate the method of computing the facility mass loadings, consider the following example calculation for ammonia. From Table 4-4 the mean leachate seepage rate during the period (2004-14) of wet sluicing to Ash Dredge Cells 1-3 is 425,135 Lpd. The volume-weighted average $NH_3$-N concentration of 1.00 mg/L for leachate generated from Cells 1-3 shown in Table H2 is based on 4.034 million CY of new sluiced ash (above elevation 805 ft) having a pore water $NH_3$-N concentration of 2.64 mg/L and 6.652million CY of existing ash (between elevations 760 and 805 ft) having a zero $NH_3$-N concentration. Applying the weighted-average pore water $NH_3$-N

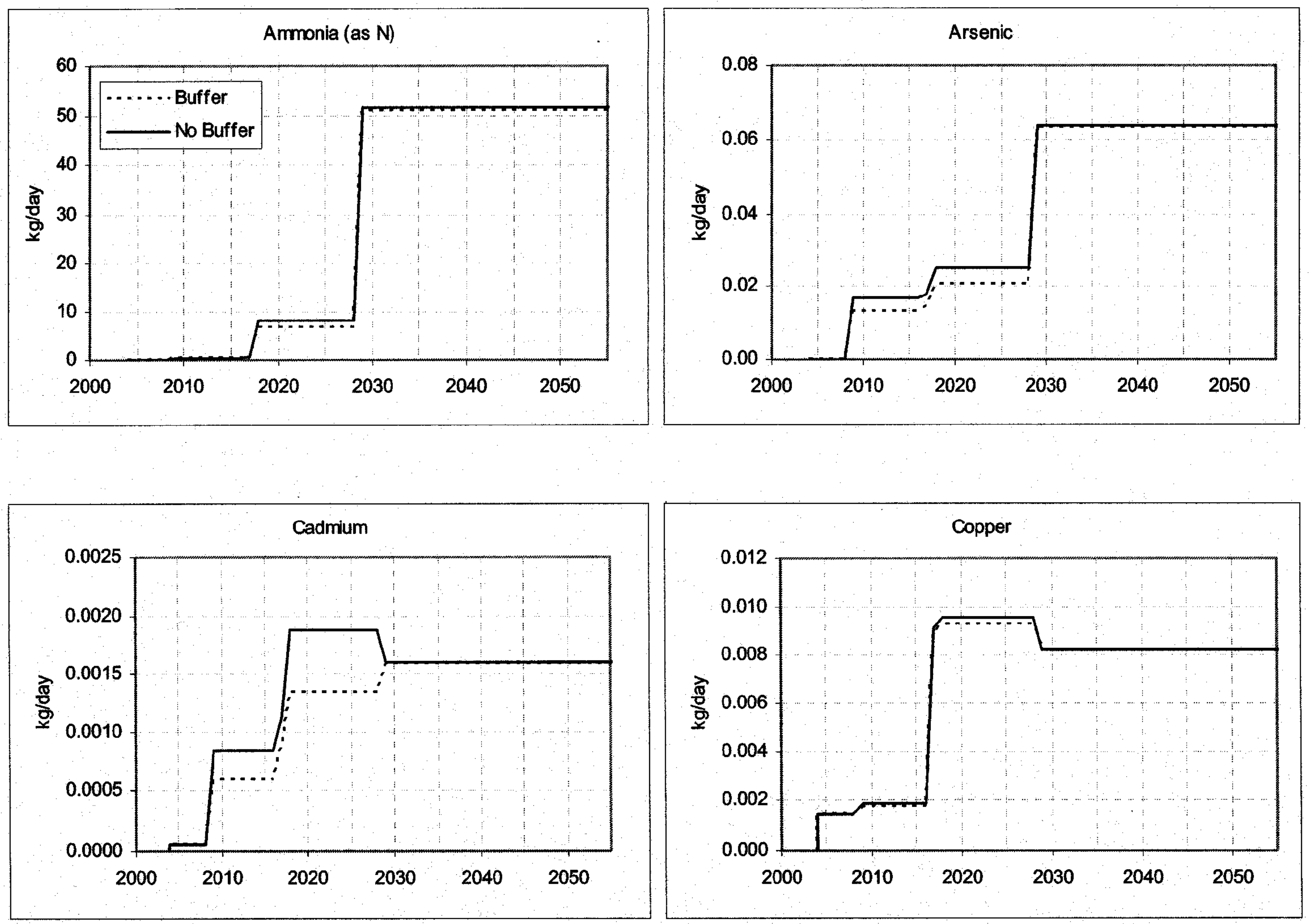



Figure 4-4. Option A – Cumulative COC Mass Loading for Emory River (Ammonia, Arsenic, Cadmium, and Copper)

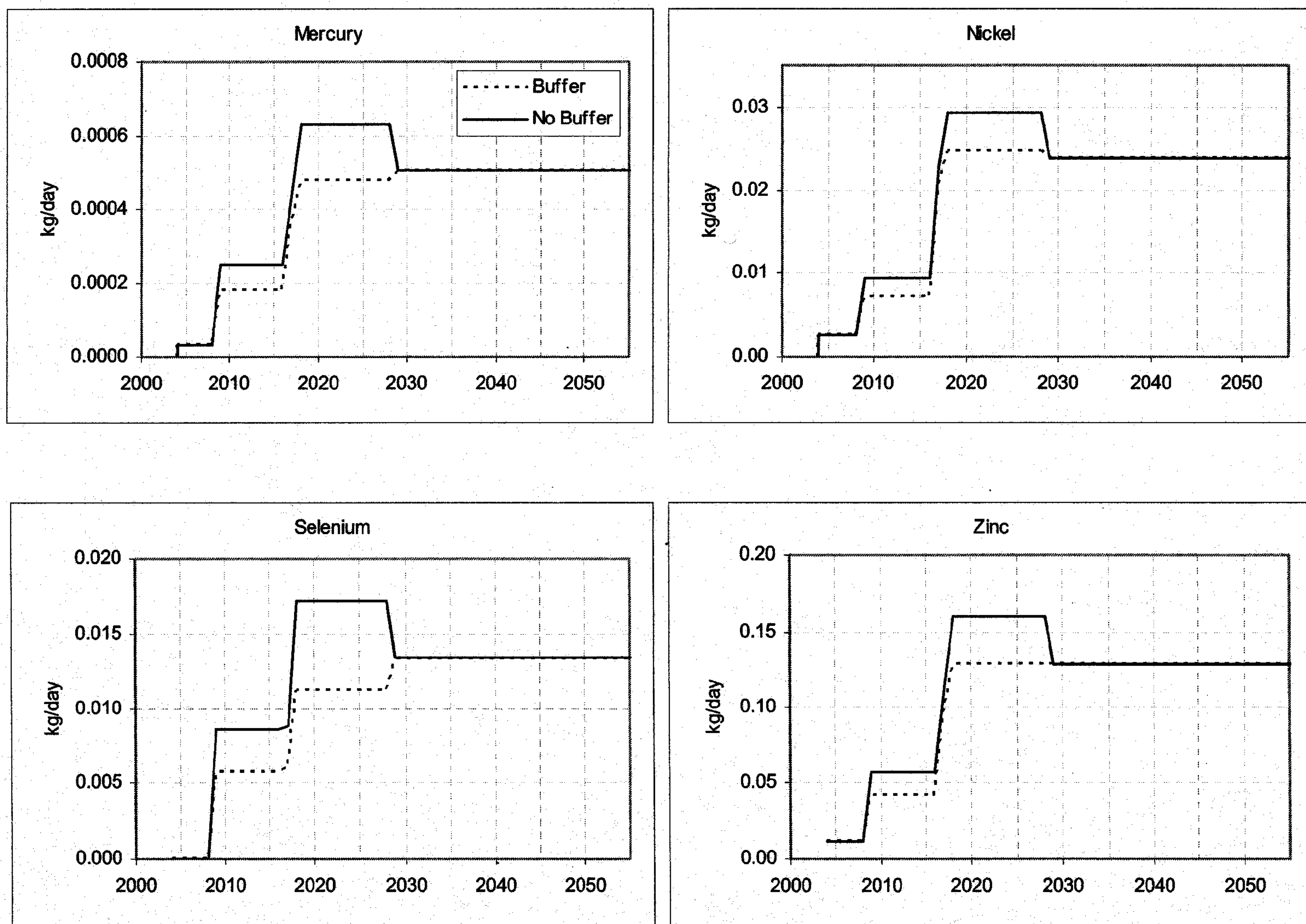



Figure 4-5. Option A – Cumulative COC Mass Loading for Emory River (Mercury, Nickel, Selenium, and Zinc)

concentration to the predicted seepage rate yields a mass loading of 0.424 kg/day. Since SPC discharges into the Emory River a short distance downstream, the $NH_3$-N loading to the Emory River is also 0.424 kg/day. Loadings of other ash-related COC to SPC were computed using historical mean groundwater quality data for monitoring wells 4A, 4B, 5, 5A, and 5B (Appendix I). As shown on Figure 2-6, these wells are situated downgradient of existing ash disposal areas, and provide representative COC concentrations of ash leachate currently entering SPC.

The period of wet sluicing of ash to Ash Dredge Cells 1-3 produces the largest ammonia loading to SPC of any of the future disposal activities in this area. Consequently, the worst-case $NH_3$-N concentration in SPC after full mixing of the predicted maximum loading (0.424 kg/day) with the 7Q10 low flow would be approximately 0.15 mg/L (Table 4-5). While there is no drinking water MCL for ammonia, conversion of ammonia to nitrate or nitrite is possible during groundwater transport, and these constituents have MCLs of 10 mg/L and 1 mg/L, respectively. Resulting $NO_3$-N or $NO_2$-N concentrations in SPC would be <0.15 mg/L for either constituent and would be below MCLs. Maximum allowable levels of ammonia for protection of aquatic life presented in Table 4-6 are dependent on stream pH and temperature. Although no historical pH data are available for SPC embayment, three measurements performed on July 21, 2004, indicated pH of approximately 8.0 to 8.1. The estimated $NH_3$-N level is below the aquatic life CCC for the expected range of stream pH and temperature conditions. Further examination of Table 4-5 indicates that the predicted maximum stream loadings for the remaining COC produce in-stream concentrations meeting applicable MCL and CCC standards.

**Table 4-6. Maximum Allowable Ammonia Concentrations to Protect Aquatic Life[a]**

| | CMC (mg N/L)[b] | | | | CCC (mg N/L) | | | |
|---|---|---|---|---|---|---|---|---|
| **Temp[c] (°C)** | **pH=7.0** | **pH=7.5** | **pH=8.0** | **pH=8.5** | **pH=7.0** | **pH=7.5** | **pH=8.0** | **pH=8.5** |
| 15 | | | | | 5.73 | 4.23 | 2.36 | 1.06 |
| 20 | | | | | 4.15 | 3.07 | 1.71 | 0.77 |
| 25 | 36.09 | 19.89 | 8.41 | 3.20 | 3.01 | 2.22 | 1.24 | 0.55 |
| 30 | | | | | 2.18 | 1.61 | 0.90 | 0.40 |

[a] *Assumes Salmonids absent and fish early life stages present.*

[b] *CMC is not temperature dependent.*

[c] *Chronic values do not change with temperature below 14.6°C.*

### 4.3.4 Predicted COC Concentrations in Emory River

The summary of maximum COC stream loadings and concentrations for the Emory River presented in Table 4-5 account for the cumulative contributions of COC mass loadings from multiple CCB disposal areas and from SPC. The graphs shown on Figures 4-4 and 4-5 provide cumulative mass loading time-series for each COC based on the facility operational schedules and loading data derived from Table H2. These graphs provide a general indication of the temporal variation of stream loadings in response to proposed disposal activities.

Figure 4-4 shows that the cumulative ammonia loading to the Emory River is low for both the buffer and no-buffer cases until 2019, when disposal of dry ash, with its relatively high ammonia content, begins in the region between the Phase 2 and 3 areas. The cumulative loads peak at closure (2029) after the maximum quantity of dry ash has been placed between and over the Phase 2 and 3 gypsum stacks. The worst-case $NH_3$-N loading estimated for the no-buffer design is 51.4 kg/day, resulting in an in-stream concentration of approximately 0.250 mg/L under low-flow conditions (Table 4-5). The clay buffer design slightly reduces the predicted in-stream concentration to 0.248 mg/L. These results suggest a negligible environmental advantage to the clay buffer, particularly since the in-stream $NH_3$-N concentration in both cases is below MCL and CCC.

Predicted worst-case in-stream concentrations for the remaining COC are also well below human health and aquatic life criteria in all cases. Differences between the estimated COC concentrations for the no-buffer and buffer design cases are directly related to predicted seepage differences and are generally 22% or less. As expected, constituents strongly associated with gypsum (e.g., cadmium, mercury, nickel, selenium and zinc) show substantial increases in cumulative load during the Phase 2 and 3 gypsum disposal periods from 2009 to 2029 (Figures 4-4 and 4-5). Loadings decrease substantially in 2029 after closure of the Phase 2 and 3 areas in response to decreased surface infiltration provided by the low-permeability clay cap.

## 4.4 Option B - Future Disposal of Coal Ash Only

### 4.4.1 Facility Description

Figure 4-6 provides the schedule of CCB disposal operations proposed for the ash-only disposal option. Phase 1 ash disposal operations would be the same as those described in Section 4.3.1 including closure of Ash Dredge Cells 1-3 in 2018. Sluiced ash disposal in the Phase 2 area is expected to begin in 2017. Ash would be alternately sluiced to two or three dredge cells until 2029 when the stack reaches elevation 870 ft. At that point, dry ash disposal operations would begin in the Phase 3 area.

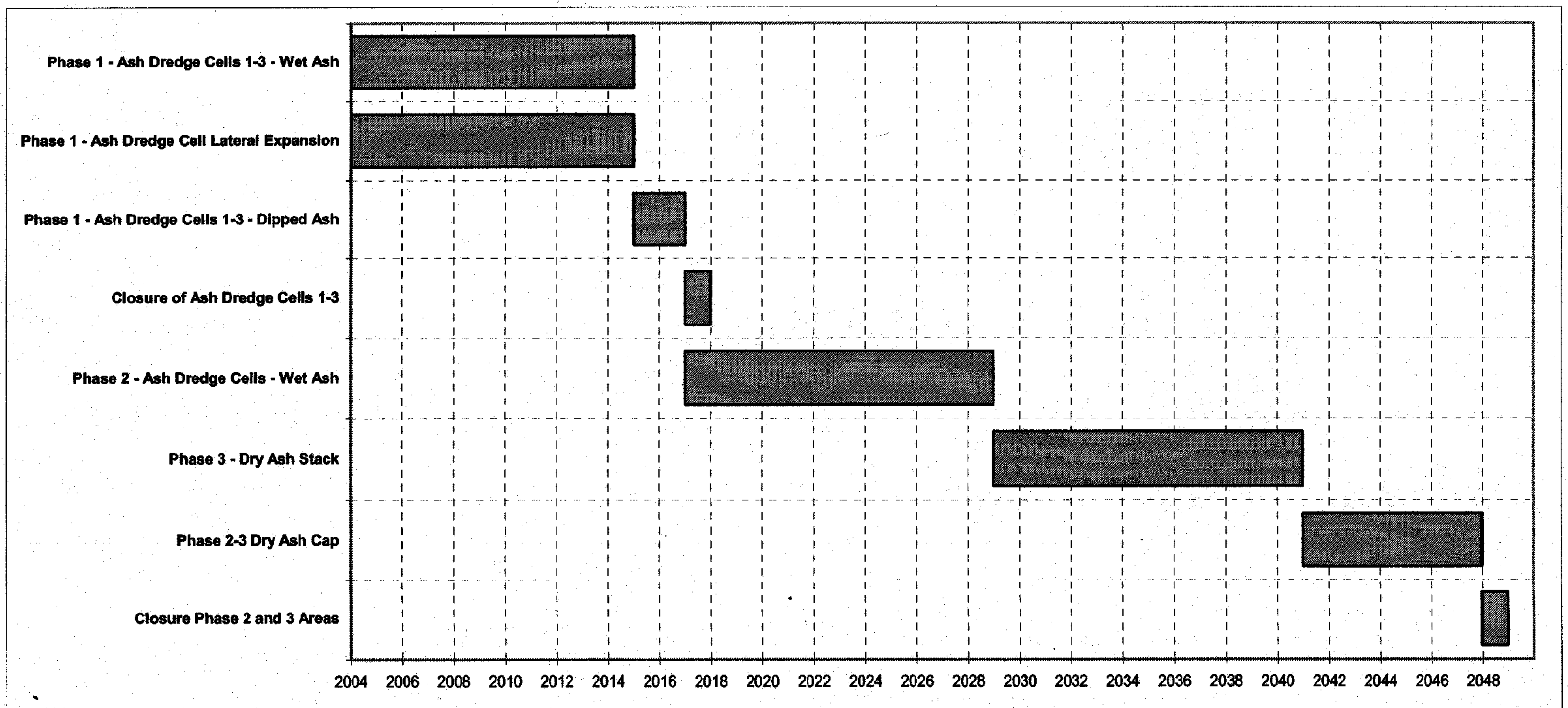



Figure 4-6. Option B – Schedule of Facility Operations

Dry ash stacking is expected to continue in the Phase 2 and 3 areas until 2048 when the stack attains a maximum elevation of 930 ft. Closure of the Phase 2 and 3 areas and the Phase 1 Lateral Expansion Area would occur in 2048 in the same manner described in Section 4.3.1 for Option A.

### 4.4.2 Leachate Seepage Results

Average leachate seepage estimates for each of the proposed disposal facilities considered under Option B are presented in Table 4-7. Detailed seepage data for all disposal facility subregions are given in Table J1 (Appendix J) along with information regarding estimation methods.

Leachate seepage estimates for Ash Dredge Cells 1-3 and the Lateral Expansion Area given in Table 4-7 are identical to those presented in Table 4-4 for Option A, since proposed disposal operations in these areas would be the same under both options. Results indicate that construction of an artificial clay buffer beneath the Phase 2 and 3 areas would reduce seepage during the active disposal period by 22 to 28%. As with Option A, 30-year post-closure simulations of the combined Phase 2 and 3 areas indicate essentially no difference between leachate production rates with or without a clay buffer.

### 4.4.3 Predicted COC Concentrations in Swan Pond Creek Embayment

Maximum COC stream loadings and concentrations for SPC embayment for Option B presented in Table J2 are identical to those presented for Option A (Table H2) , since future disposal operations affecting SPC are the same for both disposal options. Refer to Section 4.2.3 for discussion of potential water quality impacts to SPC.

### 4.4.4 Predicted COC Concentrations in Emory River

Except for ammonia, future ash leachate generated from existing ash disposal areas is expected to be chemically similar to current ash leachate. Therefore, future loadings of COC other than ammonia would not be expected to differ significantly from current loadings to the Emory River. Nevertheless, worst-case in-stream concentrations for the remaining COC are included in the analysis for consistency.

**Table 4-7. Option B – Facility Leachate Seepage Estimates**

| Facility | Start Date | End Date | Waste | Mean Leachate Seepage (Lpd) | Seepage Difference Buffer vs. No Buffer |
|---|---|---|---|---|---|
| Phase 1 - Ash Dredge Cells 1-3 | 2004 | 2014 | wet ash | 425,135 | NA |
| Phase 1 - Ash Dredge Cells 1-3 | 2015 | 2016 | dipped ash | 243,499 | NA |
| Closure of Ash Dredge Cells 1-3 | 2017 | 2046 | mixed ash | 287,409 | NA |
| Phase 1 - Dredge Cell Lateral Expansion Area | 2004 | 2014 | wet ash | 56,936 | NA |
| Phase 2 - Ash Dredge Cells - NO BUFFER | 2017 | 2028 | wet ash | 125,956 | |
| Phase 2 - Ash Dredge Cells - BUFFER | 2017 | 2028 | wet ash | 92,002 | 27% |
| Phase 3 - Dry Ash Stack - NO BUFFER | 2029 | 2040 | dry ash | 111,158 | |
| Phase 3 - Dry Ash Stack - BUFFER | 2029 | 2040 | dry ash | 80,042 | 28% |
| Phase 2&3 - Dry Ash Cap - NO BUFFER | 2041 | 2047 | dry ash | 88,160 | |
| Phase 2&3 - Dry Ash Cap - BUFFER | 2041 | 2047 | dry ash | 68,837 | 22% |
| Closure of Phase 2&3 Areas - NO BUFFER | 2048 | 2077 | ash | 230,944 | |
| Closure of Phase 2&3 Areas - BUFFER | 2048 | 2077 | ash | 229,223 | 1% |

Facility COC mass loadings for Option B are provided in Table J2, while Figures 4-7 and 4-8 show predicted cumulative COC mass loading time series for the Emory River. The ammonia loading to the Emory River is low for both buffer and no-buffer cases until 2029, when dry ash disposal, with its relatively high ammonia content, begins in the Phase 3 Area. The ammonia load decreases following facility closure (2048) in response to reduced infiltration through the clay cap. Table 4-8 indicates the worst-case cumulative $NH_3$-N loading estimated for the no-buffer design is approximately 119 kg/day, resulting in an in-stream concentration of approximately 0.58 mg/L for the Emory River low-flow condition (Section 4.2.2). The clay buffer reduces the predicted in-stream concentration by 19% to approximately 0.47 mg/L. For both buffer and no-buffer cases, potential ammonia-derived nitrate or nitrite byproduct concentrations would be well below drinking water limits during low flow conditions. Predicted ammonia levels would also be below the CCC under typical pH conditions for the Emory River (Figure 4-9). Potential adverse aquatic impacts could occur under coincident conditions of extreme pH, temperature, and low flow in the Emory River (i.e., pH>8.0 and temperature ≥30°C). Historical data for Oakdale (RM 18.3) show that river pH exceeds 8.0 less than 8% of the time, whereas temperatures of 30°C or more occur less than 3% of the time. Disregarding the probability of the Emory River low flow condition at the plant for which data are unavailable, the joint probability of the extreme pH and temperature conditions would be less than 0.3%.

Worst-case in-stream concentrations for the remaining COC are also well below human health and aquatic life criteria in all cases. Differences between the estimated COC concentrations for the no-buffer and buffer design cases are directly related to predicted seepage differences and are generally less than 13%.

## 4.5 Potential Impacts to Groundwater Users

There are currently 13 residential wells and one public water supply spring located within approximately one mile of the proposed disposal area (Figure 3-1). Wells 7 and 20 lie north of Swan Creek embayment and are hydrologically isolated from the disposal site. Similarly, the public water supply spring (Spring 1) and well 23 are hydrologically isolated from the site by Pine Ridge. The ten remaining wells, located to the southwest along Swan Pond Road, are situated indirectly upgradient of the site. There is no indication of groundwater movement from the proposed disposal site toward any off-site wells or springs. No adverse off-site groundwater impacts associated with the proposed CCB disposal facilities are anticipated under present or future conditions.

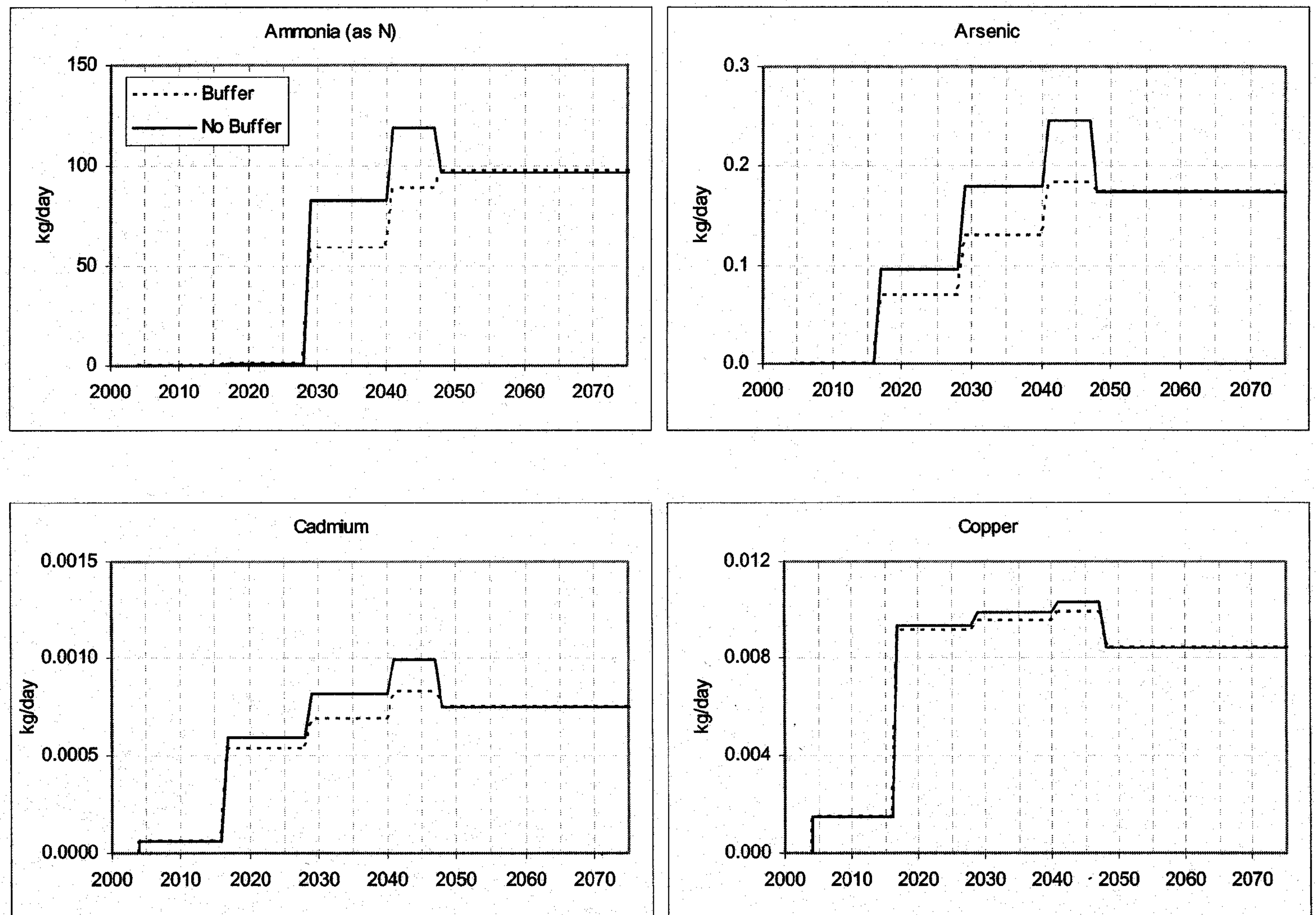



Figure 4-7. Option B – Cumulative COC Mass Loading for Emory River (Ammonia, Arsenic, Cadmium, and Copper)

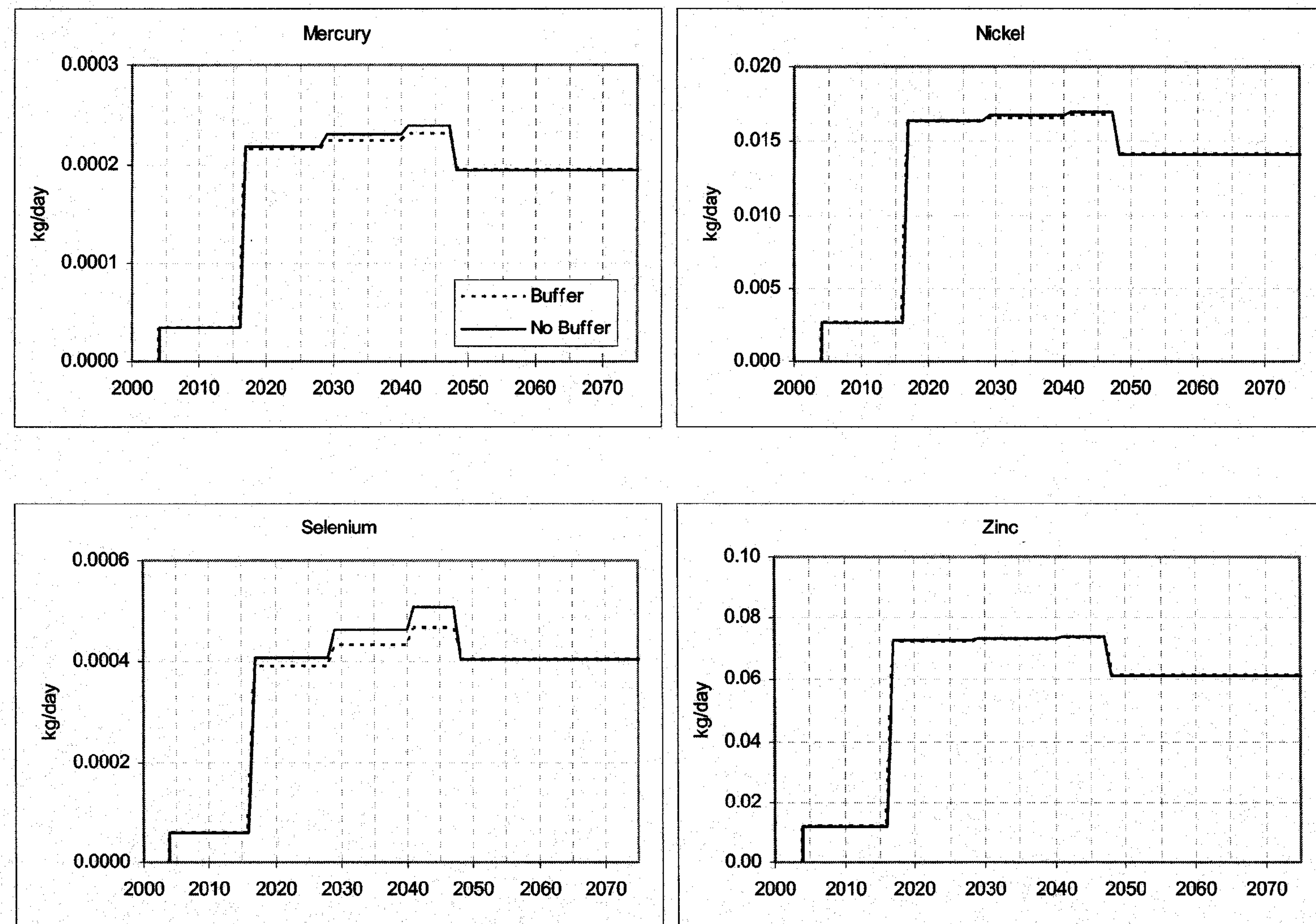



Figure 4-8. Option B – Cumulative COC Mass Loading for Emory River (Mercury, Nickel, Selenium, and Zinc)

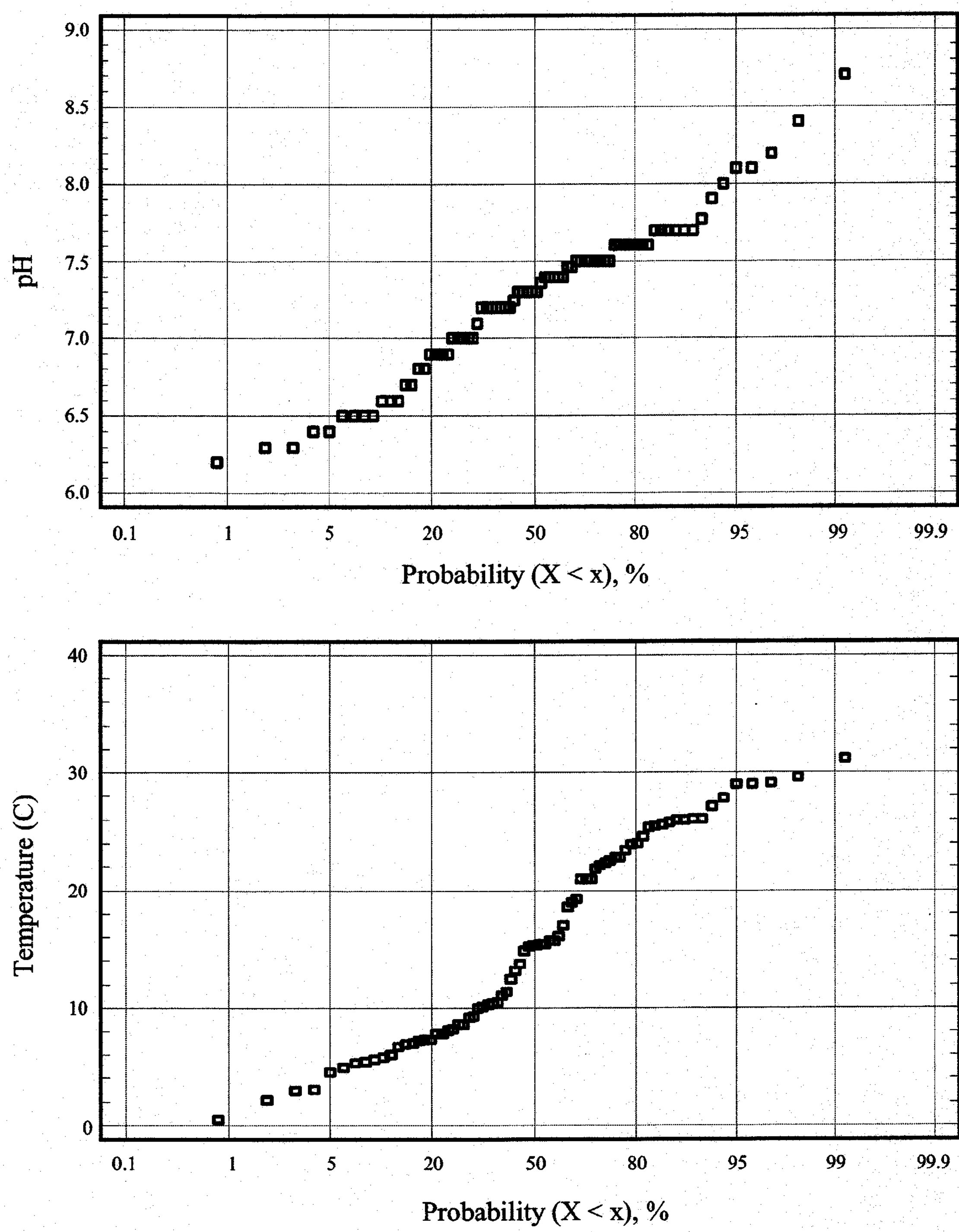



Figure 4-9. Emory River (RM 18.3) pH and Temperature Duration Data (1986-2001)

**Table 4-8. Option B - Predicted Maximum Stream Loadings and In-Stream Concentrations**

| | | | Swan Pond Creek Embayment | | Emory River – No Buffer Case | | Emory River – Buffer Case | |
|---|---|---|---|---|---|---|---|---|
| Constituent | MCL | CCC | Maximum Loading (kg/day) | Maximum Concentration (mg/L) | Maximum Loading (kg/day) | Maximum Concentration (mg/L) | Maximum Loading (kg/day) | Maximum Concentration (mg/L) |
| Ammonia-N | 10/1 | (**) | 4.24E-01 | 0.15221 | 1.19E+02 | 0.57939 | 9.67E+01 | 0.47043 |
| Arsenic | 0.05 | 0.15000 | 1.57E-03 | 0.00061 | 2.45E-01 | 0.00119 | 1.82E-01 | 0.00089 |
| Cadmium | 0.005 | 0.00021 | 4.25E-04 | 0.00016 | 9.95E-04 | 0.00000 | 8.26E-04 | 0.00000 |
| Copper | 1.3 | 0.00720 | 1.08E-02 | 0.00414 | 1.03E-02 | 0.00005 | 9.92E-03 | 0.00005 |
| Mercury | 0.002 | 0.00077 | 2.55E-04 | 0.00010 | 2.39E-04 | 0.00000 | 2.31E-04 | 0.00000 |
| Nickel | 0.1 | 0.04220 | 1.98E-02 | 0.00763 | 1.70E-02 | 0.00008 | 1.68E-02 | 0.00008 |
| Selenium | 0.05 | 0.00500 | 4.25E-04 | 0.00016 | 5.07E-04 | 0.00000 | 4.65E-04 | 0.00000 |
| Zinc | 5 | 0.09570 | 8.89E-02 | 0.03424 | 7.36E-02 | 0.00036 | 7.32E-02 | 0.00036 |

*** See Table 4-6*

## 4.6 Discussion and Conclusions

Modeling of leachate seepage from proposed CCB disposal facilities indicates that construction of an artificial 3-ft clay buffer having a hydraulic conductivity of $10^{-6}$ cm/s or less beneath the Phase 2 and 3 disposal areas would not provide a significant environmental benefit. During the operational phase, predicted leachate seepage rates for the no-buffer and buffer designs for Option A differed by 38% or less. Similar comparisons for Option B showed differences of 28% or less. In general, differences in seepage rates with and without the buffer are relatively small because hydraulic conductivity of the clay buffer is only an order of magnitude lower than that of CCB materials. Following facility closure, differences in seepage rates were 1% or less for both disposal options indicating essentially no long-term environmental benefit of an artificial clay buffer.

A conservative evaluation of leachate seepage effects on local stream water quality further supports the suitability of the site for the proposed disposal options without an artificial geologic buffer. Under Option A, maximum cumulative COC stream loadings predicted for the Emory River during low flow conditions would not produce in-stream concentrations exceeding the drinking water MCL or aquatic life criteria for either the buffer or no-buffer cases. Predicted COC concentrations for the Emory River low-flow condition under disposal Option B were below drinking water and aquatic life standards for all COC except ammonia. Worst-case $NH_3$-N concentrations of 0.58 and 0.47 mg/L estimated for the no-buffer and buffer designs pose no threat to human health, but could exceed the CCC under coincident conditions of extreme pH, temperature, and low flow in the Emory River. Historical data suggest the joint probability of such an occurrence would be less than 0.3%. The potential risk associated with ammonia under Option B can be addressed by future monitoring. Periodic sampling of ash ammonia content and groundwater downgradient of the facility could be performed to assure ammonia levels remain within the limits assumed in this evaluation.

The facility poses no risk to existing or future groundwater users. There are no existing groundwater wells downgradient of the proposed facility, and there is no potential for future development of such wells. All downgradient property between the disposal site and surface water boundaries lies within plant reservation boundaries.

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# APPENDIX A

# SOIL BORING LOGS

**This information taken from "Report of Geotechnical Exploration – Ash Disposal Area – Kingston Fossil Plant, Kingston, Tennessee," MACTEC Engineering and Consulting, Inc., May 4, 2004.**

# FIELD EXPLORATORY PROCEDURES

## Soil Test Boring (Hollow Stem)

All boring and sampling operations were conducted in general accordance with ASTM D 1586. The borings were advanced by mechanically turning continuous steel hollow-stem auger flights into the ground. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot of penetration was recorded and is designated the "standard penetration test (SPT) resistance." Proper evaluation of the penetration resistance provides an index to the soil's strength, density, and ability to support foundations.

Representative portions of the soil samples obtained from the split-tube sampler were sealed in glass jars and transported to our laboratory for testing and further examination. Test Boring Records are attached, graphically showing the soil descriptions and penetration resistances.

## Plugging and Abandonment of Boreholes

Upon completion of drilling and sampling, the geotechnical boreholes were plugged with a Type I Portland cement-bentonite grout mixture using a tremie pipe method. The borings were plugged in general accordance with the requirements specified by TVA. The borings were plugged immediately after drilling and sampling of the boreholes.

## Bulk Samples

Bulk samples of several ash types obtained at various elevations were collected for testing.

## Undisturbed Sampling

The relatively undisturbed soil samples were obtained by pushing a section of 3-inch O.D., 16-gauge steel tubing into the soil at the desired sampling level. The sampling procedure is described by ASTM D-1587. The tube, together with the encased soils, was carefully removed from the ground, made airtight, and transported to our laboratory.

To obtain relatively undisturbed samples of ash a 3-1/2-inch OD, 3-inch ID split spoon with liner was used. The spoon was pushed into the bottoms of the boreholes at the desired sampling depths. The ash samples, enclosed in the liners, were then sealed with a wax / motor oil mixture at both ends and then capped to minimize changes in the structure and moisture content of the samples.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" | 2nd 6" | 3rd 6" | PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | NOTE: MONITORING WELL 1 (PIEZOMETER) WAS INSTALLED APPROXIMATELY 11.0' NORTH EAST OF B-1.<br>AUGER BORING FROM 0.0' TO 20.0'.<br>1" PIEZOMETER PIPE INSTALLED FROM GROUND SURFACE TO A DEPTH OF 20.0'. | | 781.8 | | | | | | |
| 5 | | | 776.8 | | | | | | |
| 10 | | | 771.8 | | | | | | |
| 15 | | | 766.8 | | | | | | |
| 20 | BORING TERMINATED AT 20.0' | | 761.8 | | | | | | |
| 25 | | | 756.8 | | | | | | |
| 30 | | | 751.8 | | | | | | |
| 35 | | | 746.8 | | | | | | |
| 40 | | | 741.8 | | | | | | |
| 45 | | | 736.8 | | | | | | |

SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/23/04

REMARKS:

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** Kingston Fossil Plant - Ash Diposal Area

**DRILLED:** March 25, 2004 **BORING NO.:** MW-1

**PROJ. NO.:** 3043041009/0001 **PAGE** 1 **OF** 1

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" | 2nd 6" | 3rd 6" |
|---|---|---|---|---|---|---|---|---|
| 0 | NOTE: MONITORING WELL 2 (PIEZOMETER) WAS INSTALLED APPROXIMATELY 15.0' NORTH EAST OF B-2.<br>AUGER BORING FROM 0.0' TO 35.0'.<br>1" PIEZOMETER PIPE INSTALLED FROM GROUND SURFACE TO A DEPTH OF 35.0'. | | 795.3 | | | | | |
| 5 | | | 790.3 | | | | | |
| 10 | | | 785.3 | | | | | |
| 15 | | ▼ | 780.3 | | | | | |
| 20 | | | 775.3 | | | | | |
| 25 | | | 770.3 | | | | | |
| 30 | | | 765.3 | | | | | |
| 35 | BORING TERMINATED AT 35.0' | | 760.3 | | | | | |
| 40 | | | 755.3 | | | | | |
| 45 | | | 750.3 | | | | | |

PL (%) — NM (%) — LL (%)
▲ FINES (%)
● SPT (bpf)
10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60 70 80 90 100

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

REMARKS:

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Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** Kingston Fossil Plant - Ash Diposal Area

**DRILLED:** March 25, 2004 **BORING NO.:** MW-2

**PROJ. NO.:** 3043041009/0001 **PAGE** 1 **OF** 1

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" | 2nd 6" | 3rd 6" | PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | NOTE: MONITORING WELL 3 (PIEZOMETER) WAS INSTALLED APPROXIMATELY 16.0' SOUTH WEST OF B-3.<br>AUGER BORING FROM 0.0' TO 40.0'.<br>1" PIEZOMETER PIPE INSTALLED FROM GROUND SURFACE TO A DEPTH OF 40.0'. | | 810.8 | | | | | | |
| 5 | | | 805.8 | | | | | | 5 |
| 10 | | | 800.8 | | | | | | 10 |
| 15 | | | 795.8 | | | | | | 15 |
| 20 | | | 790.8 | | | | | | 20 |
| 25 | | ▼ | 785.8 | | | | | | 25 |
| 30 | | | 780.8 | | | | | | 30 |
| 35 | | | 775.8 | | | | | | 35 |
| 40 | BORING TERMINATED AT 40.0' | | 770.8 | | | | | | 40 |
| 45 | | | 765.8 | | | | | | 0 10 20 30 40 50 60 70 80 90 100 |

SOIL 3043041009_01.GPJ LAW GIBB.GDT 4/23/04

REMARKS:

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** Kingston Fossil Plant - Ash Diposal Area

**DRILLED:** March 25, 2004 **BORING NO.:** MW-3

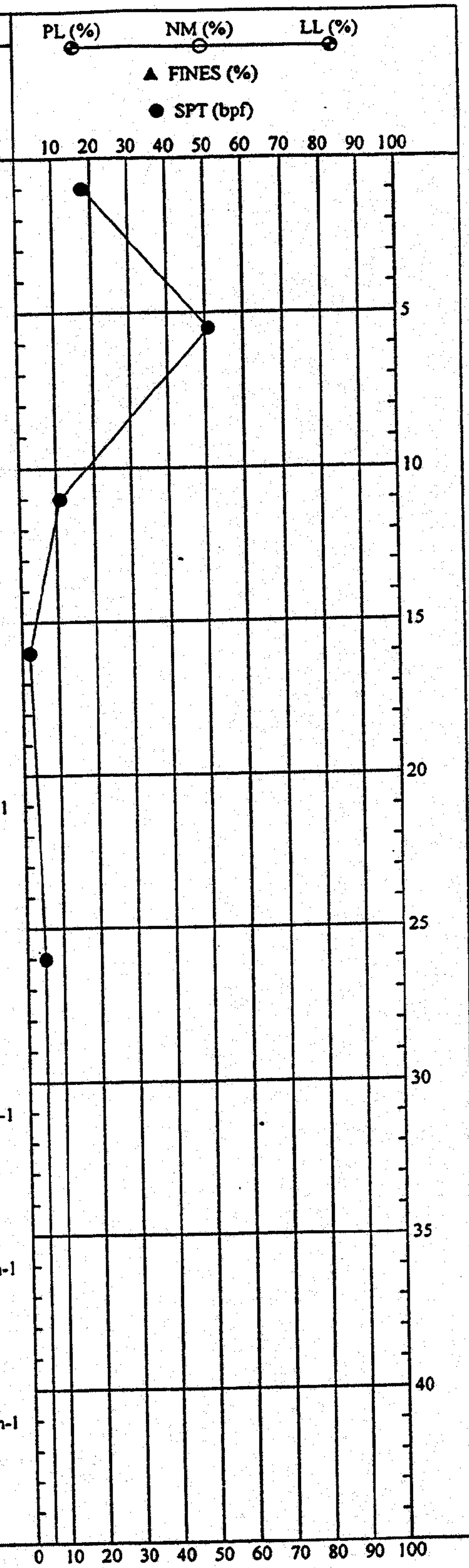
**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 1**

MACTEC

## SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | ELEV (ft) | SAMPLE IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| 0 | FIRM TO STIFF, ORANGE-BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - FILL | 781.8 | SPT-1 | 3-7-11 |
| | VERY STIFF, GRAY, DRY TO SLIGHTLY MOIST, SANDY CLAYEY SILT - ASH | | | |
| | VERY DENSE TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO WET, SILTY SAND - ASH | | UD-1 | 0.5-0.5 |
| 5 | | 776.8 | SPT-2 | 15-25-26 |
| 10 | | 771.8 | SPT-3 | 4-5-6 |
| 15 | NOTE: AT ABOUT 15.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS. | 766.8 | SPT-4 | 2-1-1 |
| 20 | | 761.8 | SPT-5 | woh-woh-1 |
| 25 | | 756.8 | SPT-6 | 1-2-3 |
| 30 | | 751.8 | SPT-7 | woh-woh-1 |
| 35 | | 746.8 | SPT-8 | woh-woh-1 |
| 40 | | 741.8 | SPT-9 | woh-woh-1 |
| | FIRM TO VERY SOFT, GRAY, WET, SANDY CLAYEY SILT / SILTY CLAY - ASH | | | |
| 45 | | 736.8 | | |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins

Prepared By: Justice

Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash

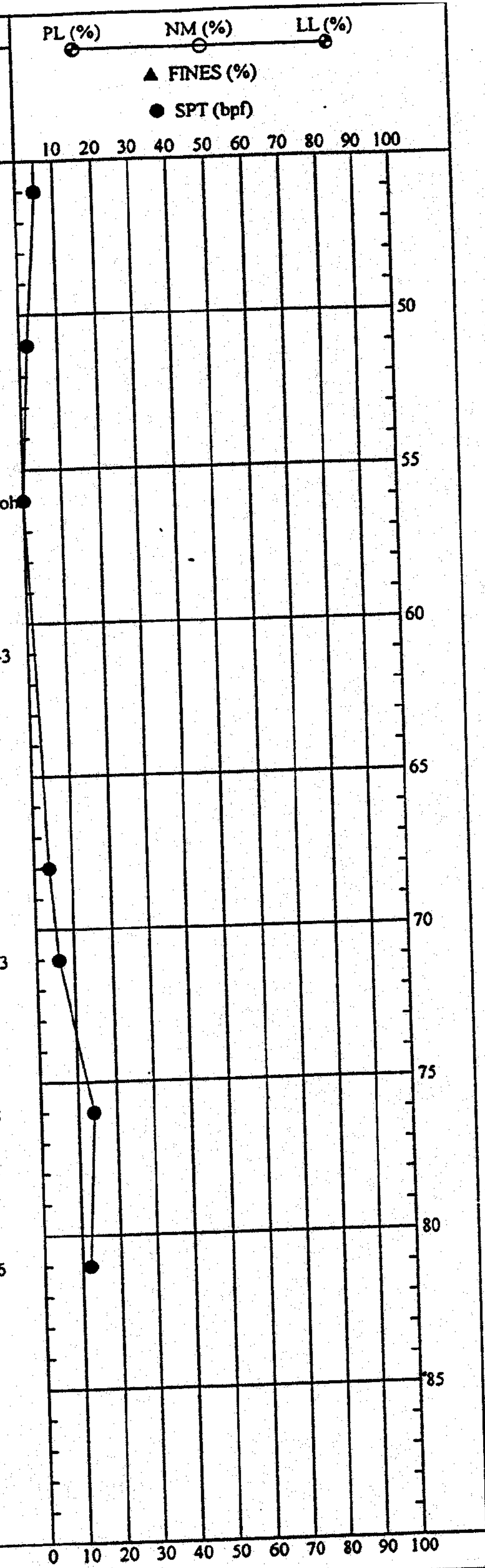
**DRILLED:** March 8, 2004 **BORING NO.:** B-1

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 2**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/6/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.) | ELEV (ft) | SAMPLES IDENT | N-COUNT (1st 6" 2nd 6" 3rd 6") |
|---|---|---|---|---|
| 45 | FIRM TO VERY SOFT, GRAY, WET, SANDY CLAYEY SILT / SILTY CLAY - ASH | 736.8 | SPT-10 | 1-2-3 |
| 50 | | 731.8 | SPT-11 | woh-1-1 |
| | VERY SOFT TO SOFT, GRAY, MOIST, SANDY SILTY CLAY - ALLUVIUM | | | |
| 55 | | 726.8 | SPT-12 | woh-woh-woh |
| 60 | | 721.8 | SPT-13 | woh-woh-3 |
| | VERY LOOSE TO FIRM, GRAY, WET CLAYEY / SILTY SAND - ALLUVIUM | | | |
| 65 | | 716.8 | UD-2 | 2.0-2.0 |
| | | | SPT-14 | 2-2-2 |
| 70 | | 711.8 | SPT-15 | woh-3-3 |
| 75 | | 706.8 | SPT-16 | 5-6-8 |
| 80 | NOTE: GRAVEL OBSERVED IN SAMPLE INTERVAL FROM 80.0' TO 81.5' | 701.8 | SPT-17 | 5-6-6 |
| | AUGER REFUSAL AT 82.2'. BORING TERMINATED AT 82.2'. | | | |
| 85 | | 696.8 | | |
| 90 | | 691.8 | | |




SOIL_3043041009_01.GPJ LAW_GIBB.GDT 4/6/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 8, 2004

**BORING NO.:** B-1

**PROJ. NO.:** 3043041009/0001

**PAGE** 2 **OF** 2

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" | 2nd 6" | 3rd 6" | PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | NOTE: B-1A WAS OFFSET APPROXIMATELY 22.0' SOUTH WEST OF B-1.<br>AUGER BORING FROM 0.0' TO 5.0' USED FOR IN-SITU HYDRAULIC CONDUCTIVITY TESTING. | | 781.8 | | | | | | |
| 5 | BORING TERMINATED AT 5.0' | | 776.8 | | | | | | 5 |
| 10 | | | 771.8 | | | | | | 10 |
| 15 | | | 766.8 | | | | | | 15 |
| 20 | | | 761.8 | | | | | | 20 |
| 25 | | | 756.8 | | | | | | 25 |
| 30 | | | 751.8 | | | | | | 30 |
| 35 | | | 746.8 | | | | | | 35 |
| 40 | | | 741.8 | | | | | | 40 |
| 45 | | | 736.8 | | | | | | |

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

REMARKS:

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Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 15, 2004 **BORING NO.:** B-1A

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 1**

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" | 2nd 6" | 3rd 6" | PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | NOTE: B-1B WAS OFFSET APPROXIMATELY 47.0' SOUTH WEST OF B-1.<br>AUGER BORING FROM 0.0' TO 5.0' USED FOR IN-SITU HYDRAULIC CONDUCTIVITY TESTING. | | 781.8 | | | | | | |
| 5 | BORING TERMINATED AT 5.0' | | 776.8 | | | | | | |
| 10 | | | 771.8 | | | | | | |
| 15 | | | 766.8 | | | | | | |
| 20 | | | 761.8 | | | | | | |
| 25 | | | 756.8 | | | | | | |
| 30 | | | 751.8 | | | | | | |
| 35 | | | 746.8 | | | | | | |
| 40 | | | 741.8 | | | | | | |
| 45 | | | 736.8 | | | | | | |

SOIL 3043041009 01.GPJ LAW_GIBB.GDT 4/7/04

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Driller : Akins
Prepared By:Justice
Checked By:

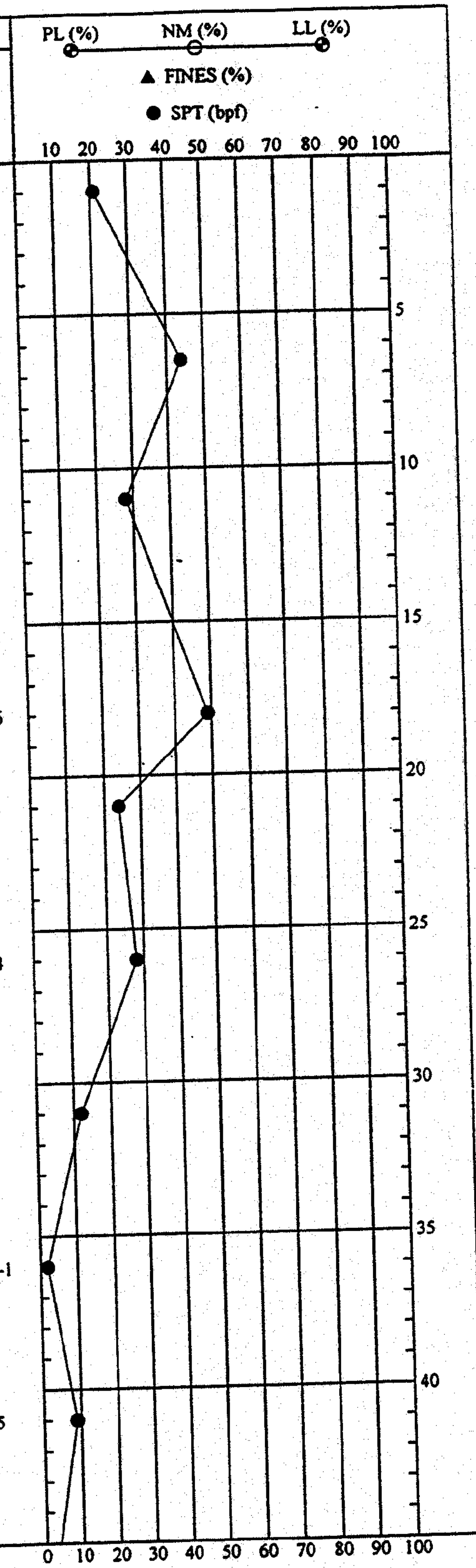
**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash
**DRILLED:** March 15, 2004 **BORING NO.:** B-1B
**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 1**

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | ELEV (ft) | IDENT | N-COUNT (1st 6" / 2nd 6" / 3rd 6") |
|---|---|---|---|---|
| 0 | STIFF, RED-BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - FILL | 795.3 | SPT-1 | 5-5-16 |
| | DENSE TO FIRM, GRAY, SLIGHTLY MOIST TO WET, CLAYEY / SILTY SAND - ASH | | | |
| 5 | | 790.3 | UD-1 | 0-1.5 |
| | | | SPT-2 | 18-30-14 |
| 10 | | 785.3 | SPT-3 | 10-11-17 |
| 15 | | 780.3 | UD-2 | 0-2.0 |
| | | | SPT-4 | 13-23-26 |
| 20 | | 775.3 | SPT-5 | 10-8-16 |
| 25 | | 770.3 | SPT-6 | 8-14-14 |
| 30 | NOTE: AT ABOUT 30.0' STARTED INTRODUCING WATER INTO THE HOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS. | 765.3 | SPT-7 | 4-4-8 |
| | VERY SOFT, GRAY, WET, SANDY SILTY CLAY - ASH | | | |
| 35 | | 760.3 | SPT-8 | woh-1-1 |
| | STIFF TO VERY SOFT, BROWN, RED-BROWN, AND OLIVE BROWN, MOIST TO WET, SILTY CLAY WITH COAL FRAGMENTS, CHERT FRAGMENTS, AND SOME ASH - FILL | | | |
| 40 | | 755.3 | SPT-9 | 2-4-5 |
| 45 | | 750.3 | | |

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.




SOIL. 3043041009 01.GPJ LAW GIBB.GDT 4/6/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By: Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 4, 2004 **BORING NO.:** B-2

**PROJ. NO.:** 3043041009/0001 **PAGE** 1 **OF** 2

MACTEC

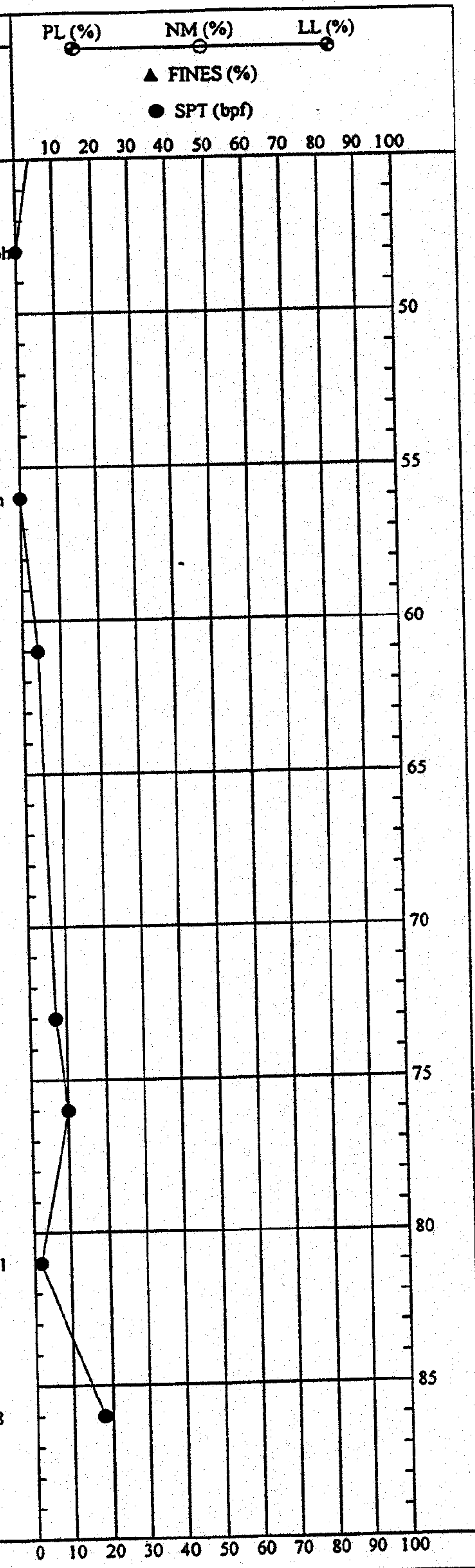
## SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | LEGEND | ELEV (ft) |
|---|---|---|---|
| 45 | STIFF TO VERY SOFT, BROWN, RED-BROWN, AND OLIVE BROWN, MOIST TO WET, SILTY CLAY WITH COAL FRAGMENTS, CHERT FRAGMENTS, AND SOME ASH - FILL | | 750.3 |
| 50 | | | 745.3 |
| | VERY LOOSE, GRAY, WET, SILTY CLAYEY SAND - ASH | | |
| 55 | | | 740.3 |
| 60 | | | 735.3 |
| | VERY SOFT TO STIFF, ORANGE BROWN AND OLIVE GRAY, WET TO MOIST, SILTY / SANDY CLAY WITH A FEW ROOTS - ALLUVIUM | | |
| 65 | | | 730.3 |
| 70 | | | 725.3 |
| 75 | | | 720.3 |
| | VERY LOOSE TO FIRM, OLIVE GRAY, WET, SILTY / CLAYEY SAND - ALLUVIUM | | |
| 80 | | | 715.3 |
| 85 | | | 710.3 |
| | AUGER REFUSAL AT 87.5'. BORING TERMINATED AT 87.5'. | | |
| 90 | | | 705.3 |

### SAMPLES

| IDENT | TYPE | N-COUNT (1st 6" / 2nd 6" / 3rd 6") |
|---|---|---|
| UD-3 | | 0-2.0 |
| SPT-10 | | woh-woh-woh |
| SPT-11 | | woh-woh-1 |
| SPT-12 | | woh-1-woh |
| SPT-13 | | 6-3-1 |
| SPT-14 | | 1-woh-1 |
| UD-4 | | 2.0-2.0 |
| SPT-15 | | 4-2-5 |
| SPT-16 | | 1-4-6 |
| SPT-17 | | woh-1-1 |
| SPT-18 | | 5-10-8 |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By: Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 4, 2004 **BORING NO.:** B-2

**PROJ. NO.:** 3043041009/0001 **PAGE 2 OF 2**

MACTEC

SOIL 3043041009 01.GPJ LAW_GIBB.GDT 4/6/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" | 2nd 6" | 3rd 6" | PL (%) / NM (%) / LL (%); ▲ FINES (%); ● SPT (bpf) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | NOTE: B-2A WAS OFFSET APPROXIMATELY 15.0' SOUTH WEST OF B-2.<br>AUGER BORING FROM 0.0' TO 5.0' USED FOR IN-SITU HYDRAULIC CONDUCTIVITY TESTING. | | 795.3 | | | | | | |
| 5 | BORING TERMINATED AT 5.0' | | 790.3 | | | | | | |
| 10 | | | 785.3 | | | | | | |
| 15 | | | 780.3 | | | | | | |
| 20 | | | 775.3 | | | | | | |
| 25 | | | 770.3 | | | | | | |
| 30 | | | 765.3 | | | | | | |
| 35 | | | 760.3 | | | | | | |
| 40 | | | 755.3 | | | | | | |
| 45 | | | 750.3 | | | | | | |

Scale: 0 10 20 30 40 50 60 70 80 90 100

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 15, 2004 **BORING NO.:** B-2A

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 1**

MACTEC

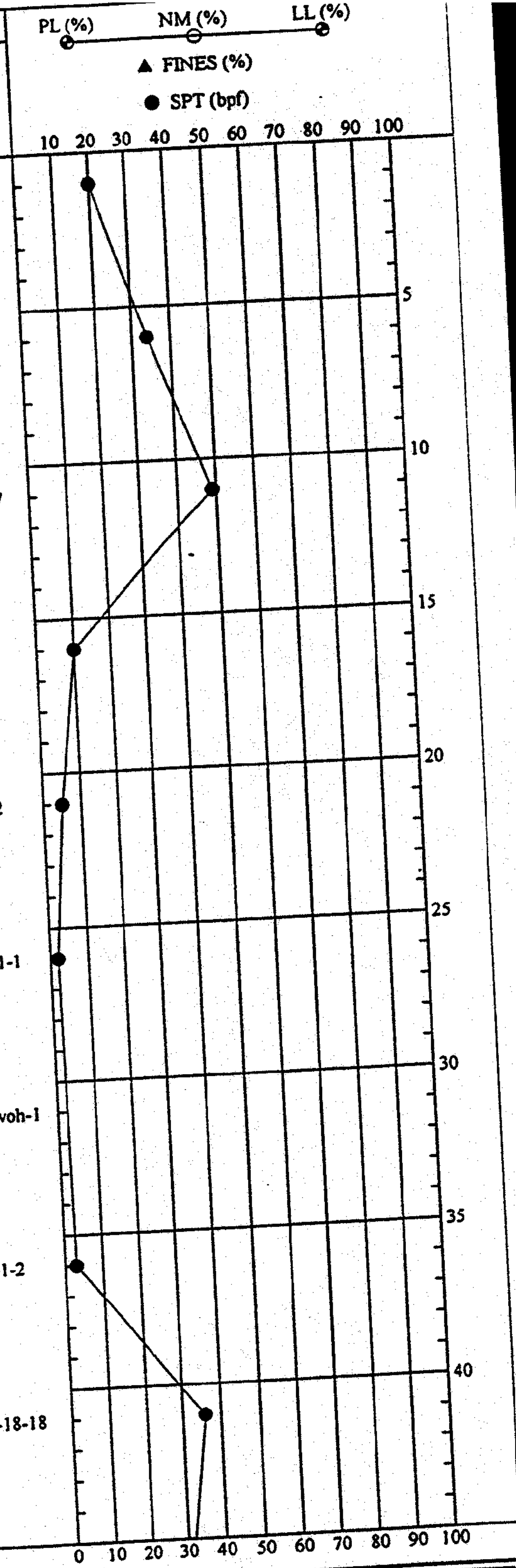
## SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | ELEV (ft) |
| --- | --- | --- |
| 0 | VERY STIFF, GRAY, SLIGHTLY MOIST, SANDY CLAYEY SILT - ASH | 810.8 |
| ~2 | DENSE TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO WET, SILTY / CLAYEY SAND - ASH | |
| 5 | | 805.8 |
| 10 | | 800.8 |
| 15 | | 795.8 |
| 20 | | 790.8 |
| 25 | | 785.8 |
| 30 | | 780.8 |
| 35 | | 775.8 |
| 40 | | 770.8 |
| 45 | | 765.8 |

### SAMPLES

| IDENT | TYPE | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
| --- | --- | --- |
| SPT-1 | | 3-8-12 |
| SPT-2 | | 7-16-18 |
| SPT-3 | | 12-22-27 |
| SPT-4 | | 2-5-5 |
| SPT-5 | | 2-3-2 |
| SPT-6 | | woh-1-1 |
| SPT-7 | | woh-woh-1 |
| SPT-8 | | 1-1-2 |
| SPT-9 | | 10-18-18 |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 3, 2004

**BORING NO.:** B-3

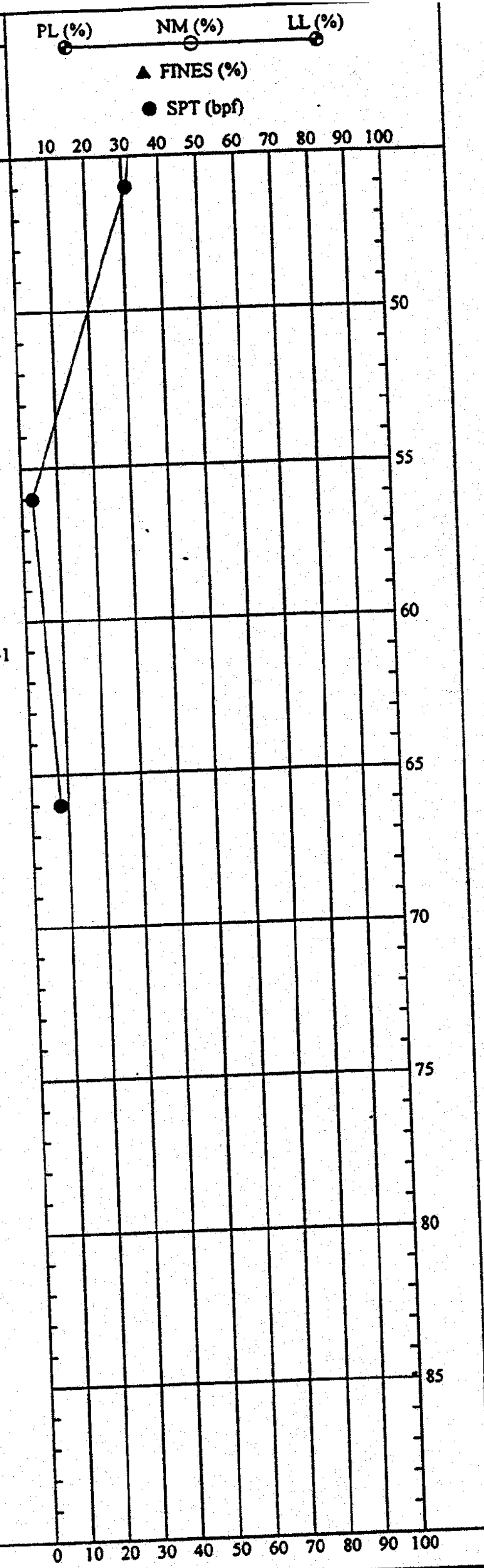
**PROJ. NO.:** 3043041009/0001



MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/6/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.) | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 45 | DENSE TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO WET, SILTY / CLAYEY SAND - ASH | | 765.8 | SPT-10 | | 7-17-14 |
| | VERY SOFT, GRAY, WET, SANDY SILTY CLAY - ASH | | | | | |
| 50 | | | 760.8 | SPT-11 | | woh-woh-1 |
| | VERY LOOSE, GRAY, WET, SAND - ASH | | | | | |
| 55 | | | 755.8 | SPT-12 | | 1-2-1 |
| | VERY SOFT, BROWN, WET, SILTY CLAY WITH COAL AND CHERT FRAGMENTS - FILL | | | | | |
| 60 | | | 750.8 | SPT-13 | | woh-woh-1 |
| | LOOSE GRAY, WET, CLAYEY SILTY SAND WITH GRAVEL - ASH | | | | | |
| 65 | | | 745.8 | SPT-14 | | 4-4-4 |
| | NOTE: AT A DEPTH OF 70.0' ATTEMPTED TO SEAT SPLIT-SPOON BUT REFUSED AT 50.0'. SUBSURFACE MATERIAL SUSPECTED TO HAVE PIPED IN AUGERS. FLUSHING OF BOREHOLE WITH WATER WAS UNSUCCESSFUL. | | | | | |
| 70 | BORING TERMINATED AT 70.0' | | 740.8 | | | |
| 75 | | | 735.8 | | | |
| 80 | | | 730.8 | | | |
| 85 | | | 725.8 | | | |
| 90 | | | 720.8 | | | |




SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By: Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 3, 2004 **BORING NO.:** B-3

**PROJ. NO.:** 3043041009/0001 **PAGE 2 OF 2**

MACTEC

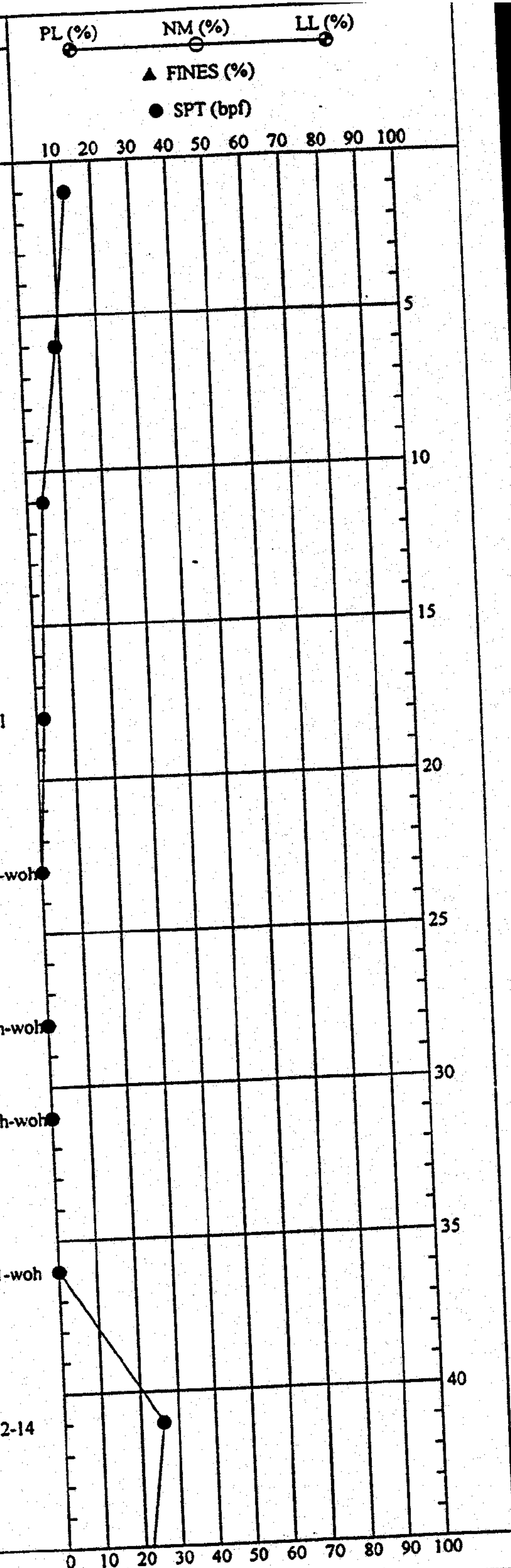
## SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | LEGEND | ELEV (ft) |
|---|---|---|---|
| 0 | STIFF TO VERY SOFT, GRAY, SLIGHTLY MOIST TO WET, CLAYEY / SANDY SILT - ASH | | 810.6 |
| 5 | | | 805.6 |
| 10 | | | 800.6 |
| 15 | | | 795.6 |
| 20 | | | 790.6 |
| 25 | | | 785.6 |
| 30 | | | 780.6 |
| 35 | | | 775.6 |
| 40 | VERY FIRM TO FIRM, GRAY, VERY MOIST TO WET, SILTY / CLAYEY SAND - ASH<br>NOTE: DRILLER REPORTED "STIFF" DRILLING AT ABOUT 38.0'. | | 770.6 |
| 45 | | | 765.6 |

### SAMPLES

| IDENT | TYPE | N-COUNT (1st 6" / 2nd 6" / 3rd 6") |
|---|---|---|
| SPT-1 | | 3-6-7 |
| SPT-2 | | 2-3-6 |
| SPT-3 | | 3-2-2 |
| UD-1 | | 0-2.0 |
| SPT-4 | | woh-1-1 |
| UD-2 | | 0-2.0 |
| SPT-5 | | woh-woh-woh |
| SPT-6 | | woh-woh-woh |
| SPT-7 | | woh-woh-woh |
| SPT-8 | | woh-1-woh |
| SPT-9 | | 4-12-14 |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** Kingston Fossil Plant - Ash Diposal Area

**DRILLED:** March 23, 2004 **BORING NO.:** B-4

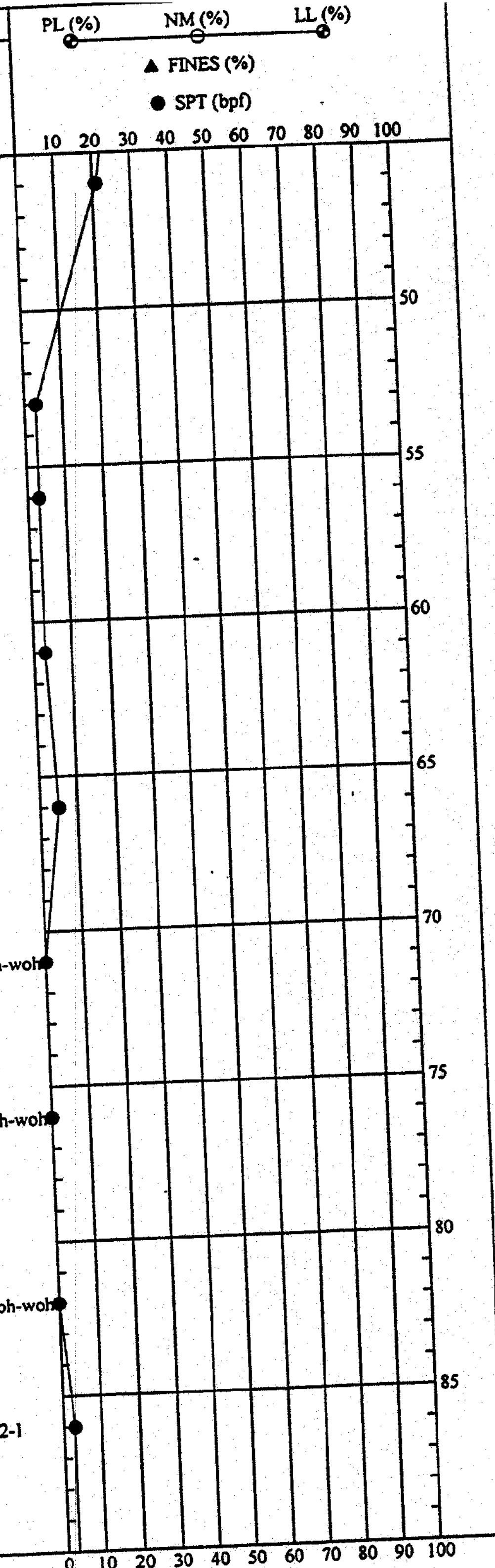
**PROJ. NO.:** 3043041009/0001 **PAGE** 1 **OF** 3

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT (1st 6" / 2nd 6" / 3rd 6") |
|---|---|---|---|---|---|---|
| 45 | FIRM, GRAY, VERY MOIST TO WET, SILTY / CLAYEY SAND - ASH | | 765.6 | SPT-10 | | 8-11-10 |
| | SOFT, GRAY, WET, CLAYEY SANDY SILT - ASH | | | | | |
| 50 | | | 760.6 | UD-3 | | 0-2.0 |
| | | | | SPT-11 | | 2-2-1 |
| | VERY LOOSE TO LOOSE, GRAY, WET, CLAYEY SILTY SAND - ASH | | | | | |
| 55 | | | 755.6 | SPT-12 | | 1-2-1 |
| 60 | | | 750.6 | SPT-13 | | 1-1-2 |
| 65 | | | 745.6 | SPT-14 | | 1-3-2 |
| 70 | | | 740.6 | SPT-15 | | woh-woh-woh |
| | VERY SOFT, GRAY, WET, CLAYEY SILT - ASH | | | | | |
| 75 | NOTE: AT SAMPLE INTERVAL FROM 75.0' TO 76.5' SPLIT-SPOON DROPPED UNDER THE WEIGHT OF THE TOOLS. | | 735.6 | SPT-16 | | woh-woh-woh |
| 80 | | | 730.6 | SPT-17 | | woh-woh-woh |
| | NOTE: DRILLER REPORTED CLAYEY ALLUVIAL SAND AT ABOUT 83.0'. | | | | | |
| 85 | VERY LOOSE TO LOOSE, GRAY, YELLOW-BROWN, AND OLIVE GRAY, WET, CLAYEY SAND WITH A FEW ROOTS - ALLUVIUM | | 725.6 | SPT-18 | | 1-2-1 |
| 90 | | | 720.6 | | | |

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By: Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 23, 2004 **BORING NO.:** B-4

**PROJ. NO.:** 3043041009/0001 **PAGE 2 OF 3**

**MACTEC**

SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/6/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.) | ELEV (ft) | SAMPLES IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| 90 | VERY LOOSE TO LOOSE, GRAY, YELLOW-BROWN, AND OLIVE GRAY, WET, CLAYEY SAND WITH A FEW ROOTS - ALLUVIUM | 720.6 | UD-4 | 0-2.0 |
| | | | SPT-19 | 1-2-1 |
| 95 | | 715.6 | UD-5 | 0-2.0 |
| | | | SPT-20 | 4-4-3 |
| 98.5 | BORING TERMINATED AT 98.5' | | | |

PL (%) — NM (%) — LL (%)

▲ FINES (%)

● SPT (bpf)

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/6/04

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Driller : Akins

Prepared By:Justice

Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 23, 2004 **BORING NO.:** B-4

**PROJ. NO.:** 3043041009/0001 **PAGE 3 OF 3**

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT (1st 6" 2nd 6" 3rd 6") |
|---|---|---|---|---|---|
| 0 | AUGER BORING<br>NOTE: BORING B-4A WAS OFFSET ABOUT 3 FEET EAST OF B-4. | 810.6 | | | |
| 5 | | 805.6 | | | |
| 10 | | 800.6 | | | |
| 15 | | 795.6 | UD-1 | | 1.1-2.0 |
| | VERY LOOSE, GRAY, VERY MOIST TO WET, CLAYEY SILTY SAND - ASH | | SPT-1 | | woh-woh-1 |
| 20 | | 790.6 | UD-2 | | 0-2.0 |
| 25 | | 785.6 | UD-3 | | 1.2-2.0 |
| | | | SPT-2 | | woh-woh-woh |
| 28.5 | BORING TERMINATED AT 28.5' | | | | |
| 30 | | 780.6 | | | |
| 35 | | 775.6 | | | |
| 40 | | 770.6 | | | |
| 45 | | 765.6 | | | |

PL (%) — NM (%) — LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043041009_01.GPJ LAW GIBB.GDT 4/6/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION.

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Driller : Akins

Prepared By:Justice

Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 24, 2004 **BORING NO.:** B-4A

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 1**

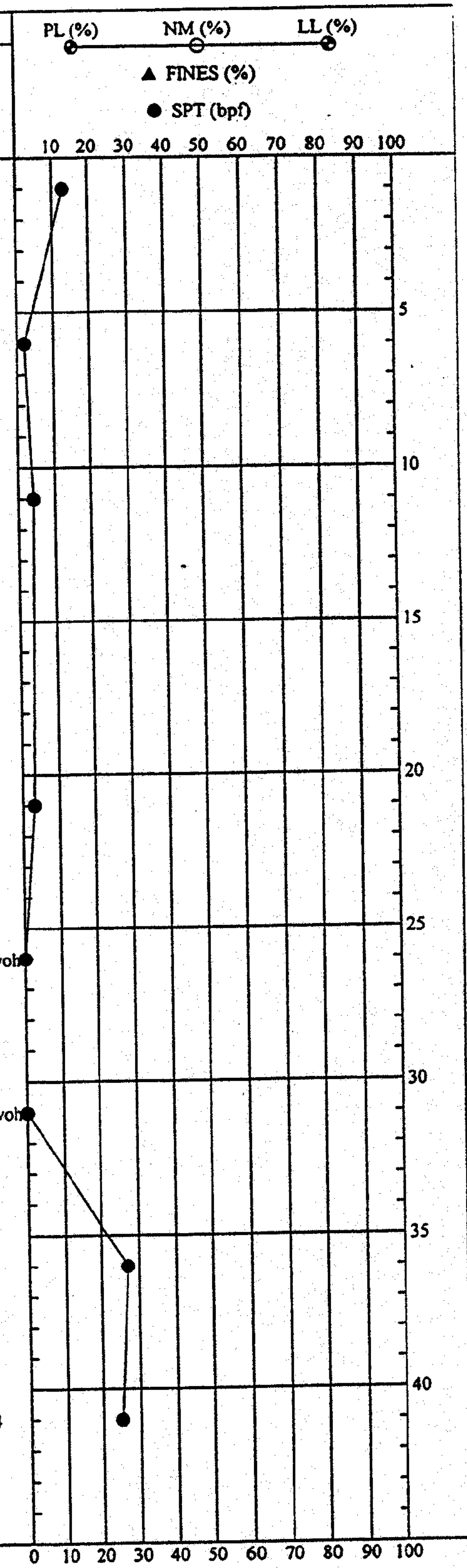
MACTEC

# SOIL TEST BORING RECORD

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | ELEV (ft) | SAMPLE IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| 0 | FIRM TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO WET, CLAYEY SILTY SAND - ASH | 810.2 | SPT-1 | 3-6-7 |
| 5 | | 805.2 | SPT-2 | 1-1-1 |
| 10 | | 800.2 | SPT-3 | 2-2-2 |
| 15 | | 795.2 | SPT-4 | 1-woh-1 |
| 20 | | 790.2 | SPT-5 | woh-2-1 |
| 25 | | 785.2 | SPT-6 | woh-woh-woh |
| 30 | | 780.2 | SPT-7 | woh-woh-woh |
| 35 | VERY STIFF, GRAY, SLIGHTLY MOIST, CLAYEY SILT - ASH | 775.2 | SPT-8 | 8-12-15 |
| | VERY FIRM, GRAY, SLIGHTLY MOIST, SILTY SAND - ASH | | | |
| 40 | NOTE: BORING TERMINATED DUE TO DIFFICULT DRILLING. | 770.2 | SPT-9 | 5-11-14 |
| | BORING TERMINATED AT 41.5' | | | |
| 45 | | 765.2 | | |




SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION.

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Driller: Akins
Prepared By: Justice
Checked By:

**PROJECT:** Kingston Fossil Plant - Ash Diposal Area

**DRILLED:** March 1, 2004 **BORING NO.:** B-5

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 1**

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" | 2nd 6" | 3rd 6" | PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | AUGER BORING FROM 0.0' TO 45.0' - ASH<br>NOTE: BORING B-5A WAS OFFSET ABOUT 3 FEET NORTH OF B-5. | | 810.2 | | | | | | |
| 5 | | | 805.2 | | | | | | 5 |
| 10 | | | 800.2 | | | | | | 10 |
| 15 | | | 795.2 | | | | | | 15 |
| 20 | | | 790.2 | | | | | | 20 |
| 25 | | | 785.2 | | | | | | 25 |
| 30 | | | 780.2 | | | | | | 30 |
| 35 | | | 775.2 | | | | | | 35 |
| 40 | | ∇ | 770.2 | | | | | | 40 |
| 45 | | | 765.2 | | | | | | 0 10 20 30 40 50 60 70 80 90 100 |

SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/7/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 2, 2004 **BORING NO.:** B-5A

**PROJ. NO.:** 3043041009/0001 **PAGE** 1 **OF** 3

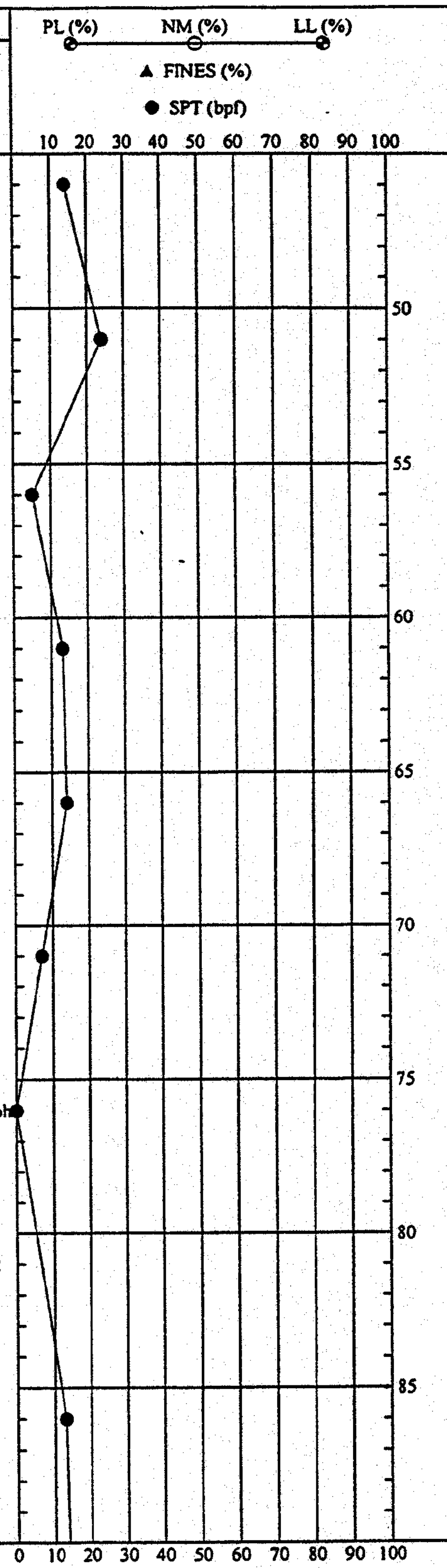
MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | ELEV (ft) |
|---|---|---|
| 45 | STIFF, GRAY, MOIST TO VERY MOIST, SANDY CLAYEY SILT - ASH | 765.2 |
| | VERY FIRM TO FIRM TO VERY LOOSE, GRAY, MOIST TO WET, CLAYEY SILTY SAND - ASH | |
| 50 | | 760.2 |
| 55 | | 755.2 |
| 60 | | 750.2 |
| 65 | | 745.2 |
| 70 | | 740.2 |
| 75 | | 735.2 |
| 80 | | 730.2 |
| | VERY SOFT TO STIFF, OLIVE GRAY, ORANGE BROWN, AND OLIVE BROWN, VERY MOIST TO SLIGHTLY MOIST, SANDY SILTY CLAY - ALLUVIUM | |
| 85 | | 725.2 |
| 90 | | 720.2 |

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

**SAMPLES**

| IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|
| SPT-1 | 3-4-10 |
| SPT-2 | 7-11-13 |
| SPT-3 | 1-1-4 |
| SPT-4 | 2-7-6 |
| SPT-5 | 1-6-8 |
| SPT-6 | 2-3-4 |
| SPT-7 | woh-woh-woh |
| SPT-8 | woh-woh-2 |
| SPT-9 | 1-6-7 |

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Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** Kingston Fossil Plant - Ash Diposal Area

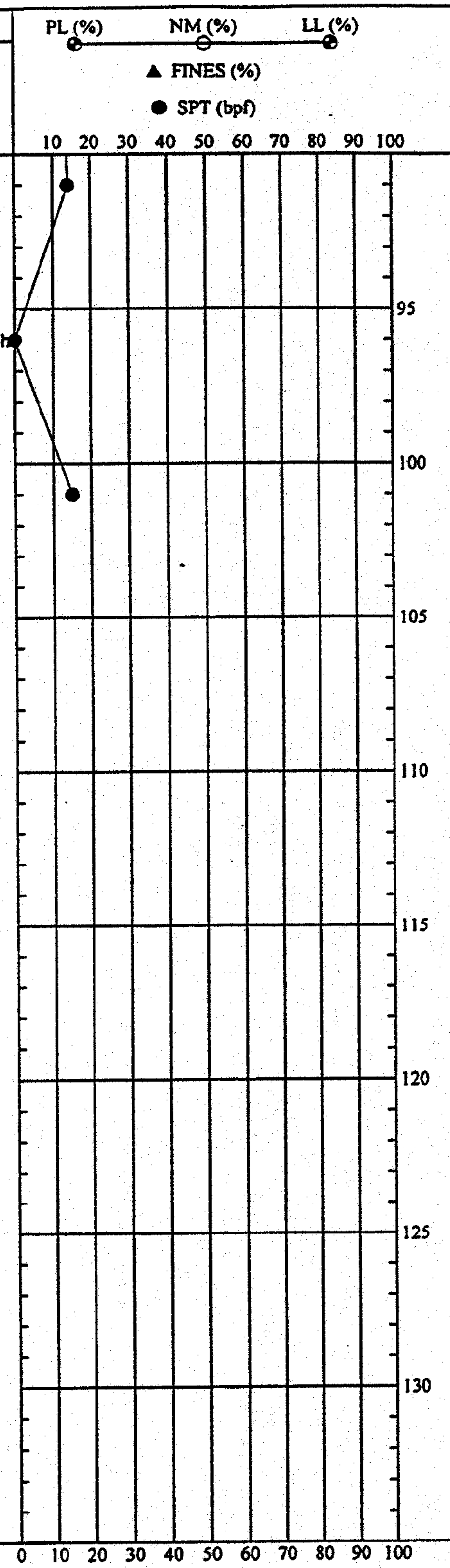
**DRILLED:** March 2, 2004 **BORING NO.:** B-5A

**PROJ. NO.:** 3043041009/0001 **PAGE 2 OF 3**

MACTEC

SOIL 3043041009_01.GPJ LAW GIBB.GDT 4/23/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | ELEV (ft) | SAMPLES IDENT | N-COUNT (1st 6" 2nd 6" 3rd 6") |
|---|---|---|---|---|
| 90 | VERY SOFT TO STIFF, OLIVE GRAY, ORANGE BROWN, AND OLIVE BROWN, VERY MOIST TO SLIGHTLY MOIST, SANDY SILTY CLAY - ALLUVIUM | 720.2 | SPT-10 | 5-7-7 |
| | VERY LOOSE TO FIRM, GRAY , WEY, SILTY CLAYEY SAND - ALLUVIUM | | | |
| 95 | | 715.2 | SPT-11 | woh-woh-woh |
| 100 | | 710.2 | SPT-12 | 3-7-8 |
| | BORING TERMINATED A 101.5' | | | |
| 105 | | 705.2 | | |
| 110 | | 700.2 | | |
| 115 | | 695.2 | | |
| 120 | | 690.2 | | |
| 125 | | 685.2 | | |
| 130 | | 680.2 | | |
| 135 | | 675.2 | | |




SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/7/04

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Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 2, 2004 **BORING NO.:** B-5A

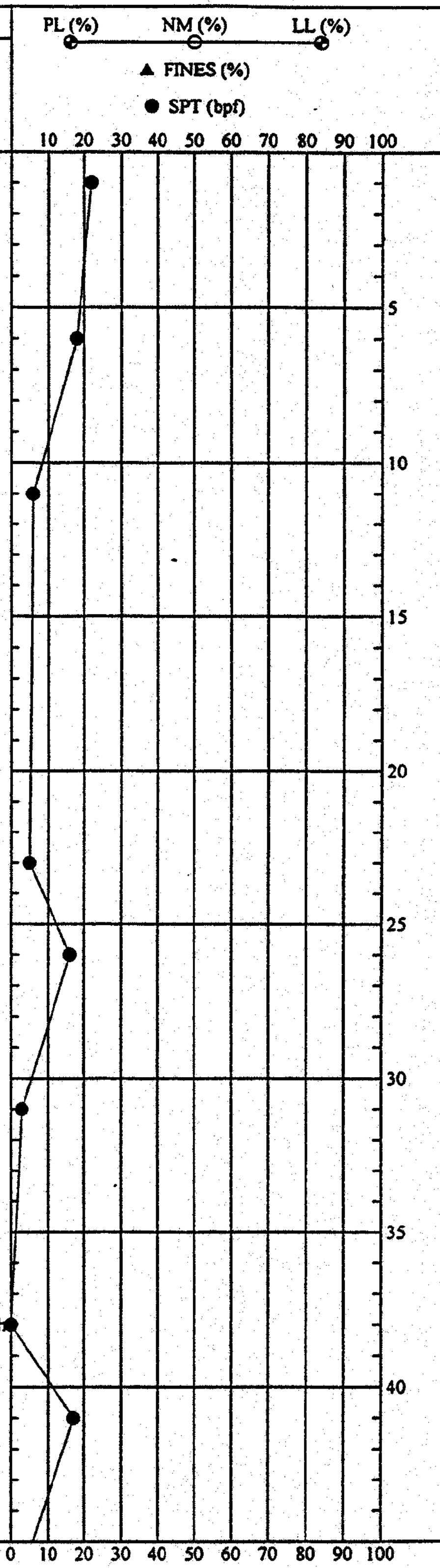
**PROJ. NO.:** 3043041009/0001 **PAGE 3 OF 3**

MACTEC

## SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | ELEV (ft) | IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| 0 | VERY STIFF TO VERY SOFT, GRAY, DRY TO WET, SANDY CLAYEY SILT - ASH | 809.5 | SPT-1 | 6-10-12 |
| 5 | | 804.5 | SPT-2 | 2-7-11 |
| 10 | | 799.5 | SPT-3 | 3-3-3 |
| 15 | | 794.5 | SPT-4 | woh-woh-1 |
| 20 | | 789.5 | UD-1 | 0-2.0 |
| | | | SPT-5 | 1-2-3 |
| 25 | | 784.5 | SPT-6 | 5-6-10 |
| 30 | VERY LOOSE, GRAY, SLIGHTLY MOIST, SILTY SAND - ASH | 779.5 | | |
| | VERY SOFT, GRAY, WET, SANDY SILTY CLAY - ASH | | SPT-7 | 2-1-2 |
| 35 | | 774.5 | UD-2 | 0-2.0 |
| | | | SPT-8 | woh-woh-woh |
| | VERY STIFF TO SOFT, GRAY, SLIGHTLY MOIST TO WET, SANDY / CLAYEY SILT - ASH | | | |
| 40 | ∇ | 769.5 | SPT-9 | 5-8-9 |
| 45 | | 764.5 | | |

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

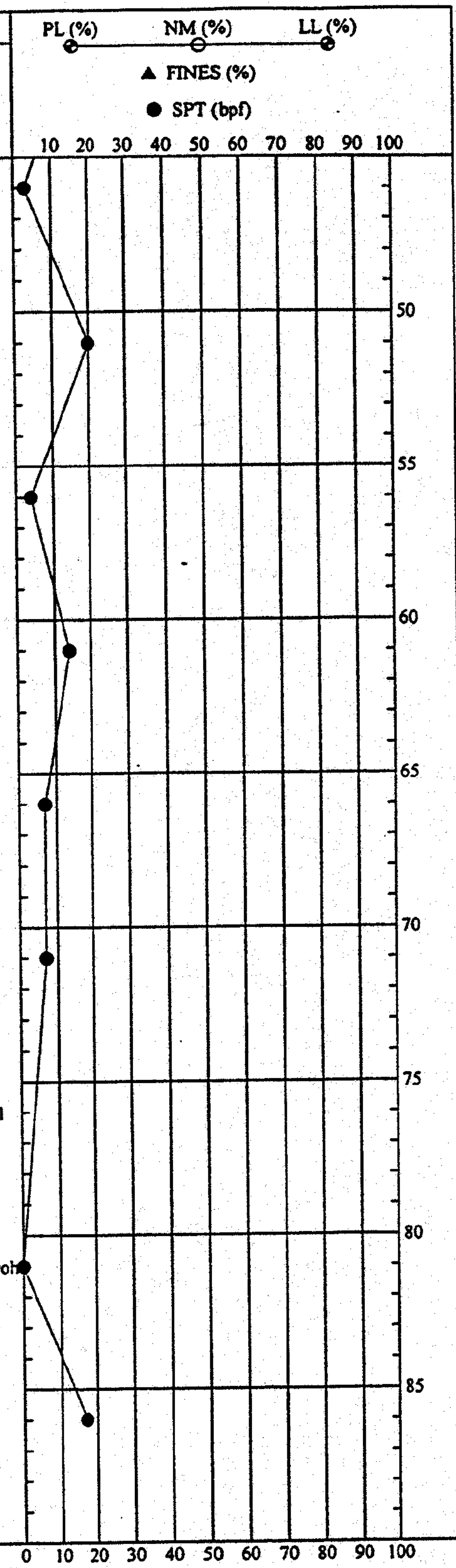
**DRILLED:** March 10, 2004 **BORING NO.:** B-6

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 2**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/6/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | ELEV (ft) | SAMPLES IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| 45 | VERY STIFF TO SOFT, GRAY, SLIGHTLY MOIST TO WET, SANDY / CLAYEY SILT - ASH | 764.5 | SPT-10 | 3-2-1 |
| 50 | | 759.5 | SPT-11 | 8-10-10 |
| 55 | | 754.5 | SPT-12 | 2-1-3 |
| 60 | | 749.5 | SPT-13 | 2-4-10 |
| | LOOSE, GRAY, WET, SILTY SAND - ASH | | | |
| 65 | NOTE: AT ABOUT 65.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS. | 744.5 | SPT-14 | 1-3-4 |
| | FIRM TO VERY SOFT, GRAY, WET, SANDY CLAYEY SILT - ASH | | | |
| 70 | | 739.5 | SPT-15 | 1-4-3 |
| 75 | | 734.5 | SPT-16 | woh-woh-1 |
| 80 | VERY SOFT TO VERY STIFF, OLIVE GRAY TO OLIVE BROWN, VERY MOIST TO SLIGHTLY MOIST, SILTY / SANDY CLAY WITH A FEW ROOTS - ALLUVIUM | 729.5 | SPT-17 | woh-woh-woh |
| 85 | NOTE: BORING TERMINATED DUE TO DIFFICULT DRILLING.<br>BORING TERMINATED AT 86.5' | 724.5 | SPT-18 | 1-8-9 |
| 90 | | 719.5 | | |




SOIL 3043041009 01.GPJ LAW GIBB.GDT 4/6/04

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Driller : Akins
Prepared By: Justice
Checked By:

## SOIL TEST BORING RECORD

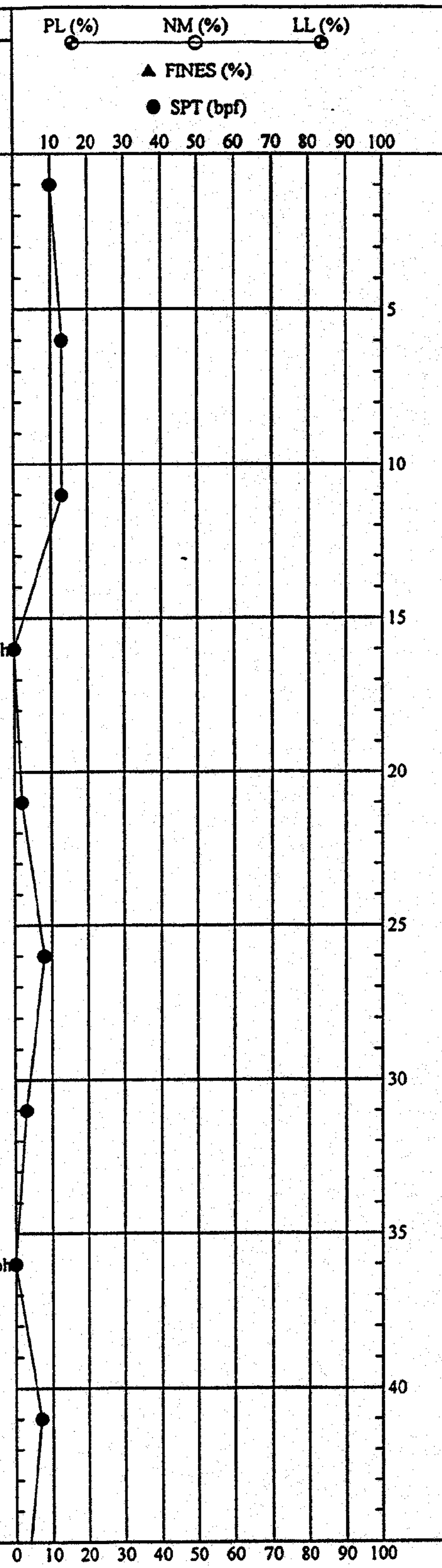
**PROJECT:** TVA Kingston Ash

**DRILLED:** March 10, 2004 **BORING NO.:** B-6

**PROJ. NO.:** 3043041009/0001 

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | ELEV (ft) | SAMPLES IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| 0 | STIFF, GRAY, SLIGHTLY MOIST, SANDY CLAYEY SILT - ASH | 767.0 | SPT-1 | 3-5-5 |
| 5 | FIRM, GRAY, SLIGHTY MOIST, SILTY SAND AND STIFF, RED-BROWN , SILTY CLAY - FILL | 762.0 | SPT-2 | 4-6-7 |
| | FIRM TO VERY LOOSE, GRAY, WET, CLAYEY / SILTY SAND - ASH | | | |
| 10 | | 757.0 | SPT-3 | 6-7-6 |
| 15 | | 752.0 | SPT-4 | woh-woh-woh |
| 20 | NOTE: AT ABOUT 20.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS. | 747.0 | SPT-5 | woh-1-1 |
| 25 | | 742.0 | SPT-6 | 1-4-4 |
| | SOFT, GRAY, WET, SANDY SILTY CLAY - ASH | | | |
| 30 | | 737.0 | SPT-7 | 1-2-1 |
| 35 | VERY SOFT TO FIRM, GRAY. OLIVE BROWN, AND LIGHT ORANGE BROWN, WET TO SLIGHTLY MOIST SANDY / SILTY CLAY WITH A TRACE OF COAL FRAGMENTS - ALLUVIUM | 732.0 | SPT-8 | woh-woh-woh |
| 40 | | 727.0 | SPT-9 | woh-4-3 |
| 45 | | 722.0 | | |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 11, 2004 **BORING NO.:** B-7

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 2**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT (1st 6" / 2nd 6" / 3rd 6") | PL (%) / NM (%) / LL (%) ▲ FINES (%) ● SPT (bpf) |
|---|---|---|---|---|---|---|---|
| 45 | | | 722.0 | SPT-10 | | woh-1-2 | ● |
| | BORING TERMINATED AT 46.5' | | | | | | |
| 50 | | | 717.0 | | | | |
| 55 | | | 712.0 | | | | |
| 60 | | | 707.0 | | | | |
| 65 | | | 702.0 | | | | |
| 70 | | | 697.0 | | | | |
| 75 | | | 692.0 | | | | |
| 80 | | | 687.0 | | | | |
| 85 | | | 682.0 | | | | |
| 90 | | | 677.0 | | | | |

Scale: 0 10 20 30 40 50 60 70 80 90 100

SOIL 3043041009 01.GPJ LAW_GIBB.GDT 4/7/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 11, 2004 **BORING NO.:** B-7

**PROJ. NO.:** 3043041009/0001 **PAGE** 2 **OF** 2

MACTEC

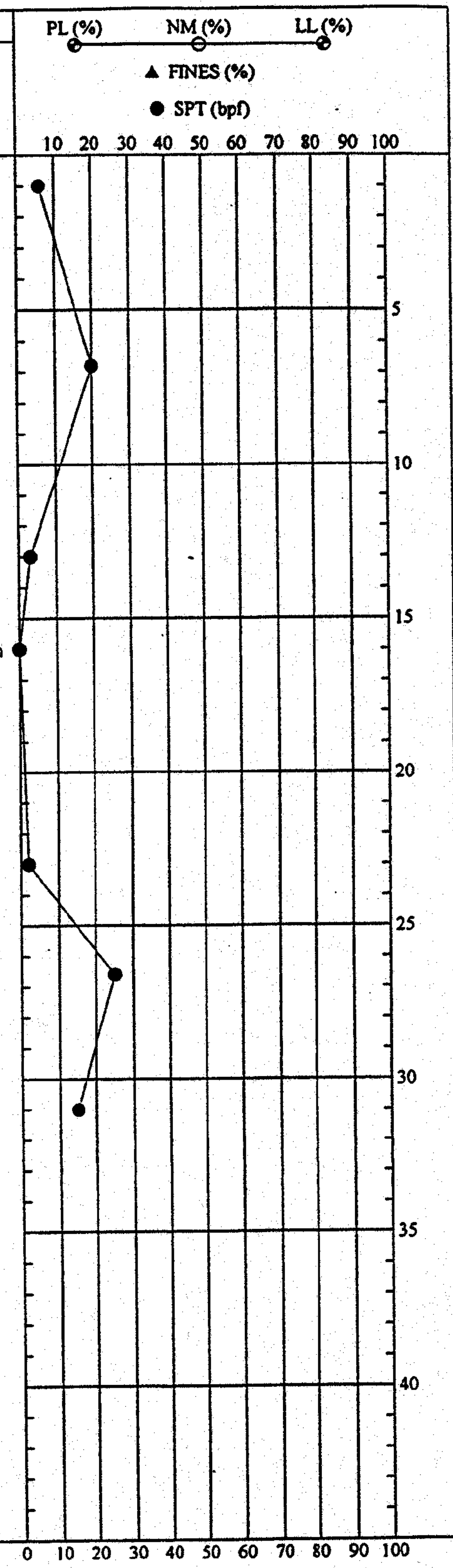
## SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS | ELEV (ft) |
|---|---|---|
| 0 | FIRM, GRAY, SLIGHTLY MOIST, SANDY CLAYEY SILT - ASH | 773.6 |
| | FIRM TO VERY LOOSE, GRAY, SLIGHTLY MOIST TO MOIST, SILTY / CLAYEY SAND - ASH | |
| 5 | | 768.6 |
| 10 | | 763.6 |
| | NOTE: RED-BROWN, SILTY CLAY WAS OBSERVED IN THE SAMPLE OBTAINED FROM 12.0' TO 13.5'. | |
| | VERY SOFT, GRAY WET SANDY CLAYEY SILT - ASH | |
| 15 | NOTE: AT ABOUT 15.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS. | 758.6 |
| | VERY LOOSE TO VERY FIRM, GRAY, WET TO MOIST, CLAYEY SILTY SAND - ASH | |
| 20 | | 753.6 |
| 25 | | 748.6 |
| | FIRM, GRAY, WET, GRAVELLY SAND - ASH | |
| 30 | | 743.6 |
| 35 | BORING TERMINATED AT 35.0' | 738.6 |
| 40 | | 733.6 |
| 45 | | 728.6 |

### SAMPLES

| IDENT | N-COUNT (1st 6" / 2nd 6" / 3rd 6") |
|---|---|
| SPT-1 | 2-3-3 |
| UD-1 | 0-0.8 |
| SPT-2 | 9-10-10 |
| UD-2 | 1.0-2.0 |
| SPT-3 | 2-2-1 |
| SPT-4 | 1-woh-woh |
| UD-3 | 1.7-2.0 |
| SPT-5 | 1-1-1 |
| UD-4 | 0-0.6 |
| SPT-6 | 2-11-14 |
| SPT-7 | 2-7-8 |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** Kingston Fossil Plant - Ash Diposal Area

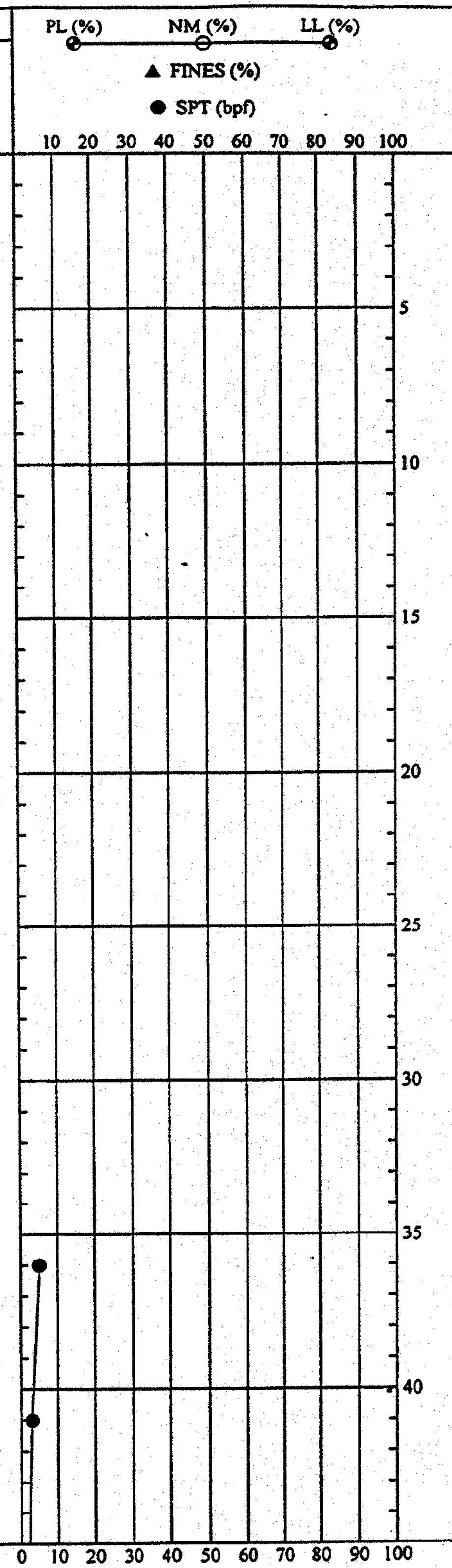
**DRILLED:** March 19, 2004 **BORING NO.:** B-8

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 1**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | LEGEND | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT 1st 6" 2nd 6" 3rd 6" |
|---|---|---|---|---|---|---|
| 0 | AUGER BORING FROM 0.0' TO 35.0' - ASH<br>NOTE: BORING B-8A WAS OFFSET ABOUT 3.0 FEET SOUTH EAST OF B-8. | | 773.6 | | | |
| 5 | | | 768.6 | | | |
| 10 | ▽ | | 763.6 | | | |
| 15 | | | 758.6 | | | |
| 20 | | | 753.6 | | | |
| 25 | | | 748.6 | | | |
| 30 | | | 743.6 | | | |
| 35 | NOTE: AT ABOUT 35.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS.<br>LOOSE TO VERY LOOSE, WET, CLAYEY SILTY SAND - ASH | | 738.6 | SPT-1 | | 2-2-3 |
| 40 | | | 733.6 | SPT-2 | | 1-2-1 |
| 45 | | | 728.6 | | | |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 22, 2004 **BORING NO.:** B-8A

**PROJ. NO.:** 3043041009/0001 **PAGE** 1 **OF** 2

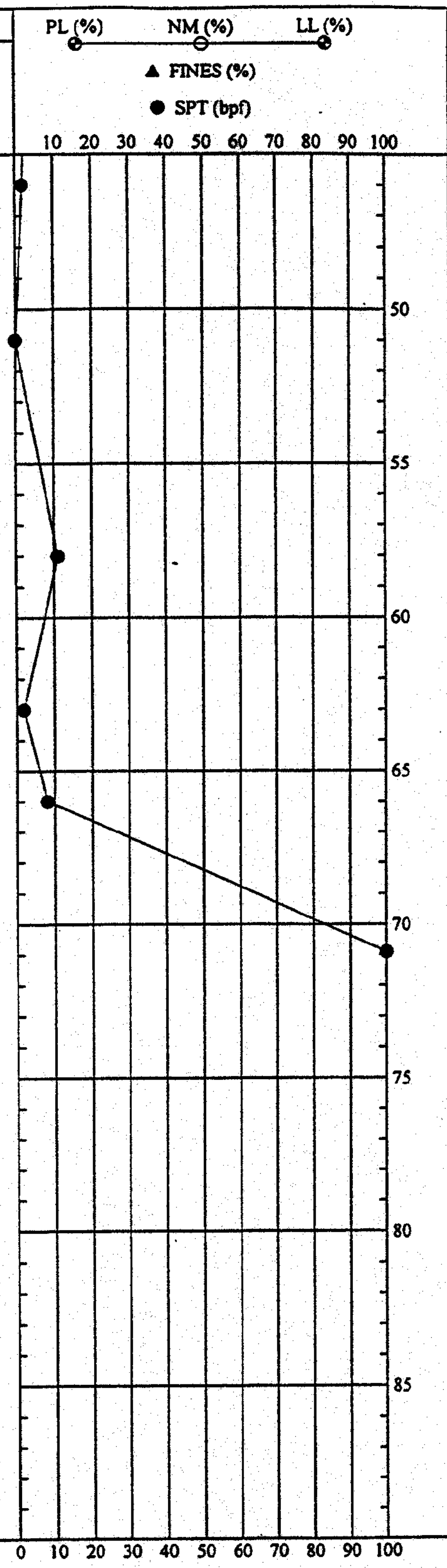
# MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/9/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | ELEV (ft) |
|---|---|---|
| 45 | LOOSE TO VERY LOOSE, WET, CLAYEY SILTY SAND - ASH | 728.6 |
| | VERY SOFT, GRAY, WET, CLAYEY SANDY SILT - ASH | |
| 50 | | 723.6 |
| | STIFF, GRAY TO OLIVE BROWN, SLIGHTLY MOIST TO MOIST, SILTY / SANDY CLAY WITH A FEW ROOTS - ALLUVIUM | |
| 55 | | 718.6 |
| 60 | | 713.6 |
| | VERY LOOSE, OLIVE BROWN, WET, CLAYEY SAND - ALLUVIUM | |
| | LOOSE TO FIRM, OLIVE BROWN, MOIST, SAND - ALLUVIUM | |
| 65 | | 708.6 |
| 70 | | 703.6 |
| | VERY HARD, GREENISH GRAY, SHALE - RESIDUUM<br>AUGER REFUSAL AT 70.7'. BORING TERMINATED AT 70.9' | |
| 75 | | 698.6 |
| 80 | | 693.6 |
| 85 | | 688.6 |
| 90 | | 683.6 |

SAMPLES

| IDENT | N-COUNT (1st 6" 2nd 6" 3rd 6") |
|---|---|
| SPT-3 | woh-1-1 |
| SPT-4 | woh-1-woh |
| UD-1 | 0-2.0 |
| SPT-5 | woh-5-6 |
| UD-2 | 2.0-2.0 |
| SPT-6 | 1-1-1 |
| SPT-7 | woh-3-5 |
| SPT-8 | 5-50/0.4 |




SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/13/04

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 22, 2004 **BORING NO.:** B-8A

**PROJ. NO.:** 3043041009/0001 **PAGE 2 OF 2**

MACTEC

# SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 12, 2004

**BORING NO.:** B-9

**PROJ. NO.:** 3043041009/0001

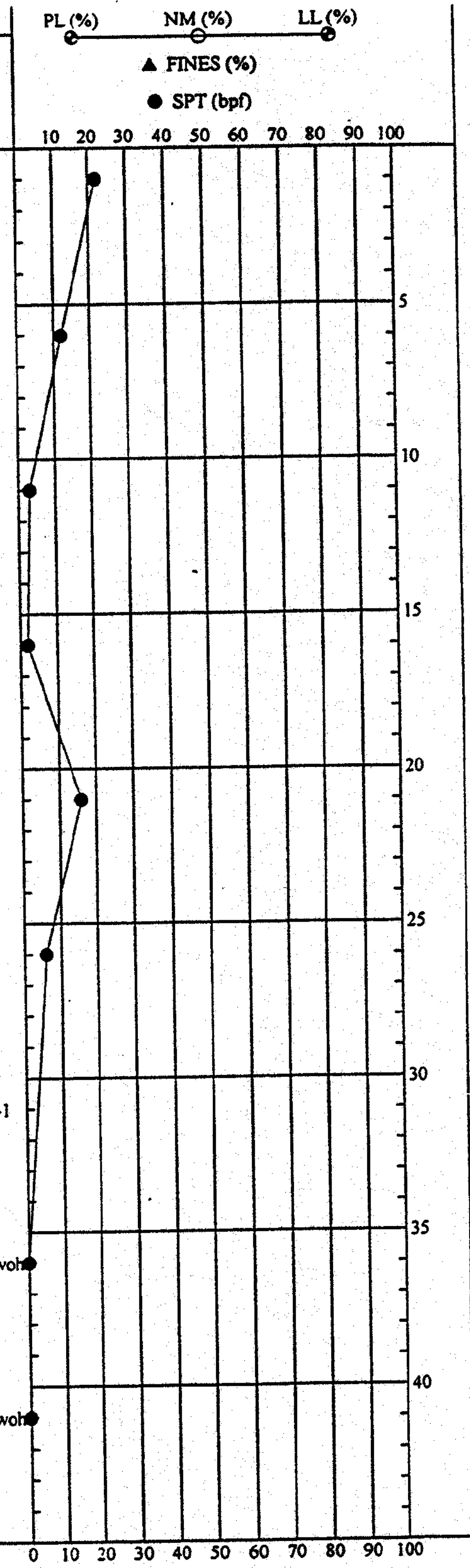
**PAGE 1 OF 2**

MACTEC

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS |
|---|---|
| 0 | FIRM GRAYISH-BROWN TO BROWN, DRY TO SLIGHTLY MOIST, SILTY SAND WITH COAL FRAGMENTS AND RED-BROWN SILTY CLAY - FILL |
| | FIRM, GRAY, SLIGHTLY MOIST TO MOIST, CLAYEY SILTY SAND - ASH |
| | VERY LOOSE, GRAY, WET, CLAYEY GRAVELLY SAND WITH COAL FRAGMENTS - ASH |
| 15 | NOTE: AT ABOUT 15.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS. |
| | VERY STIFF TO VERY SOFT, GRAY, WET, SANDY CLAYEY SILT - ASH |
| 35 | VERY SOFT TO SOFT, GRAY AND LIGHT ORANGE BROWN, WET TO SLIGHTLY MOIST, SILTY / SANDY CLAY WITH A TRACE OF ROOT HAIRS AND ROUNDED GRAVEL - ALLUVIUM |
| 45 | |

| DEPTH (ft) | ELEV (ft) | SAMPLE IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|
| 0 | 764.4 | SPT-1 | 6-10-12 |
| 5 | 759.4 | SPT-2 | 3-7-5 |
| 10 | 754.4 | SPT-3 | 1-2-1 |
| 15 | 749.4 | SPT-4 | 1-1-1 |
| 20 | 744.4 | SPT-5 | 4-7-9 |
| 25 | 739.4 | SPT-6 | 2-4-2 |
| 30 | 734.4 | SPT-7 | woh-woh-1 |
| 35 | 729.4 | SPT-8 | woh-woh-woh |
| 40 | 724.4 | SPT-9 | woh-woh-woh |
| 45 | 719.4 | | |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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Driller : Akins

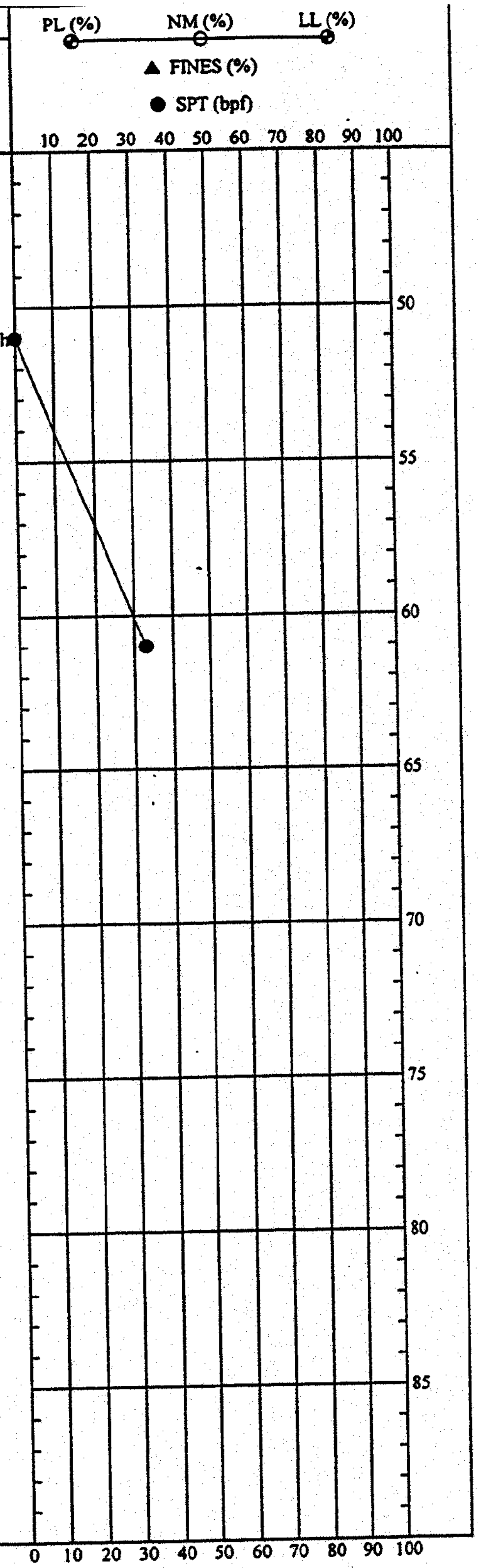
Prepared By:Justice

Checked By:

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

TVA-00015792

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.) | ELEV (ft) | SAMPLES IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| 45 | VERY SOFT TO SOFT, GRAY AND LIGHT ORANGE BROWN, WET TO SLIGHTLY MOIST, SILTY / SANDY CLAY WITH A TRACE OF ROOT HAIRS AND ROUNDED GRAVEL - ALLUVIUM | 719.4 | SPT-10 | woh-woh-4 |
| 50 | | 714.4 | SPT-11 | woh-woh-woh |
| 55 | | 709.4 | SPT-12 | woh-woh-1 |
| | DENSE, GRAY, VERY MOIST, CLAYEY SAND WITH SOME LEAVES - ALLUVIUM | | | |
| 60 | | 704.4 | SPT-13 | 2-12-21 |
| | HARD, GREENISH-GRAY, SHALE WITH SOME LIMESTONE FRAGMENTS - RESIDUUM | | | |
| | AUGER REFUSAL AT 61.9'. BORING TERMINATED AT 61.9'. | | | |
| 65 | | 699.4 | | |
| 70 | | 694.4 | | |
| 75 | | 689.4 | | |
| 80 | | 684.4 | | |
| 85 | | 679.4 | | |
| 90 | | 674.4 | | |




SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

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Driller : Akins
Prepared By: Justice
Checked By:

## SOIL TEST BORING RECORD

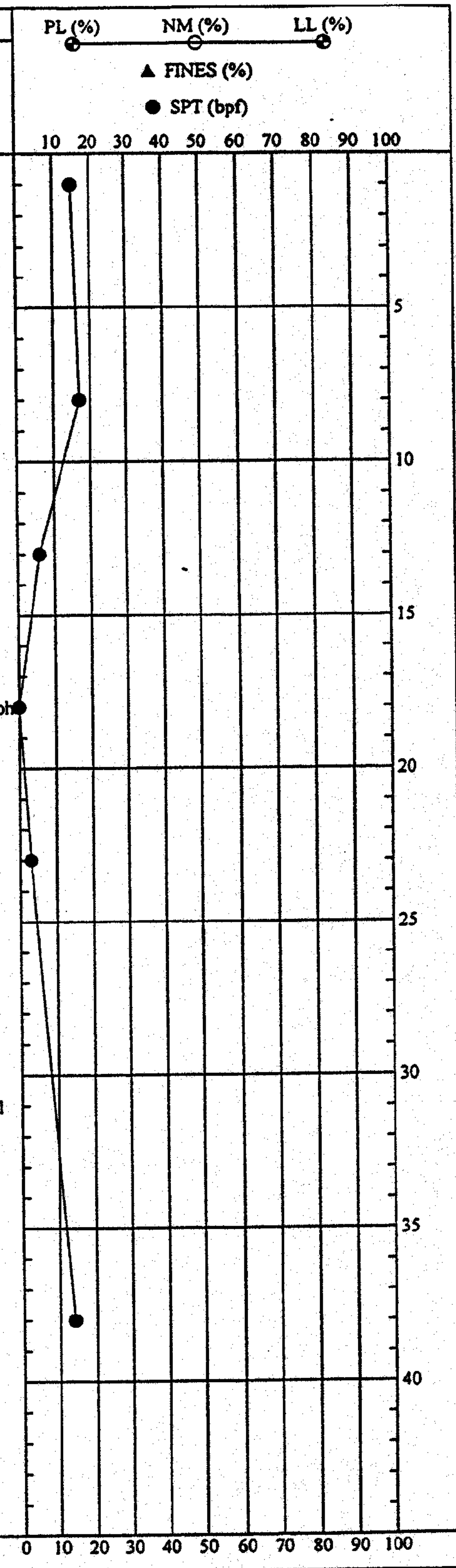
**PROJECT:** TVA Kingston Ash

**DRILLED:** March 12, 2004 **BORING NO.:** B-9

**PROJ. NO.:** 3043041009/0001 **PAGE 2 OF 2**

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | ELEV (ft) | SAMPLES IDENT | N-COUNT (1st 6" / 2nd 6" / 3rd 6") |
|---|---|---|---|---|
| 0 | FIRM, GRAY, SLIGHTLY MOIST, SILTY SAND WITH COAL FRAGMENTS - ASH | 762.6 | SPT-1 | 3-6-9 |
| | FIRM, GRAY, WET, SILTY SAND - ASH | | | |
| 5 | | 757.6 | UD-1 | 2.0-2.0 |
| | NOTE: AT ABOUT 7.0' STARTED INTRODUCING WATER INTO THE BOREHOLE TO REDUCE PIPING OF SUBSURFACE MATERIALS INTO AUGERS. | | SPT-2 | 5-7-10 |
| 10 | FIRM. GRAY, WET, SANDY CLAYEY SILT - ASH | 752.6 | UD-2 | 0.9-2.0 |
| | | | SPT-3 | 2-2-4 |
| 15 | VERY LOOSE, GRAY, WET, SAND - ASH | 747.6 | UD-3 | 0.4-2.0 |
| | | | SPT-4 | woh-woh-woh |
| 20 | VERY LOOSE, GRAY, WET, CLAYEY SILTY SAND - ASH | 742.6 | UD-4 | 1.7-2.0 |
| | | | SPT-5 | 1-1-2 |
| 25 | | 737.6 | SPT-6 | 1-woh-1 |
| | VERY LOOSE, GRAY, WET, CLAYEY SAND - ALLUVIUM | | | |
| 30 | | 732.6 | SPT-7 | woh-woh-1 |
| 35 | | 727.6 | UD-5 | 2.0-2.0 |
| | | | SPT-8 | 4-5-9 |
| | STIFF TO HARD, OLIVE BROWN TO BROWN, WEATHERED SHALE - RESIDUUM | | | |
| 40 | AUGER REFUSAL AT 39.2'. BORING TERMINATED AT 39.2' | 722.6 | | |
| 45 | | 717.6 | | |

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Driller : Akins
Prepared By:Justice
Checked By:

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 18, 2004 **BORING NO.:** B-10

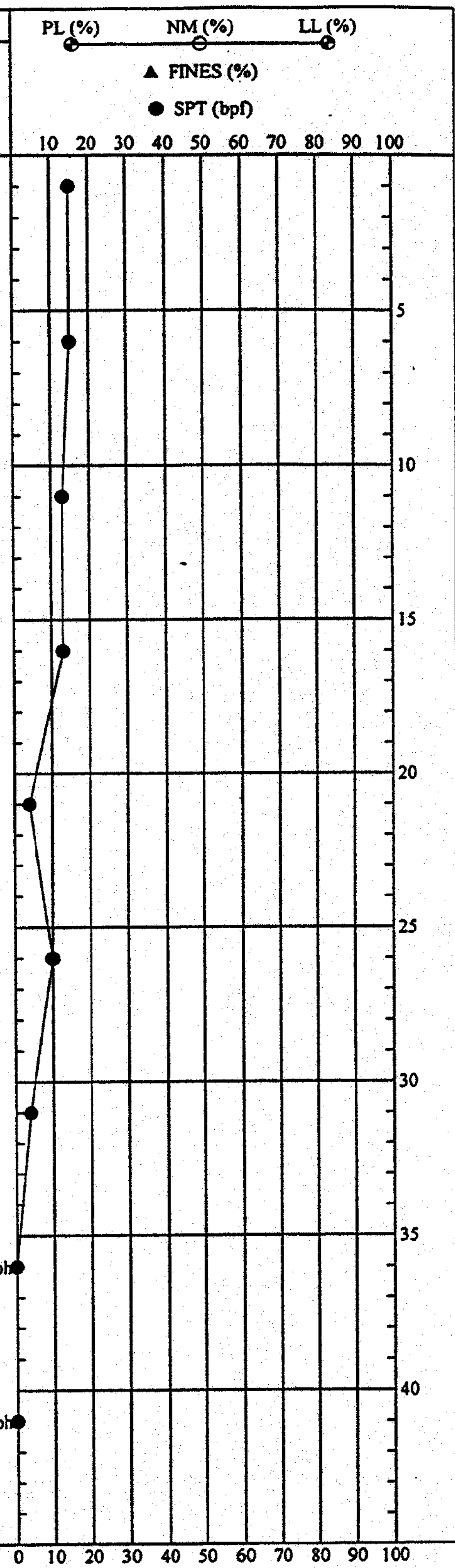
**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 1**

MACTEC

SOIL 3043041009 01.GPJ LAW_GIBB.GDT 4/7/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS<br>SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW. | ELEV (ft) |
|---|---|---|
| 0 | CRUSHED STONE BASE (0.3') | 765.0 |
| | STIFF, ORANGE-BROWN, DRY TO SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - FILL | |
| 5 | | 760.0 |
| 10 | | 755.0 |
| 15 | | 750.0 |
| 20 | VERY LOOSE, GRAY, MOIST TO WET, SILTY SAND WITH COAL FRAGMENTS - ASH | 745.0 |
| | STIFF, LIGHT GRAY, WET, SANDY SILTY CLAY - ASH | |
| 25 | LOOSE TO VERY LOOSE, ORANGE-BROWN TO GRAYISH-BROWN, WET, SILTY SAND - ALLUVIUM | 740.0 |
| 30 | | 735.0 |
| | VERY SOFT, OLIVE BROWN, WET, SILTY SANDY CLAY - ALLUVIUM | |
| 35 | | 730.0 |
| 40 | | 725.0 |
| 45 | | 720.0 |

| SAMPLES IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|
| SPT-1 | 8-7-8 |
| SPT-2 | 2-6-9 |
| SPT-3 | 2-5-8 |
| SPT-4 | 3-6-7 |
| SPT-5 | 2-2-2 |
| SPT-6 | 6-7-3 |
| SPT-7 | 2-2-2 |
| SPT-8 | woh-woh-woh |
| SPT-9 | woh-woh-woh |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

## SOIL TEST BORING RECORD

**PROJECT:** TVA Kingston Ash

**DRILLED:** March 15, 2004 **BORING NO.:** B-11

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 2**

MACTEC

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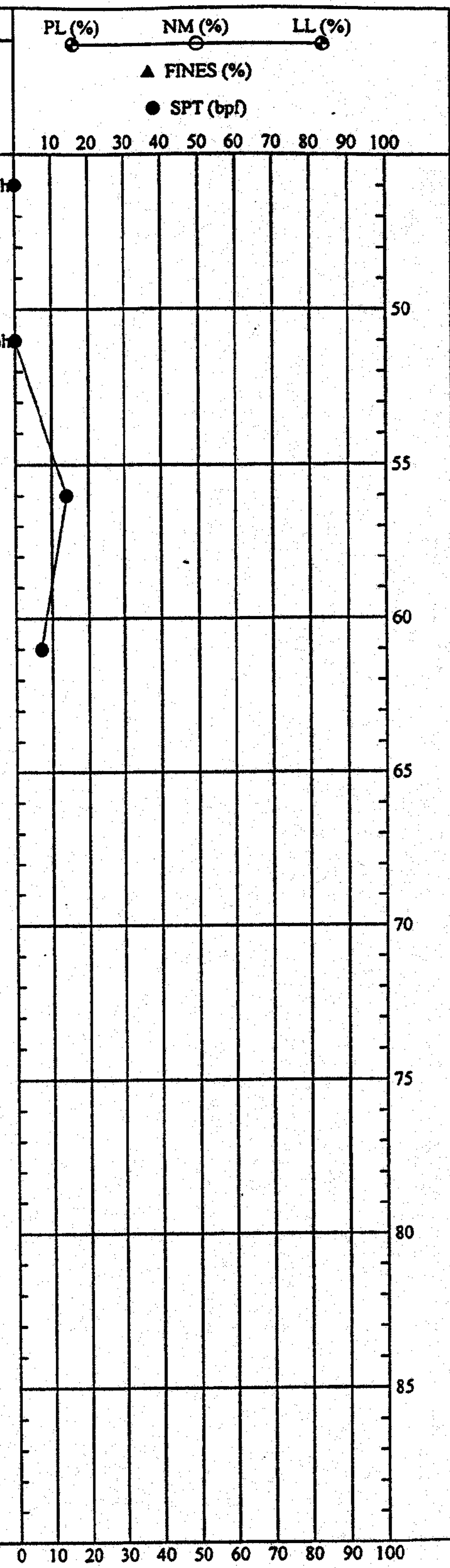
Driller : Akins
Prepared By: Justice
Checked By:

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

## SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

| Depth (ft) | Soil Classification and Remarks | Elev (ft) | Sample Ident | N-Count (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| | VERY SOFT, OLIVE BROWN, WET, SILTY SANDY CLAY - ALLUVIUM | 720.0 | SPT-10 | woh-woh-woh |
| | VERY LOOSE TO FIRM, GRAY, WET, CLAYEY SAND - ALLUVIUM | | | |
| 50 | | 715.0 | SPT-11 | woh-woh-woh |
| 55 | | 710.0 | SPT-12 | 2-3-11 |
| | LOOSE, GRAY, WET, SAND WITH A FEW ROOTS - ALLUVIUM | | | |
| 60 | | 705.0 | SPT-13 | 1-1-6 |
| | AUGER REFUSAL AT 62.5'. BORING TERMINATED AT 62.5' | | | |
| 65 | | 700.0 | | |
| 70 | | 695.0 | | |
| 75 | | 690.0 | | |
| 80 | | 685.0 | | |
| 85 | | 680.0 | | |
| 90 | | 675.0 | | |




SOIL 3043041009 01.GPJ LAW_GIBB.GDT 4/7/04

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Driller : Akins
Prepared By: Justice
Checked By:

**SOIL TEST BORING RECORD**

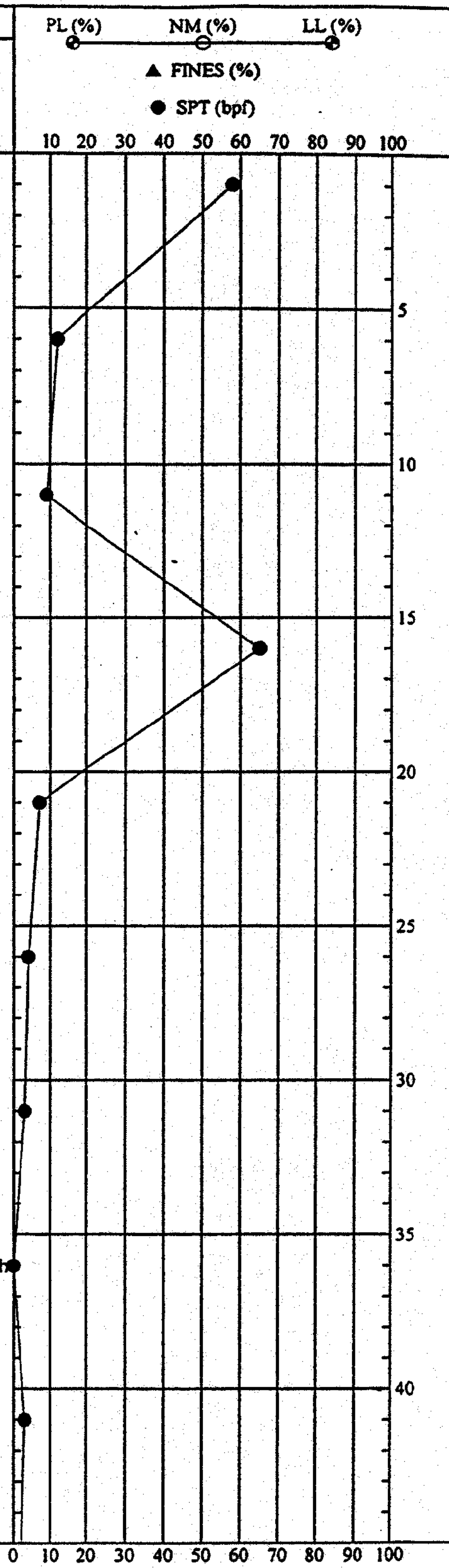
**PROJECT:** TVA Kingston Ash

**DRILLED:** March 15, 2004 **BORING NO.:** B-11

**PROJ. NO.:** 3043041009/0001 **PAGE 2 OF 2**

MACTEC

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.) | ELEV (ft) | SAMPLES IDENT | N-COUNT (1st 6" - 2nd 6" - 3rd 6") |
|---|---|---|---|---|
| 0 | VERY STIFF TO VERY HARD, RED-BROWN, DRY SILTY CLAY WITH CHERT FRAGMENTS - FILL | 763.9 | | |
| | VERY DENSE, GRAY, SLIGHTLY MOIST, SILTY SAND WITH COAL FRAGMENTS - ASH | | SPT-1 | 4-20-38 |
| | STIFF TO VERY HARD, RED-BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS, LIMESTONE FRAGMENTS, AND A FEW ROOTS - FILL | | | |
| 5 | | 758.9 | SPT-2 | 4-6-6 |
| 10 | | 753.9 | SPT-3 | 1-4-5 |
| 15 | NOTE: BLOW COUNTS WERE MORE THAN LIKELY INFLATED DUE TO THE PRESENCE OF LARGE ROCK FRAGMENTS IN SPT-1 AND SPT-4. | 748.9 | SPT-4 | 10-26-39 |
| | LOOSE TO VERY LOOSE, GRAY, WET, SILTY SAND WITH COAL FRAGMENTS - ASH ∇ | | | |
| 20 | | 743.9 | SPT-5 | 2-4-3 |
| 25 | | 738.9 | | |
| | VERY LOOSE, YELLOW-BROWN, WET, CLAYEY SILTY SAND - ALLUVIUM | | SPT-6 | 2-2-2 |
| | SOFT, YELLOW-BROWN, MOIST TO VERY MOIST, SANDY CLAY - ALLUVIUM | | | |
| 30 | | 733.9 | SPT-7 | woh-1-2 |
| | VERY LOOSE TO LOOSE, YELLOW-BROWN, WET, CLAYEY SAND - ALLUVIUM | | | |
| 35 | | 728.9 | SPT-8 | woh-woh-woh |
| 40 | | 723.9 | SPT-9 | 1-2-1 |
| 45 | | 718.9 | | |




REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** TVA Kingston Ash

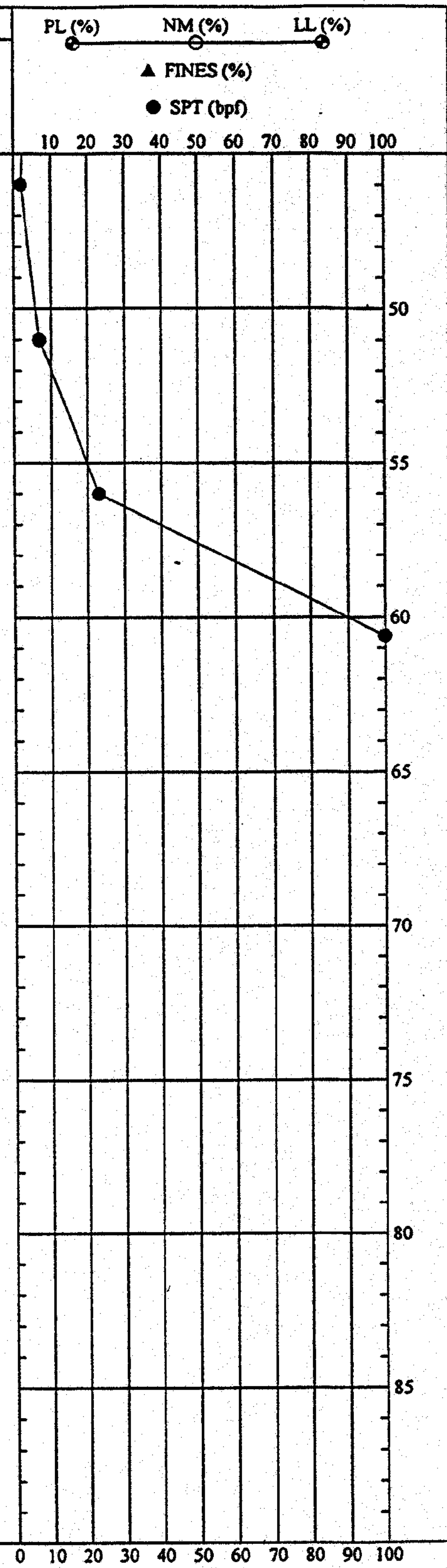
**DRILLED:** March 16, 2004 **BORING NO.:** B-12

**PROJ. NO.:** 3043041009/0001 **PAGE 1 OF 2**

MACTEC

SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/7/04

| DEPTH (ft) | SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.) | ELEV (ft) | SAMPLES IDENT | TYPE | N-COUNT (1st 6" / 2nd 6" / 3rd 6") |
|---|---|---|---|---|---|
| 45 | VERY LOOSE TO LOOSE, YELLOW-BROWN, WET, CLAYEY SAND - ALLUVIUM | 718.9 | SPT-10 | | 1-1-1 |
| 50 | | 713.9 | SPT-11 | | woh-3-4 |
| | VERY FIRM, LIGHT BROWN, WET, SAND - ALLUVIUM | | | | |
| 55 | | 708.9 | SPT-12 | | 4-10-13 |
| 60 | AUGER REFUSAL AT 59.7' | 703.9 | SPT-13 | | 20-50/0.4 |
| | VERY HARD, MAROON AND BLUISH GRAY WEATHERED SHALE - RESIDUUM | | | | |
| | BORING TERMINATED AT 60.6' | | | | |
| 65 | | 698.9 | | | |
| 70 | | 693.9 | | | |
| 75 | | 688.9 | | | |
| 80 | | 683.9 | | | |
| 85 | | 678.9 | | | |
| 90 | | 673.9 | | | |




SOIL 3043041009_01.GPJ LAW_GIBB.GDT 4/23/04

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By:Justice
Checked By:

**SOIL TEST BORING RECORD**

**PROJECT:** Kingston Fossil Plant - Ash Diposal Area

**DRILLED:** March 16, 2004 **BORING NO.:** B-12

**PROJ. NO.:** 3043041009/0001 **PAGE 2 OF 2**

MACTEC

**This information taken from "Kingston Fossil Plant – Dredge Cells/Closure Soil Investigation," Singleton Laboratories Report 015-672-142A, September 29, 1994.**

# SINGLETON LABORATORIES

## SOIL PROFILE LEGEND AND SYMBOLS

| Depth 1"=5' | El | SPT (N) | Log* | W | LL | PI | Gr | Description or Test Results |
|---|---|---|---|---|---|---|---|---|
| Boring Depth and Scale | Elevation | Blows Per Foot (SS Boring) | Lab Soil Type | Moisture Content | Liquid Limit | Plasticity Index | Soil Group Number | |

### Legend

- Cl, etc — Soil Type (Unified Classification)
- Mat'l — Notation of Soil Not Sampled (SS, PAH, HAH Logs)
- (Core) Type — Bedrock (Note core if cored)
- ▽ — Initial Water Table Reading
- ▼ — 24 h Water Table Reading
- Explanation of US Sampling Limits if Applicable

### Boring Symbols

SS - 2-in. od Split Spoon Boring

SPT - Standard Penetration Test Blows Per Foot With 2-in. Split Spoon

CPT - Cone Penetration Test

US - Undisturbed Sample Boring

PAH - Power Auger Hole

HAH - Hand Auger Hole

TP - Test Pit or Trench

V - Vane Shear

P - Piezometer

| Under Description or Test Results | | |
|---|---|---|
| **Test** | **Engineering Test Results** | |
| Q, R, $\bar{R}$, S | Friction Angle (degrees) | Cohesion (tsf) |
| UC | Unconfined Compressive Strength (tsf) | Sensitivity Ratio |
| C | Compression Index | Preconsolidation Pressure (tsf) |
| k | Coefficient of Permeability (cm/sec) | |

Example:

Q 12.0 0.62 R 19.6 0.21 S 34.0 0
UC 4.0 2.6 C 0.72 2.0 k 5.6

### Soil Test Symbols

Q - Unconsolidated-Undrained Triaxial Compression

R - Consolidated-Undrained Triaxial Compression (Saturated)

$\bar{R}$ - Effective Consolidated-Undrained Triaxial Compression

R nat - Consolidated-Undrained Triaxial Compression (Natural Moisture)

S - Consolidated-Drained Direct Shear

UC - Unconfined Compression

C - Consolidation

k - Permeability

FLA

# SINGLETON LABORATORIES

## FIELD LOG ABBREVIATIONS

| Typical Name | Abbreviation |
|---|---|
| Sandy gravel | sd gv |
| Silty gravel | si gv |
| Clayey gravel | cl gv |
| Sand | sd |
| Silty sand | si sd |
| Clayey sand | cl sd |
| Sandy silt | sd si |
| Clayey silt | cl si |
| Fat silt | ft si |
| Sandy clay | sd cl |
| Silty clay | si cl |
| Medium clay | md cl |
| Fat clay | ft cl |
| Cobble | cob |
| Blouder | bldr |
| Riprap | rr |
| Topsoil | ts |

### Name Modifiers

| | |
|---|---|
| Clean | cln |
| Coarse | crs |
| Dirty | dty |
| Fine | fn |
| Organic | org |
| Poorly graded | pgd |
| Well graded | wgd |
| Degraded | degd |

### Gravel Shape

| | |
|---|---|
| Angular | ang |
| Platy | plty |
| Round/Rounded | rd |
| Subangular | sb ang |
| Subrounded | sb rd |

| Lithology and Mineralogy | Abbreviation |
|---|---|
| Bedrock | br |
| Chert | cht |
| Dolomite | dol |
| Limestone | ls |
| Manganese | mn |
| Micaceous | mic |
| Pyrite | py |
| Quartz | qtz |
| Sandstone | ss |
| Shale | sh |
| Bentonite | bent |
| Hematite | hem |

### Color

| | |
|---|---|
| Black | blk |
| Blue | blu |
| Brown | brn |
| Cream | crm |
| Dark | dk |
| Gray | gy |
| Green | grn |
| Light | lt |
| Maroon | mrn |
| Mottled | mott |
| Olive | olv |
| Pink | pk |
| Purple | pur |
| Red | r |
| Rust | rst |
| Tan | tn |
| White | wht |
| Yellow | yel |

| Structure | Abbreviation | Consistency | Abbreviation |
|---|---|---|---|
| Blocky | blky | Dense | dns |
| Fissured | fis | Firm | f |
| Homogeneous | homo | Hard | hd |
| Laminated | lam | Loose | lse |
| Saprolitic | sapr | Soft | s |
| Shaly | shly | Stiff | stf |
| Slickensided | slsid | Very Stiff | v stf |
| Stratified | strat | | |
| **Origin** | | **Moisture** | |
| Alluvial | all | Dry | d |
| Colluvial | coll | Moist | mst |
| Loess | lss | V Moist | v mst |
| Residual | resd | Wet | w |

## General Modifiers

| | | | |
|---|---|---|---|
| Alternate/Alternating | alt | Layers | lyrs |
| Angle | ∡ | Low | l |
| Augering | augg | Material | mtl |
| Bottom Ash | ba | Medium | md |
| Coal | col | Mud | mud |
| Contaminated | cont | Original | orig |
| Dip | dp | Partings | prtgs |
| Disturbed | dstrb | Plastic | plstc |
| Debris | dbr | River | rvr |
| Discontinued | disc | Roots | rts |
| Drive | dr | Rough | rou |
| Dust | dst | Slow | sl |
| Elevation | el | Small | sm |
| Feet | ft | Spoil | sp |
| Fill | fl | Terraced | ter |
| Fiber | fbr | Thick | thk |
| Fly Ash | fa | Thin | thn |
| High/highly | h | Trace | tr |
| Horizontal | hor | Variable | var |
| Hydraulic | hyd | Vegetation | veg |
| Inch | in | Vertical | vert |
| Inclusion | inc | Weathered | wth |
| Incomplete Recovery | IR | With | w/ |
| Interface | infa | Wood | wd |

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP
FEATURE: DREDGE CELLS
BORING: SS-1 STATION:
RANGE:
SURFACE EL: 752.0
DATE DRILLED: 7/28/94
PREPARED BY: mhd
CHECKED BY: TA

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 750 | | | | | | | |
| 5 | | | CL | 12.4 | 31 | 12 | 5 | TN & GY SI CL, D |
| | 745 | | | | | | | |
| 10 | | | CL | 19.2 | 26 | 8 | 9 | LT BRN SI CL W/TR GY TS, MST |
| | 740 | | | | | | | |
| 15 | | | CL | 17.0 | 26 | 8 | 6 | BRN SI CL, D |
| | 735 | | | | | | | |
| 20 | | | CL | 27.1 | 26 | 8 | 9 | BRN & GY SI CL, V MST |
| | 730 | | | | | | | |
| 25 | | | CL | 24.1 | 26 | 8 | 9 | BRN & GY SI CL, V MST |
| | 725 | | | | | | | |
| 30 | | | SM | 19.5 | NP | NP | 10 | GY SI SC TR GV, MST (FA) |
| | 720 | | | | | | | |
| 35 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-1 STATION: RANGE: SURFACE EL: 752.0
DATE DRILLED: 7/28/94 PREPARED BY: mhd CHECKED BY: TA

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | | SM | 27.6 | NP | NP | 10 | GY SI SD, V MST (FA) |
| | 715 | | | | | | | |
| | | | | | | | | REFUSAL<br>GROUND WATER LEVEL = 8'9" |
| 40 | | | | | | | | |
| | 710 | | | | | | | |
| 45 | | | | | | | | |
| | 705 | | | | | | | |
| 50 | | | | | | | | |
| | 700 | | | | | | | |
| 55 | | | | | | | | |
| | 695 | | | | | | | |
| 60 | | | | | | | | |
| | 690 | | | | | | | |
| 65 | | | | | | | | |
| | 685 | | | | | | | |
| 70 | | | | | | | | |

1''=5'

*LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON

SHEET 1 OF 2

PROJECT: KINGSTON FP — FEATURE: DREDGE CELLS
BORING: SS-2 — STATION: — RANGE: — SURFACE EL: 764.0
DATE DRILLED: 7/27/94 — PREPARED BY: mhd — CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 760 | | | | | | | |
| 5 | | 14 | MH-CH | 21.9 | 59 | 28 | 2 | BRN SI CL w/GV, TR TS, D |
| | 755 | | | | | | | |
| 10 | | 10 | MH-CH | 22.8 | 59 | 28 | 2 | R-BRN SI CL, TR GV, D |
| | 750 | | | | | | | |
| 15 | | 8 | MH-CH | 28.0 | 59 | 28 | 2 | R-BRN SI CL, TR GV, MST |
| | 745 | | | | | | | |
| 20 | | 13 | SM | 25.6 | NP | NP | 10 | GY SI SD w/TR GV (FA), V MST |
| | 740 | | | | | | | |
| 25 | | - | SM | 19.0 | NP | NP | 10 | GY SI SD w/GV (FA), W |
| | 735 | | | | | | | |
| 30 | | - | SM | 28.1 | NP | NP | 3 | BRN SD WI CL (FA), W |
| | 730 | | | | | | | |
| 35 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-2 STATION: RANGE: SURFACE EL: 764.0
DATE DRILLED: 7/27/94 PREPARED BY: mhd CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | - | CL | 33.6 | 26 | 8 | 9 | BRN SI CL W/GY SI (FA), V MST |
| | 725 | | | | | | | |
| 40 | | 3 | CL | 20.1 | 26 | 8 | 9 | ORNG & GY SI CL, V MST |
| | 720 | | | | | | | |
| 45 | | 28 | ML | 14.0 | NP | NP | 8 | GY SD mix W/PKTS GY CL, MST |
| | 715 | | | | | | | |
| 50 | | 50+ | ML | 15.8 | NP | NP | 8 | GY SD mix W/PKTS GY CL, MST |
| | | | | | | | | REFUSAL<br>GROUND WATER LEVEL = 5'8" |
| | 710 | | | | | | | |
| 55 | | | | | | | | |
| | 705 | | | | | | | |
| 60 | | | | | | | | |
| | 700 | | | | | | | |
| 65 | | | | | | | | |
| | 695 | | | | | | | |
| 70 | | | | | | | | |
| 1''=5' | | * LAB CLASSIF. | | | | | | |

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS

BORING: SS-3 STATION: RANGE: SURFACE EL: 773.0

DATE DRILLED: 7/28/94 PREPARED BY: mhd CHECKED BY: TA

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 770 | | | | | | | |
| 5 | | 25 | ML | 23.3 | NP | NP | 12 | GY CL SI (FA), MST |
| | 765 | | | | | | | |
| 10 | | 5 | SM | 23.0 | NP | NP | 10 | GY SD CL, TR GV (FA), V MST |
| | 760 | | | | | | | |
| 15 | | 4 | SM | 28.6 | NP | NP | 10 | GY SD CL, TR GV (FA), V MST |
| | 755 | | | | | | | |
| 20 | | 1 | SM | 28.6 | NP | NP | 10 | GY SD SI CL, TR GV (FA), W |
| | 750 | | | | | | | |
| 25 | | 2 | SM | 27.1 | NP | NP | 10 | GY SD SI CL, TR GV (FA), W |
| | 745 | | | | | | | |
| 30 | | 1 | SM | 27.0 | NP | NP | 10 | GY SD SI CL, TR GV (FA), W |
| | 740 | | | | | | | |
| 35 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-3 STATION: RANGE: SURFACE EL: 773.0
DATE DRILLED: 7/28/94 PREPARED BY: mhd CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | 2 | ML | 28.8 | NP | NP | 12 | GY SD SI CL, TR GV (FA), W |
| | 735 | | | | | | | |
| 40 | | 2 | SM | 22.0 | NP | NP | 10 | GY SD SI CL, TR GV (FA), W |
| | 730 | | | | | | | |
| 45 | | - | ML | 33.9 | NP | NP | 12 | GY CL SI, TR GV (FA), W |
| | 725 | | | | | | | |
| 50 | | - | ML | 15.7 | NP | NP | 8 | GY CL SI W/GV (FA), V MST |
| | 720 | | | | | | | |
| 55 | | 50+ | ML | 5.8 | NP | NP | 12 | GY CL SI, TR GV |
| | 715 | | | | | | | REFUSAL<br>GROUND WATER LEVEL = 9'8" |
| 60 | | | | | | | | |
| | 710 | | | | | | | |
| 65 | | | | | | | | |
| | 705 | | | | | | | |
| 70 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-4 STATION: RANGE: SURFACE EL: 752.0
DATE DRILLED: 7/26/94 PREPARED BY: mhd CHECKED BY: TA

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 750 | | | | | | | |
| 5 | | 10 | CL | 14.2 | 26 | 8 | 6 | LT BRN SI CL w/TS, D |
| | 745 | | | | | | | |
| 10 | | 3 | CL-ML | 23.8 | 26 | 4 | 1 | BRN & GY SI CL w/TS, MST |
| | 740 | | | | | | | |
| 15 | | 8 | CL | 22.3 | 31 | 12 | 5 | TN & GY SI CL (FA), V MST |
| | 735 | | | | | | | |
| 20 | | 4 | SM | 20.9 | NP | NP | 3 | TN SI SD, MST |
| | 730 | | | | | | | |
| 25 | | - | SM | 34.8 | NP | NP | 3 | TN SI SD, MST |
| | 725 | | | | | | | |
| 30 | | 7 | SM | 21.4 | NP | NP | 3 | TN SI SD, MST |
| | 720 | | | | | | | |
| 35 | | | | | | | | |
| 1''=5' | | * LAB CLASSIF. | | | | | | |

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-4 STATION: RANGE: SURFACE EL: 752.0
DATE DRILLED: 7/26/94 PREPARED BY: mhd CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 715 | 36 | SM | 20.4 | NP | NP | 3 | TN SI SD, MST |
| 40 | | | | | | | | REFUSAL<br>GROUND WATER LEVEL = 9'0" |
| | 710 | | | | | | | |
| 45 | | | | | | | | |
| | 705 | | | | | | | |
| 50 | | | | | | | | |
| | 700 | | | | | | | |
| 55 | | | | | | | | |
| | 695 | | | | | | | |
| 60 | | | | | | | | |
| | 690 | | | | | | | |
| 65 | | | | | | | | |
| | 685 | | | | | | | |
| 70 | | | | | | | | |
| 1''=5' | | * LAB CLASSIF. | | | | | | |

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-5 STATION: RANGE: SURFACE EL: 764.0
DATE DRILLED: 7/27/94 PREPARED BY: mhd CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 760 | | | | | | | |
| 5 | | 18 | MH-CH | 19.6 | 59 | 28 | 2 | R-BRN SI CL w/TR CTH, D |
| | 755 | | | | | | | |
| 10 | | 14 | MH-CH | 24.2 | 59 | 28 | 2 | BRN SI CL W/GV, D |
| | 750 | | | | | | | |
| 15 | | 54 | CL-ML | 23.5 | 26 | 4 | 1 | BRN SI CL W/PKTS GY CL SI, TR CHT, MST |
| | 745 | | | | | | | |
| 20 | | 20 | SM | 24.3 | NP | NP | 10 | GY SI SD, TR GV (FA), MST |
| | 740 | | | | | | | |
| 25 | | 3 | CL | 20.9 | 26 | 8 | 6 | LT BRN SD SI CL, TR GV, V MST |
| | 735 | | | | | | | |
| 30 | | 14 | CL | 23.6 | 31 | 12 | 5 | TN & GY SI CL, V MST |
| | 730 | | | | | | | |
| 35 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-5 STATION: RANGE: SURFACE EL: 764.0
DATE DRILLED: 7/27/94 PREPARED BY: mhd CHECKED BY: TA

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | 16 | ML | 21.5 | NP | NP | 7 | BRN SI CL w/GY FA, V MST |
| 40 | 725 | 2 | SM | 24.2 | NP | NP | 3 | ORNG CL SD, V MST |
| 45 | 720 | 2 | CL | 21.9 | 26 | 8 | 9 | TN CL SI w/PKTS GY FA, V MST |
| 50 | 715 | 30 | SC/SM | 10.8 | NP | NP | 4 | LT BRN SI SD w/GV, V MST |
| 55 | 710 | 50+ | ML | 13.9 | NP | NP | 12 | BRN & GY CL SI, FA, MST |
| 60 | 705 | | | | | | | REFUSAL<br>GROUND WATER LEVEL = 20' |
| 65 | 700 | | | | | | | |
| 70 | 695 | | | | | | | |

1''=5'

*LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP — FEATURE: DREDGE CELLS
BORING: SS-6 — STATION: — RANGE: — SURFACE EL: 773.0
DATE DRILLED: 8/1/94 — PREPARED BY: mhd — CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 770 | | | | | | | |
| 5 | | 24 | ML | 25.2 | NP | NP | 12 | GY SI (FA), MST |
| | 765 | | | | | | | |
| 10 | | 5 | SM | 19.7 | NP | NP | 10 | GY SI (FA), MST |
| | 760 | | | | | | | |
| 15 | | 2 | SM | 28.8 | NP | NP | 11 | GY SI SD (FA), MST |
| | 755 | | | | | | | |
| 20 | | - | ML | 25.8 | NP | NP | 12 | GY SI (FA), MST |
| | 750 | | | | | | | |
| 25 | | 3 | ML | 23.3 | NP | NP | 8 | BRN SI CL W/GY FA, TR GV, V MST |
| | 745 | | | | | | | |
| 30 | | 1 | ML | 32.7 | NP | NP | 12 | GY SI (FA), W |
| | 740 | | | | | | | |
| 35 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP　　FEATURE: DREDGE CELLS
BORING: SS-6　　STATION:　　RANGE:　　SURFACE EL: 773.0
DATE DRILLED: 8/1/94　　PREPARED BY: mhd　　CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | 9 | CL | 19.6 | 26 | 8 | 9 | BRN CL SI mix w/FA |
| | 735 | | | | | | | |
| 40 | | 12 | SM | 19.4 | NP | NP | 3 | BRN SI SD, V MST |
| | 730 | | | | | | | |
| 45 | | 1 | SM | 29.3 | NP | NP | 3 | BRN SI SD, V MST |
| | 725 | | | | | | | |
| 50 | | 3 | SM | 21.8 | NP | NP | 3 | BRN SD CL, V MST |
| | 720 | | | | | | | |
| 55 | | 6 | ML | 22.3 | NP | NP | 8 | GY SI SD w/FA, MST |
| | 715 | | | | | | | |
| 60 | | 50+ | ML | 9.9 | NP | NP | 12 | GY SI, FA, MST |
| | 710 | | | | | | | REFUSAL<br>GROUND WATER LEVEL = 16' 7" |
| 65 | | | | | | | | |
| | 705 | | | | | | | |
| 70 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-8 STATION: RANGE: SURFACE EL: 782.0
DATE DRILLED: 8/2/94 PREPARED BY: mhd CHECKED BY: TA

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 780 | | | | | | | |
| 5 | | 50+ | SM | 17.6 | NP | NP | 10 | GY SI (FA), TR GV, D |
| | 775 | | | | | | | |
| 10 | | 50+ | SM | 18.4 | NP | NP | 10 | GY SI (FA), TR GV, D |
| | 770 | | | | | | | |
| 15 | | 50+ | SM | 21.9 | NP | NP | 10 | GY SI (FA), TR GV, D |
| | 765 | | | | | | | |
| 20 | | 8 | SM | 43.9 | NP | NP | 11 | GY SI SD (FA), MST |
| | 760 | | | | | | | |
| 25 | | 15 | SM | 17.9 | NP | NP | 10 | GY SI SD W/GV (FA), MST |
| | 755 | | | | | | | |
| 30 | | - | ML | 31.7 | NP | NP | 12 | GY SI (FA), W |
| | 750 | | | | | | | |
| 35 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON

SHEET 2 OF 3

PROJECT: KINGSTON FP    FEATURE: DREDGE CELLS
BORING: SS-8    STATION:    RANGE:    SURFACE EL: 782.0
DATE DRILLED: 8/2/94    PREPARED BY: mhd    CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | - | ML | 24.4 | NP | NP | 12 | GY SI (FA), MST |
| | 745 | | | | | | | |
| 40 | | 3 | ML | 23.8 | NP | NP | 12 | GY SI (FA), MST |
| | 740 | | | | | | | |
| 45 | | 9 | ML | 31.2 | NP | NP | 12 | GY SI (FA), MST |
| | 735 | | | | | | | |
| 50 | | 4 | ML | 22.3 | NP | NP | 8 | GY CL SI W/LUMPS TN SI CL, MST |
| | 730 | | | | | | | |
| 55 | | 13 | ML | 18.2 | NP | NP | 7 | MOTT BRN/TN/GY SI CL, MST |
| | 725 | | | | | | | |
| 60 | | 13 | ML | 18.6 | NP | NP | 7 | MOTT BRN/TN/GY SI CL, MST |
| | 720 | | | | | | | |
| 65 | | 4 | SC/SM | 27.7 | NP | NP | 4 | TN SI SD, W |
| | 715 | | | | | | | |
| 70 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS
BORING: SS-8 STATION: RANGE: SURFACE EL: 782.0
DATE DRILLED: 8/2/94 PREPARED BY: mhd CHECKED BY: 7A

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | 5 | SM | 24.9 | NP | NP | 10 | GY SD SI (FA), W |
| | 710 | | | | | | | |
| 75 | | 7 | SC/SM | 22.7 | NP | NP | 4 | TN SI SD, V MST |
| | 705 | | | | | | | |
| | | | | | | | | REFUSAL<br>GROUND WATER LEVEL = 11' 3" |
| 80 | | | | | | | | |
| | 700 | | | | | | | |
| 85 | | | | | | | | |
| | 695 | | | | | | | |
| 90 | | | | | | | | |
| | 690 | | | | | | | |
| 95 | | | | | | | | |
| | 685 | | | | | | | |
| 100 | | | | | | | | |
| | 680 | | | | | | | |
| 105 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP — FEATURE: DREDGE CELLS

BORING: SS-9 — STATION: — RANGE: — SURFACE EL: 795.0

DATE DRILLED: 8/2/94 — PREPARED BY: mhd — CHECKED BY: TA

| DEPTH ft. | EL 795 | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| 5 | 790 | 20 | ML | 17.8 | NP | NP | 12 | GY SI (FA), MST |
| 10 | 785 | 50+ | ML | 19.5 | NP | NP | 12 | GY SI (FA), MST |
| 15 | 780 | 44 | ML | 20.1 | NP | NP | 12 | GY SI (FA), MST |
| 20 | 775 | 46 | ML | 18.3 | NP | NP | 12 | GY SI (FA), MST |
| 25 | 770 | 6 | ML | 30.2 | NP | NP | 12 | GY SI (FA), MST |
| 30 | 765 | 5 | ML | 35.2 | NP | NP | 12 | GY SI (FA), W |
| 35 | 760 | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP  FEATURE: DREDGE CELLS
BORING: SS-9  STATION:  RANGE:  SURFACE EL: 795.0
DATE DRILLED: 8/2/94  PREPARED BY: mhd  CHECKED BY: TA

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 760 | 2 | ML | 17.3 | NP | NP | 12 | GY SI (FA), W |
| 40 | 755 | 1 | ML | 31.0 | NP | NP | 12 | GY SI (FA), W |
| 45 | 750 | - | ML | 23.0 | NP | NP | 12 | GY SI (FA), D |
| 50 | 745 | - | ML | 31.7 | NP | NP | 12 | GY SI (FA), TR GV, W |
| 55 | 740 | 5 | ML | 30.0 | NP | NP | 12 | GY SI (FA), TR GV, W |
| 60 | 735 | 6 | ML | 32.6 | NP | NP | 12 | GY SI (FA), TR GV, W |
| 65 | 730 | - | ML | 26.9 | NP | NP | 8 | BRN SI CL W/GY SI (FA), MST |
| 70 | 725 | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

## SOIL PROFILE: SPLIT-SPOON

SHEET 3 OF 3

PROJECT: KINGSTON FP — FEATURE: DREDGE CELLS
BORING: SS-9 — STATION: — RANGE: — SURFACE EL: 795.0
DATE DRILLED: 8/2/94 — PREPARED BY: mhd — CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 725 | 13 | CL | 19.2 | 26 | 8 | 9 | BRN, TN & GY SI CL, TR CL, MST |
| 75 | 720 | 19 | CL | 19.5 | 26 | 8 | 6 | ORNG-BRN SI CL, MST |
| 80 | 715 | 4 | SM | 20.5 | NP | NP | 10 | GY SD SI, W |
| 85 | 710 | 19 | SC/SM | 23.1 | NP | NP | 4 | TN SI SD |
| 90 | 705 | 8 | SC/SM | 23.1 | NP | NP | 4 | GY SI SD |
| 95 | 700 | | | | | | | REFUSAL<br>GROUND WATER LEVEL = 29' |
| 100 | 695 | | | | | | | |
| 105 | 690 | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP  FEATURE: DREDGE CELLS
BORING: SS-10  STATION:  RANGE:  SURFACE EL: 797.5
DATE DRILLED: 8/8/94  PREPARED BY: mhd  CHECKED BY: TA

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 795 | | | | | | | |
| 5 | | 50+ | ML | 17.3 | NP | NP | 12 | GY SI (FA), MST |
| | 790 | | | | | | | |
| 10 | | 26 | ML | 24.7 | NP | NP | 12 | GY SI (FA), MST |
| | 785 | | | | | | | |
| 15 | | 25 | ML | 15.0 | NP | NP | 12 | GY SD SI, TR GV, MST |
| | 780 | | | | | | | |
| 20 | | 5 | ML | 22.1 | NP | NP | 12 | GY SI (FA), MST |
| | 775 | | | | | | | |
| 25 | | 4 | ML | 27.4 | NP | NP | 12 | GY SI (FA), MST |
| | 770 | | | | | | | |
| 30 | | 14 | ML | 29.1 | NP | NP | 12 | GY SI (FA), MST |
| | 765 | | | | | | | |
| 35 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON

SHEET 2 OF 3

PROJECT: KINGSTON FP | FEATURE: DREDGE CELLS
BORING: SS-10 STATION: | RANGE: | SURFACE EL: 797.5
DATE DRILLED: 8/8/94 | PREPARED BY: mhd | CHECKED BY: 7A

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | 18 | SM | 31.2 | NP | NP | 11 | GY SD SI (FA) W/GV, W |
| | 760 | | | | | | | |
| 40 | | 9 | ML | 31.4 | NP | NP | 12 | GY SI (FA), V MST |
| | 755 | | | | | | | |
| 45 | | - | ML | 27.0 | NP | NP | 12 | GY SD SI W/GV (FA), V MST |
| | 750 | | | | | | | |
| 50 | | - | ML | 27.2 | NP | NP | 12 | GY SD SI W/GV (FA), V MST |
| | 745 | | | | | | | |
| 55 | | 6 | SM | 30.7 | NP | NP | 11 | GY PGD SI SD (FA), V MST |
| | 740 | | | | | | | |
| 60 | | 9 | SM | 16.4 | NP | NP | 11 | GY PGD SI SD (FA), V MST |
| | 735 | | | | | | | |
| 65 | | 25 | SM | 19.4 | NP | NP | 11 | CRS PGD SI SD W/GV (FA) |
| | 730 | | | | | | | |
| 70 | | | | | | | | |

1''=5'

* LAB CLASSIF.

# SINGLETON LABORATORIES

SOIL PROFILE: SPLIT-SPOON



PROJECT: KINGSTON FP FEATURE: DREDGE CELLS

BORING: SS-10 STATION: RANGE: SURFACE EL: 797.5'

DATE DRILLED: 8/8/94 PREPARED BY: mhd CHECKED BY: TAL

| DEPTH ft. | EL | SPT (N) | * LOG | W | LL | PI | GR | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 725 | 39 | ML | 19.0 | NP | NP | 8 | BRN SI CL W/PKTS GY SI (FA), V MST |
| 75 | 720 | 17 | CL | 19.2 | 26 | 8 | 9 | BRN & GY SI CL, V MST |
| 80 | 715 | 18 | CL | 16.9 | 26 | 8 | 6 | ORNG-BRN SD SI CL, MST |
| 85 | 710 | 16 | ML | 18.9 | NP | NP | 8 | GY SI SD, MST |
| 90 | 705 | 50+ | ML | 3.7 | NP | NP | 8 | GY SI SD W/GV |
| 95 | 700 | | | | | | | REFUSAL<br>GROUND WATER LEVEL = |
| 100 | 695 | | | | | | | |
| 105 | | | | | | | | |

1''=5'

* LAB CLASSIF.

**This information taken from "Report of Soil Borings, Monitoring Well Installation and Soil Laboratory Testing – Tennessee Valley Authority – Watts Bar and Kingston Facilities," Law Engineering, November 30, 1988.**

## FIELD EXPLORATORY PROCEDURES

### SOIL TEST BORING (HOLLOW STEM)

All boring and sampling operations were conducted in general accordance with ASTM Designation D 1586-67. The borings were advanced by mechanically twisting continuous steel hollow-stem auger flights into the ground. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot of penetration was recorded and is designated the "standard penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength, density and ability to support foundations.

Representative portions of the soil samples, obtained from the split-tube sampler, were sealed in glass jars and transported to our laboratory. In the laboratory, the samples were examined by our engineer to verify the driller's field classifications. Test Boring Records are attached, graphically showing the soil descriptions and penetration resistances.

# Law Engineering

BORING NUMBER J-9A
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 1 OF 2

## Boring Record

| DEPTH (FT.) | DESCRIPTION | | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|---|
| 0.0 | GRAY FLY ASH WHICH CONTAINS COAL FRAGMENTS AND CINDERS. MOISTURE CONTENT INCREASED IN SAMPLES TO A DEPTH OF 13 FEET AT WHICH TIME THE SAMPLES BECAME SATURATED. | | | |
| | | | 13.0 | |
| 40.0 | | | | |

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

BORING NUMBER J - 9A
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 2 OF 2

## Boring Record

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 40.0 | GRAY FLY ASH WHICH CONTAINS COAL FRAGMENTS AND CINDERS. MOISTURE CONTENT INCREASED IN SAMPLES TO A DEPTH OF 13 FEET AT WHICH TIME THE SAMPLES BECAME SATURATED. | | |
| 67.7 | REFUSAL | | |

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

## Boring Record

BORING NUMBER J-9B
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 1 OF 3

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT (5, 10, 20, 30, 40, 50, 60, 80, 100 "N") |
|---|---|---|---|
| 0.0 | DRY GRAY ASH | | |
| 35.0 | ALLUVIAL CLAY, SAND AND GRAVEL WITH WEATHERED SHALE FRAGMENTS | | |
| 40.0 | | | |

REMARKS: BORING DRILLED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

## Boring Record

BORING NUMBER J-9B
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 2 OF 3

| DEPTH (FT.) | DESCRIPTION | ELEV. | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 40.0 | ALLUVIAL CLAY, SAND AND GRAVEL WITH WEATHERED SHALE FRAGMENTS | | |
| 67.5 | BLUE GRAY SHALE WITH CALCITE JOINTS | | |
| 80.0 | | | |

REMARKS:

**Law Engineering**

## Boring Record

BORING NUMBER J-9B
DATE DRILLED 10-3-88
JOB NUMBER K-88195
PAGE 3 OF 3

| DEPTH (FT.) | DESCRIPTION | ELEV. | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 80.0 | BLUE GRAY SHALE WITH CALCITE JOINTS | | |
| 82.4 | BORING TERMINATED | | |

REMARKS:

# Law Engineering

## Boring Record

BORING NUMBER J-10
DATE DRILLED 9-27-88
JOB NUMBER K-88195
PAGE 1 OF 1

| DEPTH (FT.) | DESCRIPTION | | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|---|
| 0.0 | WASH BORING TO A PREDETERMINED DEPTH | | 12.0 | |
| 15.0 | BORING TERMINATED | | | |

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

## Boring Record

BORING NUMBER J-10A
DATE DRILLED 9-27-88
JOB NUMBER K-88195
PAGE 1 OF 1

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 0.0 | WASH BORING TO A PREDETERMINED DEPTH | | |
| 29.9 | BORING TERMINATED | | |

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

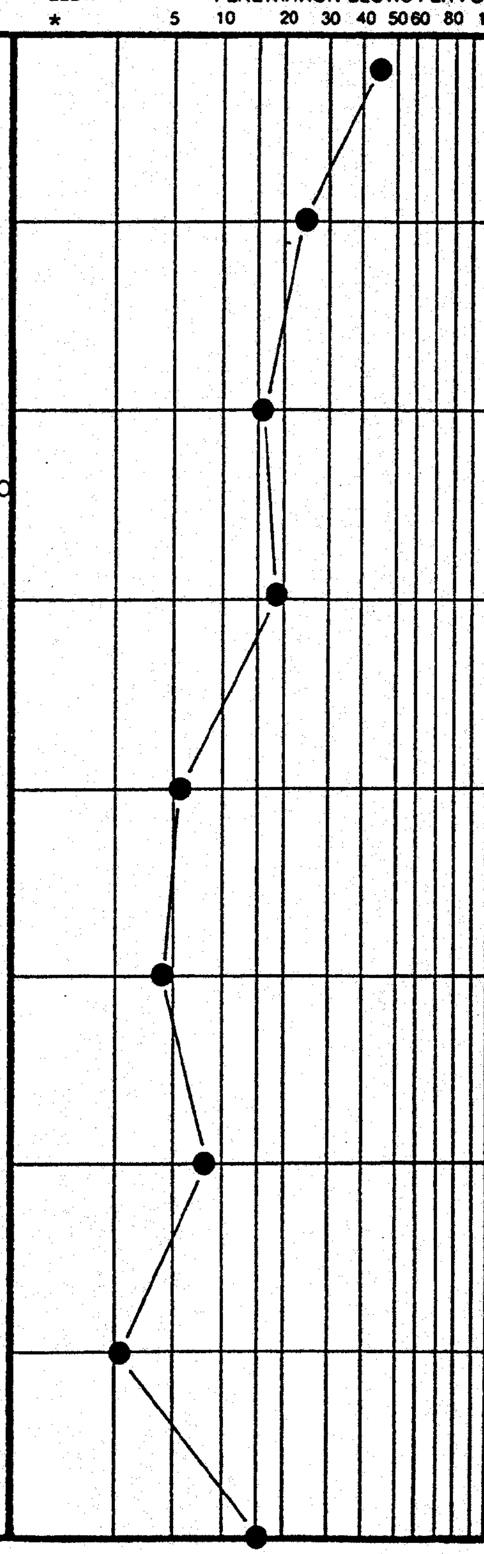
# Law Engineering

## Soil Test Boring Record

BORING NUMBER J-10B
DATE DRILLED 9-27-88
JOB NUMBER K-88195


| DEPTH (FT.) | DESCRIPTION | ELEV. * |
|---|---|---|
| 0.0 | HARD TO VERY STIFF DARK GRAY, BROWN AND BLACK SILTY CLAY - FILL | |
| 12.5 | VERY STIFF WEATHERED GRAY SHALE WITH ASH - FILL | 13.0 |
| 17.5 | FIRM TO SOFT LIGHT BROWN AND GRAY WEATHERED SHALE (WET) - FILL | |
| 27.5 | LIGHT GRAY AND BROWN SILTY CLAY RANGING FROM STIFF TO VERY SOFT - FILL | |
| 40.0 | | |

PENETRATION-BLOWS PER FOOT




| "N" |
|---|
| 43 |
| 25 |
| 16 |
| 19 |
| 6 |
| 4 |
| 8 |
| 0 |
| 15 |

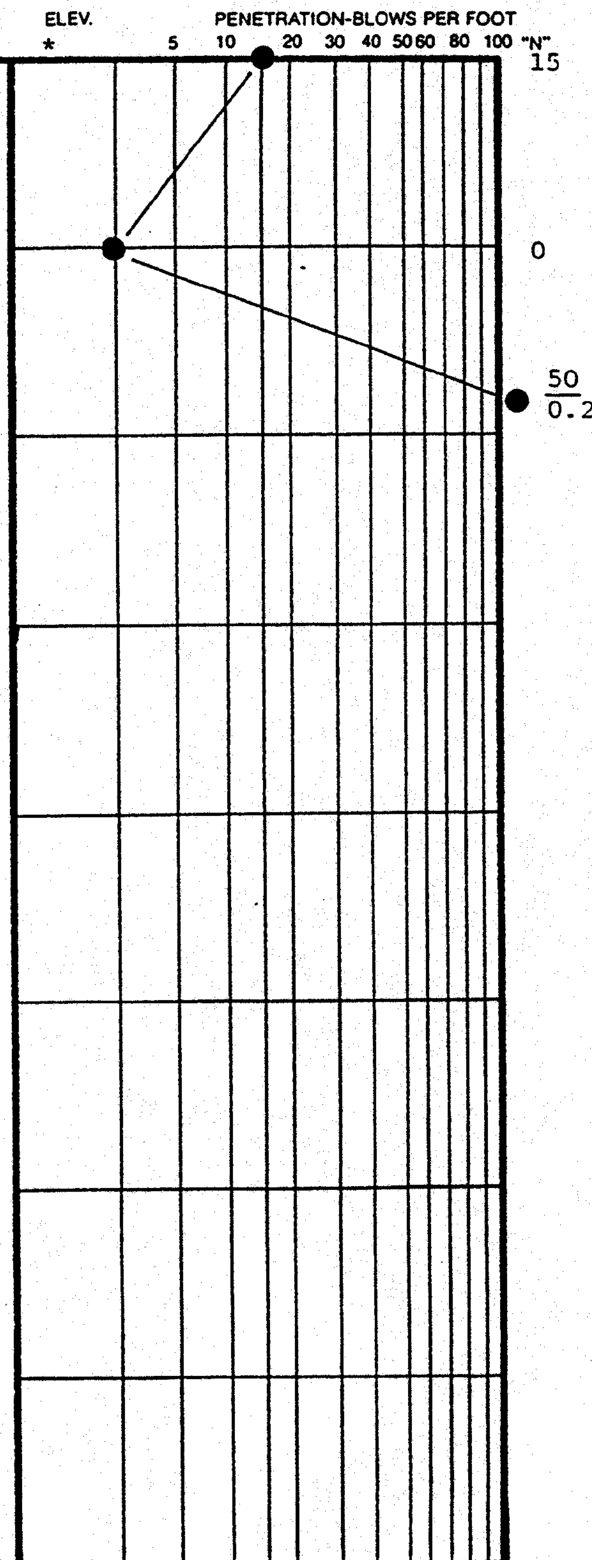
REMARKS: * ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

## Soil Test Boring Record

BORING NUMBER J-10 B
DATE DRILLED 9-27-88
JOB NUMBER K-88195
PAGE 2 OF 2

| DEPTH (FT.) | DESCRIPTION | ELEV. * |
|---|---|---|
| 40.0 | LIGHT GRAY AND BROWN SILTY CLAY RANGING FROM STIFF TO VERY SOFT - FILL | |
| 49.4 | REFUSAL | |




REMARKS: * ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

## Boring Record

BORING NUMBER J-11B
DATE DRILLED 9-19-88
JOB NUMBER K-88195
PAGE 1 OF 1

| DEPTH (FT.) | DESCRIPTION | ELEV. | PENETRATION-BLOWS PER FOOT (5, 10, 20, 30, 40, 50, 60, 80, 100 "N") |
|---|---|---|---|
| 0.0 | RED SILTY CLAY-POSSIBLE FILL | | |
| 1.0 | TANNISH-BROWN SHALEY SILTY CLAY - RESIDUUM | | |
| 5.0 | DARK BROWN AND GRAYISH GREEN SHALE | | |
| 31.5 | BORING TERMINATED | | |

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT

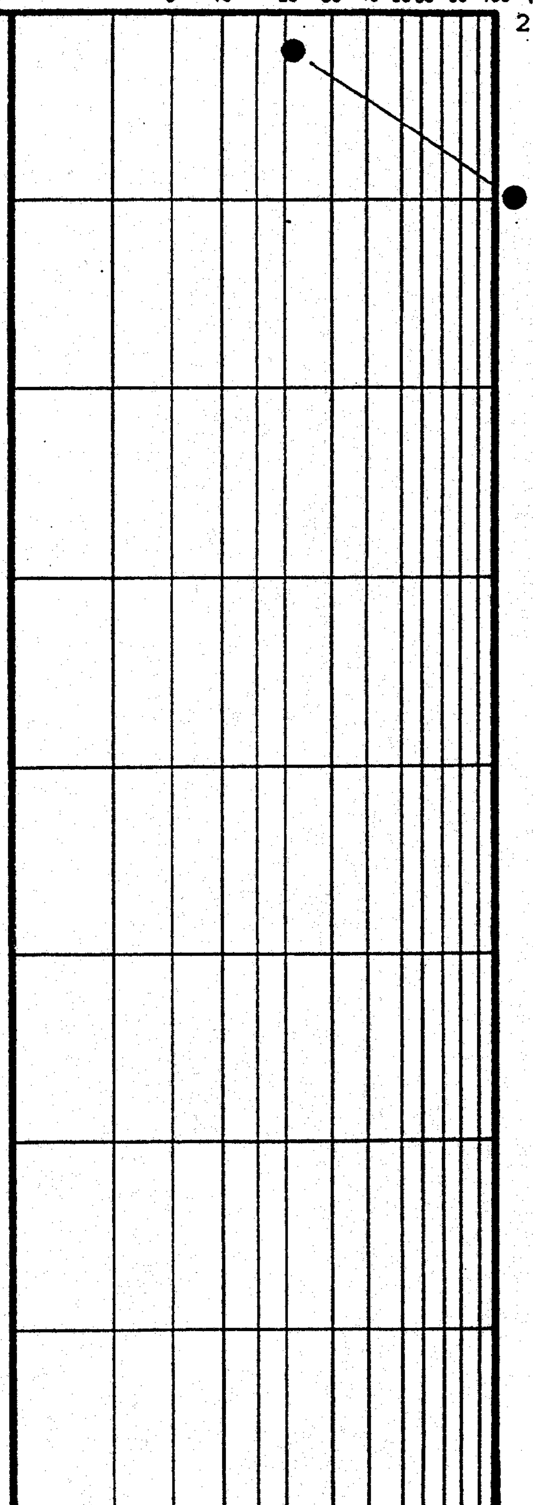
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

# Law Engineering

## Soil Test Boring Record

BORING NUMBER J-11B
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 1 OF 1

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT | "N" |
|---|---|---|---|---|
| 0.0 | | | | |
| 0.2 | TOPSOIL | | | 21 |
| 2.5 | VERY STIFF BROWN CLAYEY DESICATED SHALE - RESIDUUM | | | |
| 5.2 | VERY HARD GRAY VERY WEATHERED SHALE - RESIDUUM | | | 5( 0.: |
| | REFUSAL | | | |



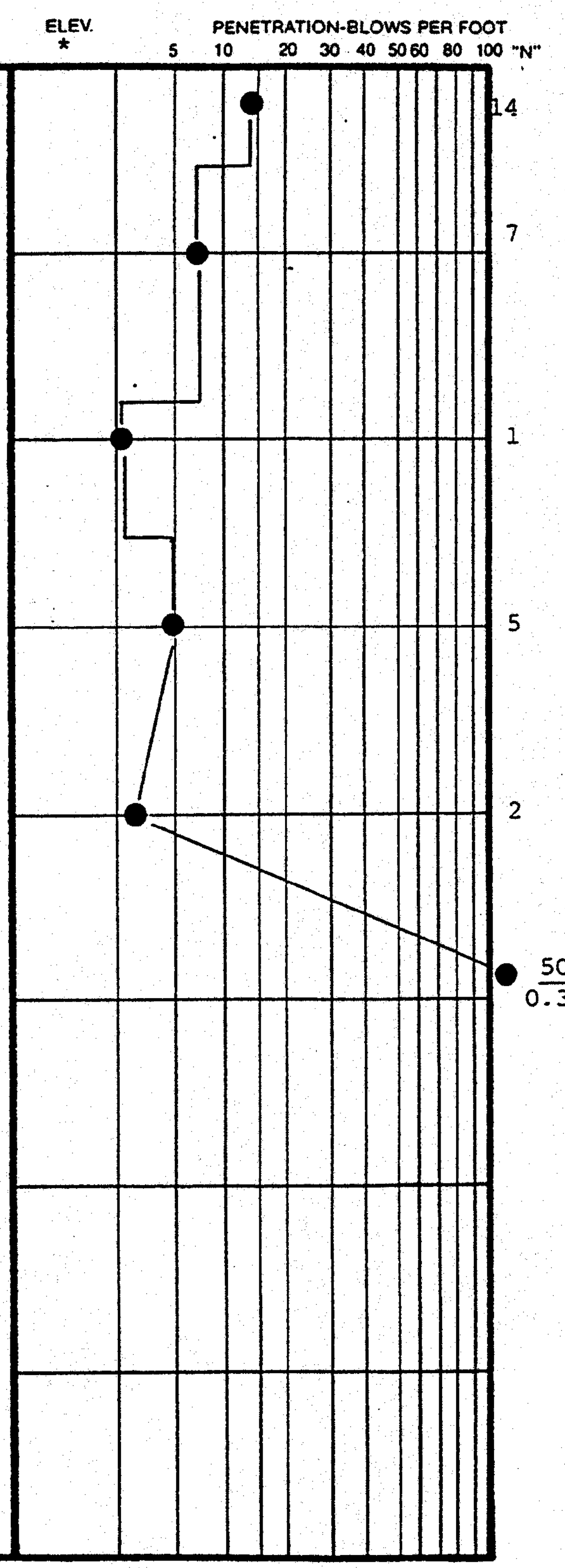

REMARKS: *ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

## Soil Test Boring Record

BORING NUMBER J-12A
DATE DRILLED 9-22-88
JOB NUMBER K-88195
PAGE 1 OF 1

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT "N" |
|---|---|---|---|
| 0.0 | STIFF MOTTLED BROWN SILTY CLAY WITH TRACE OF CHERT- FILL | | 14 |
| 2.5 | FIRM GRAY FLY ASH WITH TRACE ORGANICS - FILL | 8.0 (water level) | 7 |
| 9.0 | VERY SOFT MOTTLED BROWN SILTY CLAY WITH ORGANICS - RESIDUUM | | 1 |
| 12.5 | SOFT TO VERY SOFT SATURATED GRAYISH BROWN SILTY CLAY WITH WEATHERED SHALE FRAGMENTS - RESIDUUM | | 5<br>2 |
| 24.8 | REFUSAL | | 50/0.3 |




REMARKS: * ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

## Boring Record

BORING NUMBER J-12B
DATE DRILLED 9-26-88
JOB NUMBER K-88195
PAGE 1 OF 2

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 0.0 | RED-BROWN SILTY CLAY WITH CHERT FRAGMENTS | | |
| 3.0 | DARK GRAY ASH AND ASH AND ASH CLAY MIXTURE | | |
| 20.0 | GREENISH GRAY SHALE SLURRY WITH LIMESTONE FRAGMENTS | | |
| 28.0 | DUE TO A CAVE-IN AT 28.0 FEET THE BORING WAS OFFSET AND RE-DRILLED<br>GRAY SHALE | | |
| 40.0 | | | |

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF

# Law Engineering

BORING NUMBER J-12B
DATE DRILLED 9-26-88
JOB NUMBER K-88195


## Boring Record

| DEPTH (FT.) | DESCRIPTION | ELEV. | PENETRATION-BLOWS PER FOOT (5 10 20 30 40 50 60 80 100 "N") |
|---|---|---|---|
| 40.0 | GRAY SHALE | | |
| 54.2 | BORING TERMINATED | | |

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

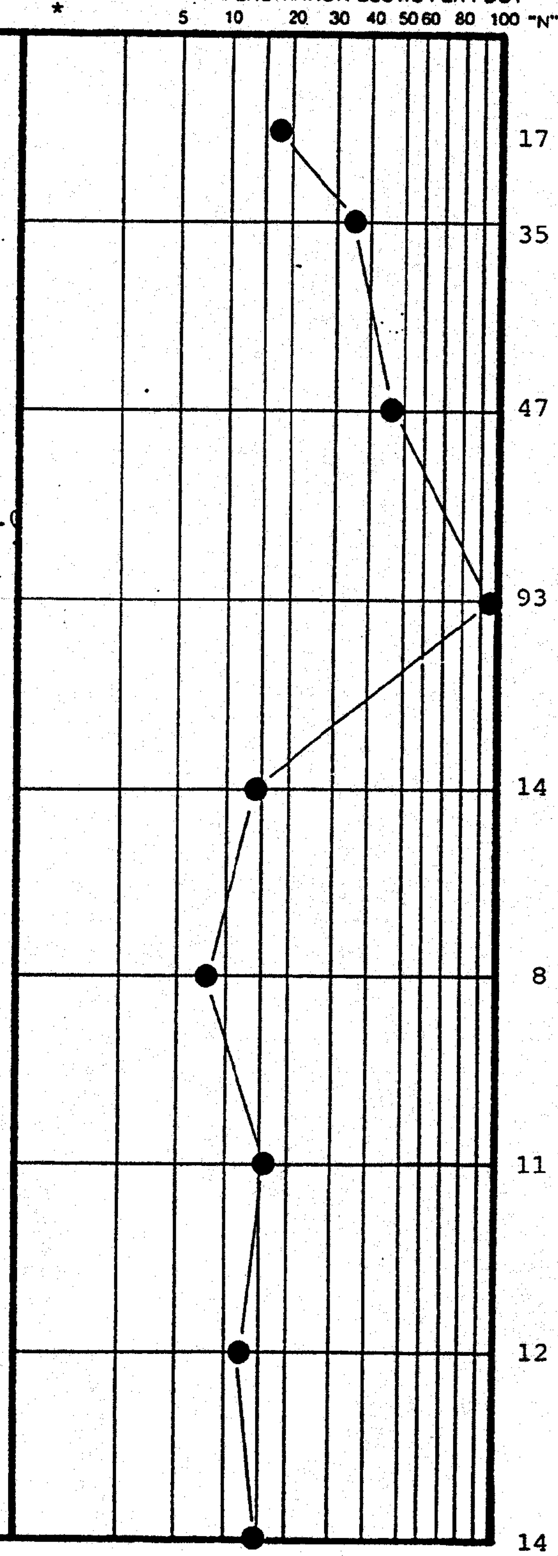
# Law Engineering

## Soil Test Boring Record

BORING NUMBER J-13 A
DATE DRILLED 9-28-88
JOB NUMBER K-88195
PAGE 1 OF 2

| DEPTH (FT.) | DESCRIPTION | | ELEV. * |
|---|---|---|---|
| 1.5 | VERY STIFF MOTTLED BROWN SILTY CLAY - FILL | | |
| | BLACK FLY ASH | | 14.0 |
| 40.0 | | | |

PENETRATION-BLOWS PER FOOT




| "N" |
|---|
| 17 |
| 35 |
| 47 |
| 93 |
| 14 |
| 8 |
| 11 |
| 12 |
| 14 |

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TVA-00015840

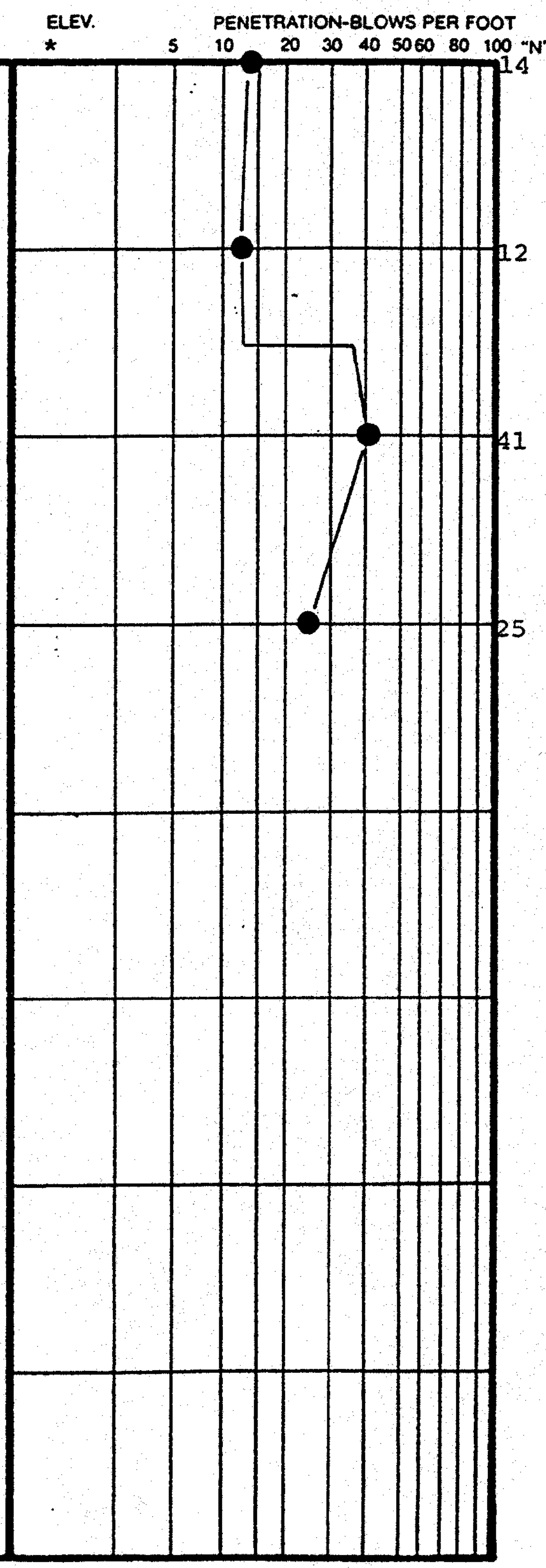
# Law Engineering

## Soil Test Boring Record

BORING NUMBER J-13 A
DATE DRILLED 9-28-88
JOB NUMBER K-88195
PAGE 2 OF 2

| DEPTH (FT.) | DESCRIPTION |
|---|---|
| 40.0 | BLACK FLY ASH |
| 47.5 | DENSE SAND AND GRAVEL -ALLUVIUM |
| 52.5 | FIRM VERY SILTY CLAY - ALLUVIUM |
| 64.0 | REFUSAL |

ELEV. *




REMARKS: * ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

# Law Engineering

BORING NUMBER J-13B
DATE DRILLED 9/29 - 30/88
JOB NUMBER K-88195
PAGE 1 OF 3

## Boring Record

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT (5, 10, 20, 30, 40, 50, 60, 80, 100 "N") |
|---|---|---|---|
| 0.0 | | | |
| 0.5 | TOPSOIL | | |
| | BROWN SILTY CLAY AND WEATHERED SHALE | | |
| 4.0 | | | |
| | GRAY ASH | | |
| 40.0 | | | |

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS ...

# Law Engineering

## Boring Record

BORING NUMBER J-13B
DATE DRILLED 9/29-30/88
JOB NUMBER K-88195


| DEPTH (FT.) | DESCRIPTION | ELEV. | PENETRATION-BLOWS PER FOOT (5 10 20 30 40 50 60 80 100 "N") |
|---|---|---|---|
| 40.0 | GRAY ASH | | |
| 45.0 | ASH AND SAND (VERY WET) | | |
| 65.0 | GRAY SHALE WITH ZONES OF LIMESTONE AND SANDSTONE | | |
| 80.0 | | | |

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

**Law Engineering**

# Boring Record

BORING NUMBER J-13B
DATE DRILLED 9/29 -30/88
JOB NUMBER K-88195
PAGE 3 OF 3

| DEPTH (FT.) | DESCRIPTION | ELEV. | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 80.0 | GRAY SHALE WITH ZONES OF LIMESTONE AND SANDSTONE | | |
| 82.0 | BORING TERMINATED | | |

REMARKS:

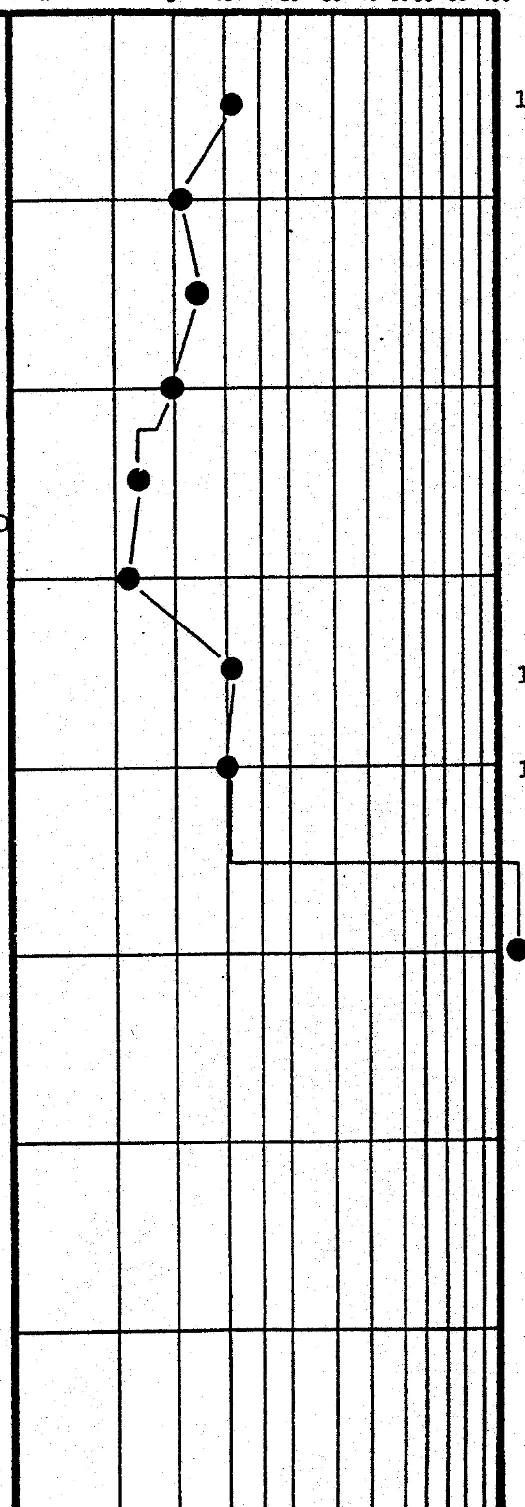
# Law Engineering

## Soil Test Boring Record

BORING NUMBER J-14
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 1 OF 1

| DEPTH (FT.) | DESCRIPTION | ELEV. * |
|---|---|---|
| 0.0 | GRAVEL | |
| 1.0 | STIFF RED-BROWN SILTY CLAY- FILL | |
| 3.5 | FIRM MOTTLED DARK BROWN SILTY CLAY FILL | |
| 6.0 | FIRM RED-BROWN SILTY CLAY WITH TRACE ORGANICS - FILL | |
| 8.5 | FIRM MOTTLED DARK BROWN SILTY CLAY - FILL | |
| 11.0 | VERY LOOSE BLACK SILTY SAND AND GRAVEL - ALLUVIUM | 14.0 (water level) |
| 16.0 | LOOSE BROWN AND GRAY SILTY CLAY WITH BLACK STAINING - ALLUVIUM | |
| 22.5 | VERY HARD GRAY WEATHERED SHALE | |
| 25.3 | BORING TERMINATED | |

PENETRATION-BLOWS PER FOOT: 5 10 20 30 40 50 60 80 100 "N"



"N": 11, 6, 7, 5, 2, 1, 11, 10, 5(/0.

REMARKS: *ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

**Law Engineering**

## Boring Record

BORING NUMBER J-14A
DATE DRILLED 9-22-88
JOB NUMBER K-88195
PAGE 1 OF 1

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 0.0 | RED-BROWN AND DARK BROWN SILTY CLAY WITH ROCK FRAGMENTS-FILL (FILL USED FOR CONSTRUCTING THE RAILROAD) | | |
| 17.0 | TANISH GRAY SILT WITH TRACE OF ASH - FILL | | |
| 19.0 | WEATHERED BROWN AND TAN SHALE | | |
| 25.0 | BORING TERMINATED | | |

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

# Law Engineering

BORING NUMBER J-14B
DATE DRILLED 9-22-88
JOB NUMBER K-88195
PAGE 1 OF 1

## Boring Record

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 0.0 | RED BROWN SILTY CLAY -FILL (FILL USED FOR CONSTRUCTING THE RAILROAD) | | |
| 18.0 | GRAY BROWN SILTY CLAY WITH A TRACE OF ASH<br>REFUSAL | | |
| 24.5 | BROWN AND GRAY TO GRAY SHALE WITH CALCITE SEAMS | | |
| 40.0 | BORING TERMINATED | | |

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

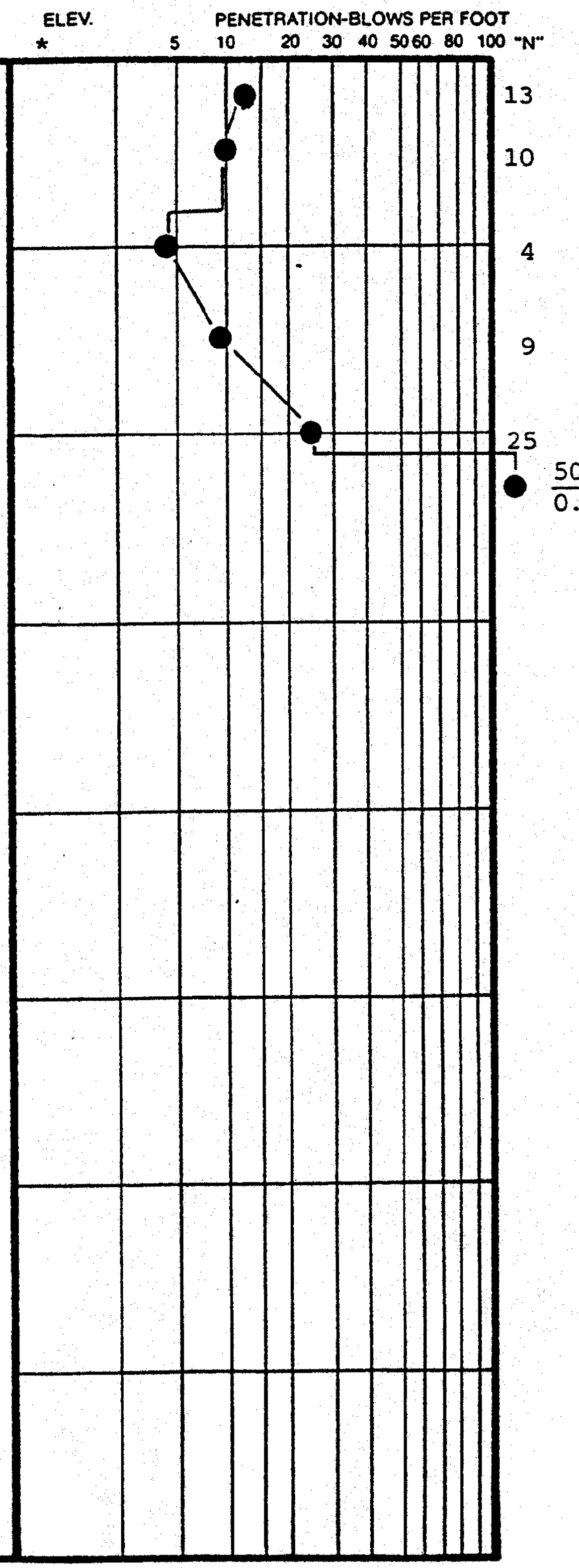
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS ...

# Law Engineering

## Soil Test Boring Record

BORING NUMBER J-15
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 1 OF 1

| DEPTH (FT.) | DESCRIPTION | ELEV. * |
|---|---|---|
| 0.0 | STIFF MOTTLED REDDISH-BROWN SILTY CLAY - FILL | |
| 2.0 | STIFF MOTTLED BROWN SILTY CLAY WITH ROCK FRAGMENT - FILL | |
| 4.0 | SOFT TO FIRM REDDISH BROWN SILTY CLAY - RESIDUUM | |
| 10.5 | LIGHT BROWN VERY WEATHERED SHALE-RESIDUUM | |
| 12.0 | REFUSAL | |




REMARKS: * ELEVATION TO BE PROVIDED BY TVA

TVA-00015848

# Law Engineering

BORING NUMBER J-15A
DATE DRILLED 9-21-88
JOB NUMBER K-88195
PAGE 1 OF 1

## Boring Record

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 0.0 | TANISH-BROWN TO BROWN SILTY CLAY | | |
| 8.0 | GRAY-BROWN SILT WITH SHALE FRAGMENTS | | |
| 13.5 | REFUSAL<br>GRAY SHALE | | |
| 25.2 | BORING TERMINATED | | |
| 40.0 | | | |

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF ...

## Law Engineering

## Boring Record

BORING NUMBER J-15B
DATE DRILLED 9-21-88
JOB NUMBER K-88195
PAGE 1 OF 2

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 0.0 | WEATHERED SHALE | | |
| 3.0 | BROWN AND GRAY-BROWN SILTY CLAY WITH TRACE SHALE FRAGMENTS | | |
| 14.0 | GRAY SHALE | | |
| 40.0 | | | |

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

# Law Engineering

## Boring Record

BORING NUMBER J-15B
DATE DRILLED 9-21-88
JOB NUMBER K-88195
PAGE 2 OF 2

| DEPTH (FT.) | DESCRIPTION | ELEV. | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 40.0 | GRAY SHALE | | |
| 44.2 | BORING TERMINATED | | |

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

# Law Engineering

## Boring Record

BORING NUMBER J-16A
DATE DRILLED 10-5-88
JOB NUMBER K-88195
PAGE 1 OF 2

| DEPTH (FT.) | DESCRIPTION | | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|---|
| 0.0 | | | | |
| 0.2 | TOPSOIL | | | |
| | RED-BROWN AND BROWN SILTY CLAY - FILL | | | |
| 13.0 | GRAY BROWN SILTY CLAY - FILL (SOME OF THE SOILS APPEAR TO BE ASSOICIATED WITH AN OLD ROAD SURFACE) | | 14.0 | |
| 18.0 | RED BROWN SANDY CLAY (SLURRY) - POSSIBLE RESIDUUM | | | |
| 40.0 | | | | |

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

**Law Engineering**

## Boring Record

BORING NUMBER J-16A
DATE DRILLED 10-5-88
JOB NUMBER K-88195
PAGE 2 OF 2

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 40.0 | GRAY BROWN SANDY CLAYEY SILT WHICH GRADES TO GRAY CLAY-SAND -RESIDUUM | | |
| 61.0 | GRAY SANDY CLAY CONTAINING WEATHERED SHALE FRAGMENTS -RESIDUUM | | |
| 64.7 | REFUSAL | | |

REMARKS: * ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF ...

# Law Engineering

## Boring Record

BORING NUMBER J-16B
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 1 OF 2

| DEPTH (FT.) | DESCRIPTION | ELEV. * | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 0.0 | RED-BROWN SILTY CLAY WITH SMALL ROCK FRAGMENTS - FILL | | |
| 10.0 | RED TO RED-BROWN TO BROWN SILTY CLAY - FILL | | |
| 20.5 | BROWN SILTY CLAY - POSSIBLE TOPSOIL | | |
| 22.0 | GRAY AND BROWN SLURRY WITH ROCK FRAGMENTS | | |
| 40.0 | | | |

REMARKS: BORING ADVANCED USING AIR ROTARY EQUIPMENT
* ELEVATION TO BE PROVIDED BY TVA

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

**Law Engineering**

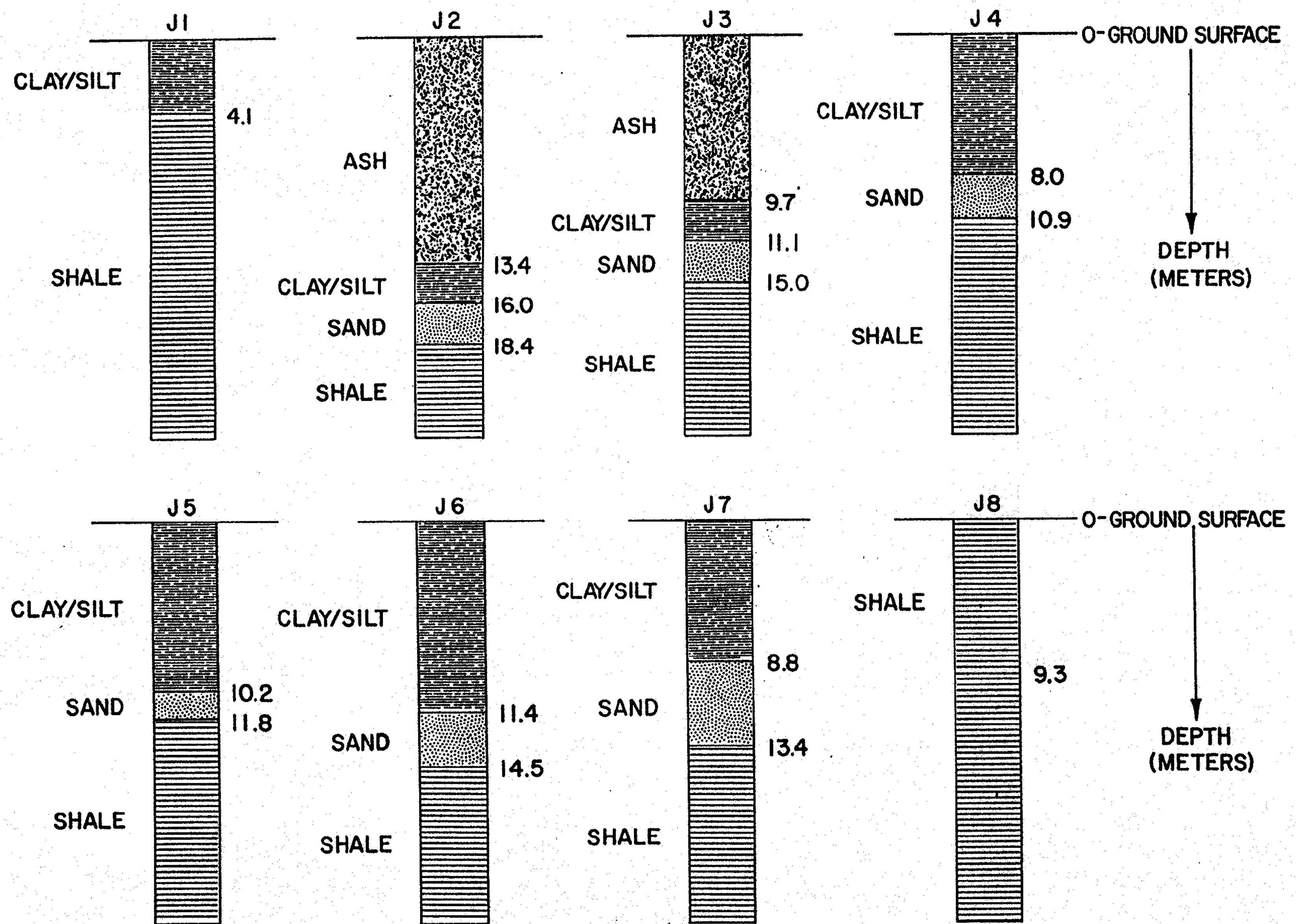
BORING NUMBER J-16B
DATE DRILLED 9-23-88
JOB NUMBER K-88195
PAGE 2 OF 2

## Boring Record

| DEPTH (FT.) | DESCRIPTION | ELEV. | PENETRATION-BLOWS PER FOOT 5 10 20 30 40 50 60 80 100 "N" |
|---|---|---|---|
| 40.0 | | | |
| 41.0 | CASING "BLEW-OUT" AROUND 41 FEET. THE BORING WAS OFFSET AND REDRILLED<br><br>RED-BROWN, BROWN AND GRAY SILTY CLAY WITH SHALE FRAGMENTS | | |
| 56.0 | BROWN AND GRAY SHALE | | |
| 73.0 | BORING TERMINATED | | |

REMARKS:

VERTICAL PROFILE OF THE SUBSTRATUM AT PLANT J's MONITORING WELL LOCATIONS



**APPENDIX B**

**MONITORING WELL DIAGRAMS**

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT KINGSTON STEAM PLANT — JOB NUMBER K-88195

WELL NUMBER J-9 A — INSTALLATION DATE 10-3 TO 10-4-88

LOCATION PLANT COORDINATES W 9+44 N 19+07 Tennessee Lambert NAD83 Easting 2408204.75 Northing 575458

GROUND SURFACE ELEVATION 769.4' MSL — TOP OF INNER CASING 772.5' MSL

GRANULAR BACKFILL MATERIAL QUARTZ SAND, COARSE — SLOT SIZE .010 INCHES

CASING MATERIAL PVC — CASING DIAMETER 2 INCHES

DRILLING TECHNIQUE POWER AUGER — DRILLING CONTRACTOR LAW ENGINEERING

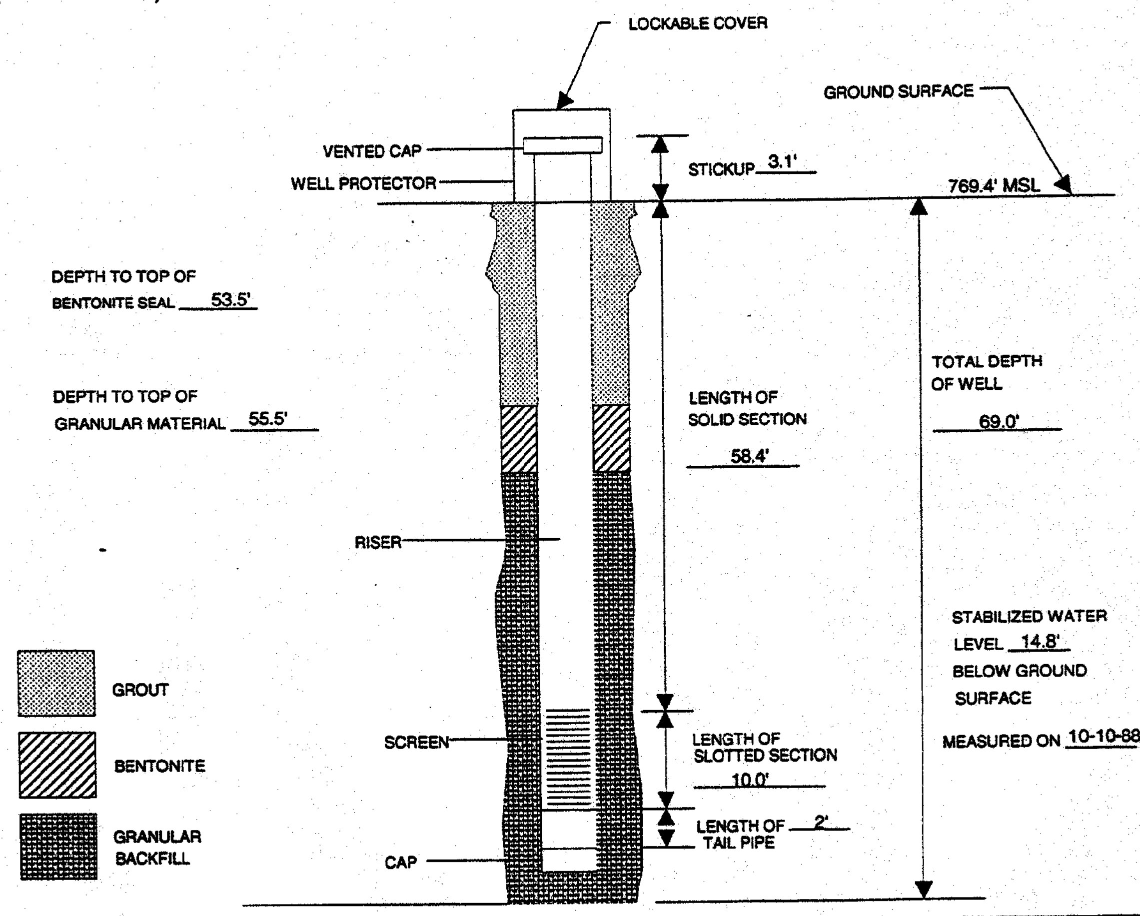
BOREHOLE DIAMETER 11 INCHES — FIELD REPRESENTATIVE H. W. ROBINSON

LOCKABLE COVER ? YES — KEY CODE/COMBINATION 2043

RISER MATERIAL PVC — SCREEN MATERIAL PVC

COMMENTS

(NOT TO SCALE)

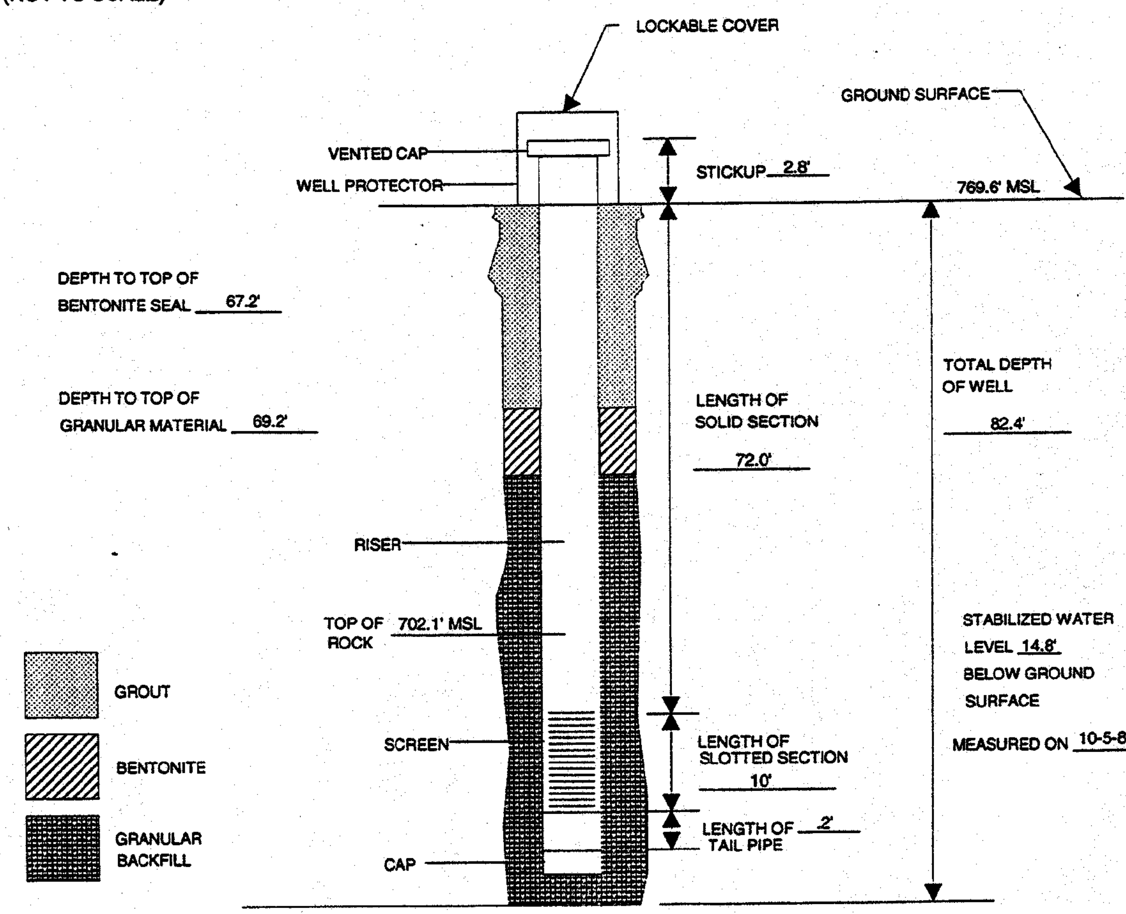



ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT KINGSTON STEAM PLANT
JOB NUMBER K-88195
WELL NUMBER J-9B
INSTALLATION DATE 9-28 TO 9-29-88
LOCATION PLANT COORDINATES W 9+42 , N 19+22 Tennessee Lambert NAD83 Easting 2408204.25 Northing 575457.5
GROUND SURFACE ELEVATION 769.6' MSL
TOP OF INNER CASING 772.4' MSL
GRANULAR BACKFILL MATERIAL QUARTZ SAND,COURSE
SLOT SIZE .010 INCHES
CASING MATERIAL PVC
CASING DIAMETER 2 INCHES
DRILLING TECHNIQUE AIR ROTARY
DRILLING CONTRACTOR HIGHLAND DRILLING
BOREHOLE DIAMETER 5 7/8 (ROLLER CONE)
FIELD REPRESENTATIVE H. W. ROBINSON
LOCKABLE COVER ? YES
KEY CODE/COMBINATION 2043
RISER MATERIAL PVC
SCREEN MATERIAL PVC
COMMENTS

(NOT TO SCALE)




ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195

WELL NUMBER: J-10
INSTALLATION DATE: 9-27-88

LOCATION: PLANT COORDINATES W 4+79, N 16+36 Tennessee Lambert NAD83 Easting 2408462.25 Northing 574754.063

GROUND SURFACE ELEVATION: 753.8' MSL
TOP OF INNER CASING: 756.8' MSL

GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COURSE
SLOT SIZE: .010 INCHES

CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES

DRILLING TECHNIQUE: POWER AUGER
DRILLING CONTRACTOR: LAW ENGINEERING

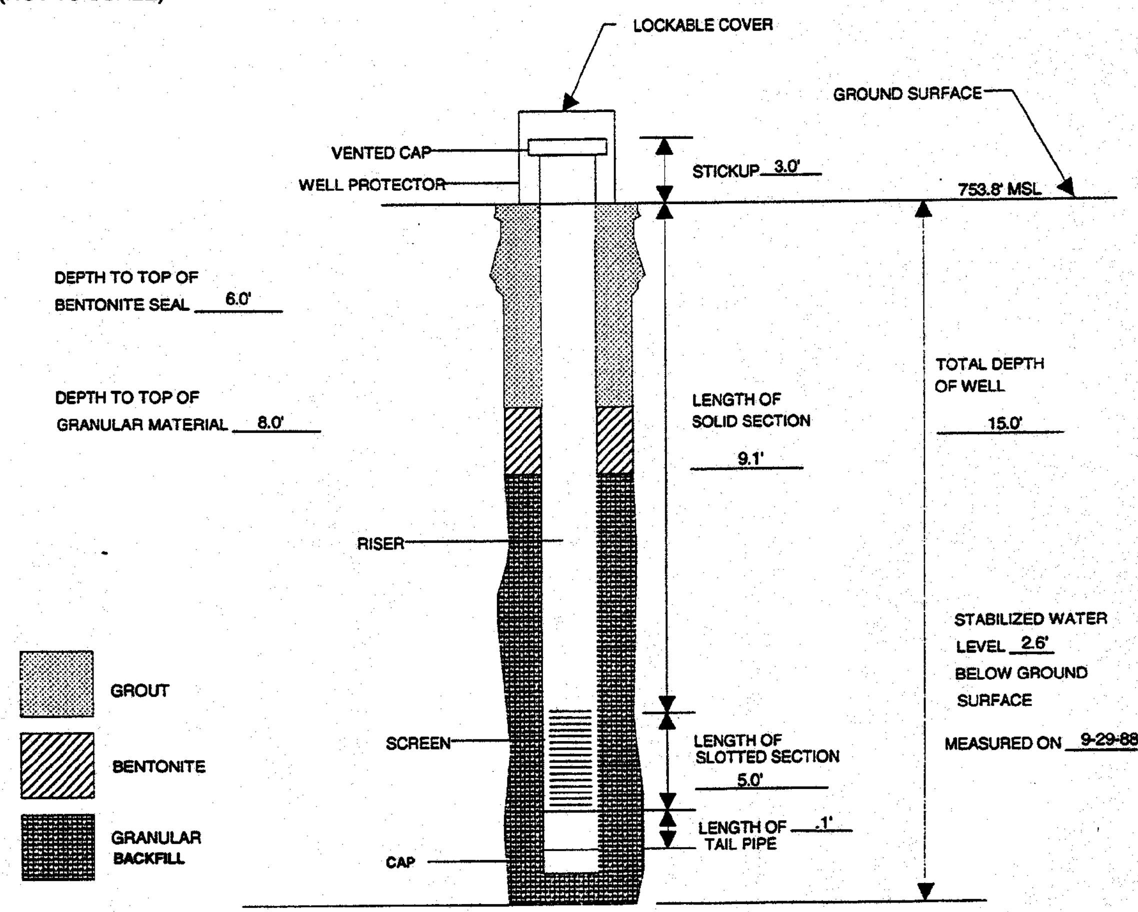
BOREHOLE DIAMETER: 11 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON

LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043

RISER MATERIAL: PVC
SCREEN MATERIAL: PVC

COMMENTS:

(NOT TO SCALE)




ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195

WELL NUMBER: J - 10A
INSTALLATION DATE: 9-19 TO 9-27-88

LOCATION: PLANT COORDINATES W 4+68, N 16+51 Tennessee Lambert NAD83 Easting 2408462.25 Northing 574754.063

GROUND SURFACE ELEVATION: 753.5' MSL
TOP OF INNER CASING: 756.3' MSL

GRANULAR BACKFILL MATERIAL: QUARTZ SAND, COURSE
SLOT SIZE: .010 INCHES

CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES

DRILLING TECHNIQUE: AIR ROTARY & POWER AUGER
DRILLING CONTRACTOR: HIGHLAND DRILLING & LAW ENGINEERING

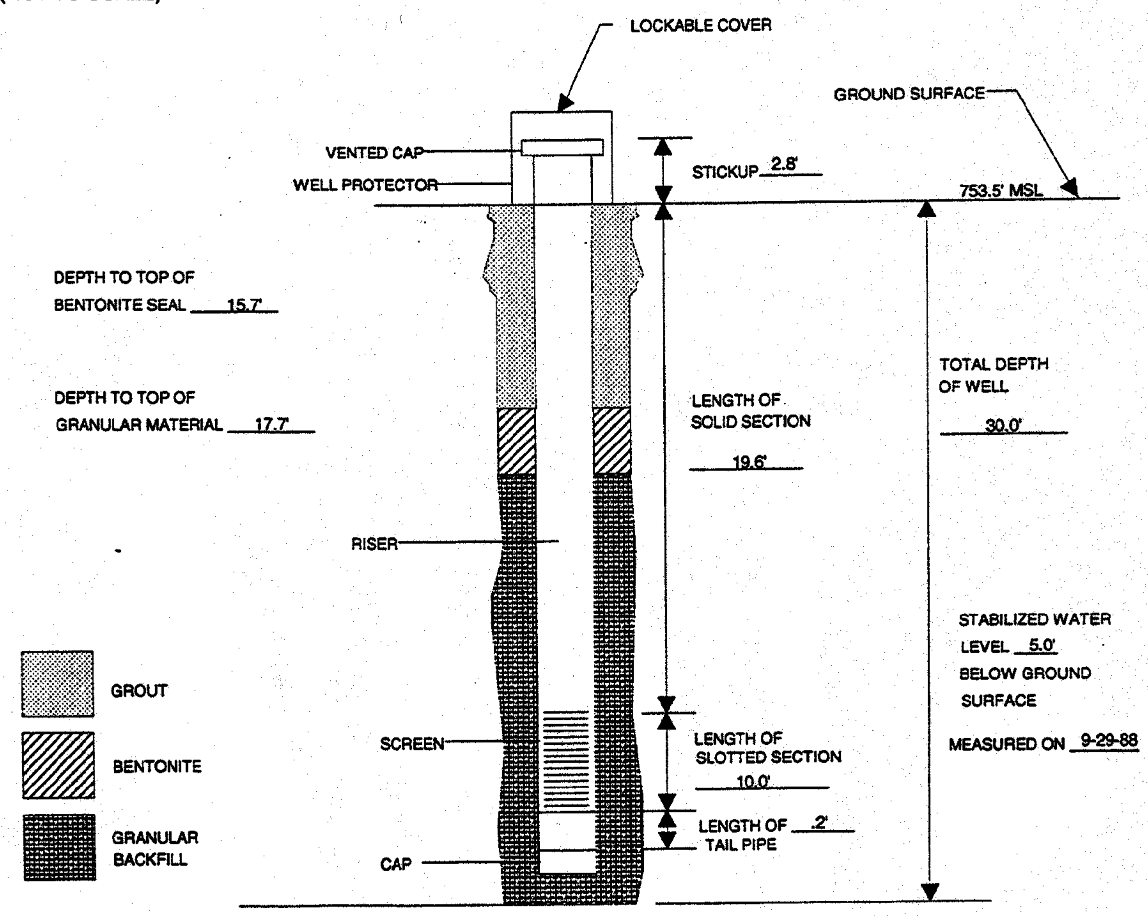
BOREHOLE DIAMETER: 11 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON

LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043

RISER MATERIAL: PVC
SCREEN MATERIAL: PVC

COMMENTS:

(NOT TO SCALE)



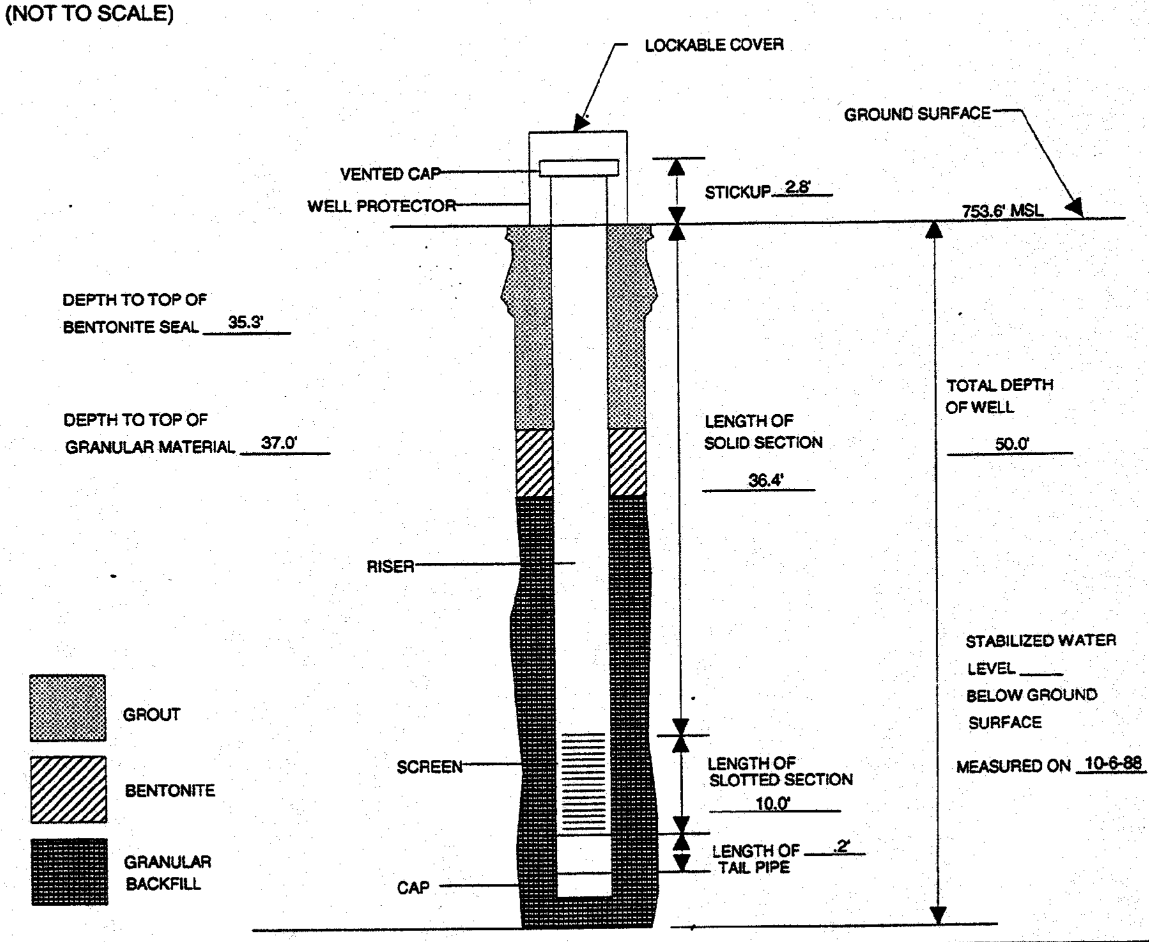

ENG LAB 102/90

TVA-00015861

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-10 B
INSTALLATION DATE: 9-23-88
LOCATION: PLANT COORDINATES W 4+73, N 16+51 Tennessee Lambert NAD83 Easting 2408462.25 Northing 574754.063
GROUND SURFACE ELEVATION: 753.6' MSL
TOP OF INNER CASING: 756.4' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COURSE
SLOT SIZE: .010 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: POWER AUGER
DRILLING CONTRACTOR: LAW ENGINEERING
BOREHOLE DIAMETER: 11 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS: ______

(NOT TO SCALE)

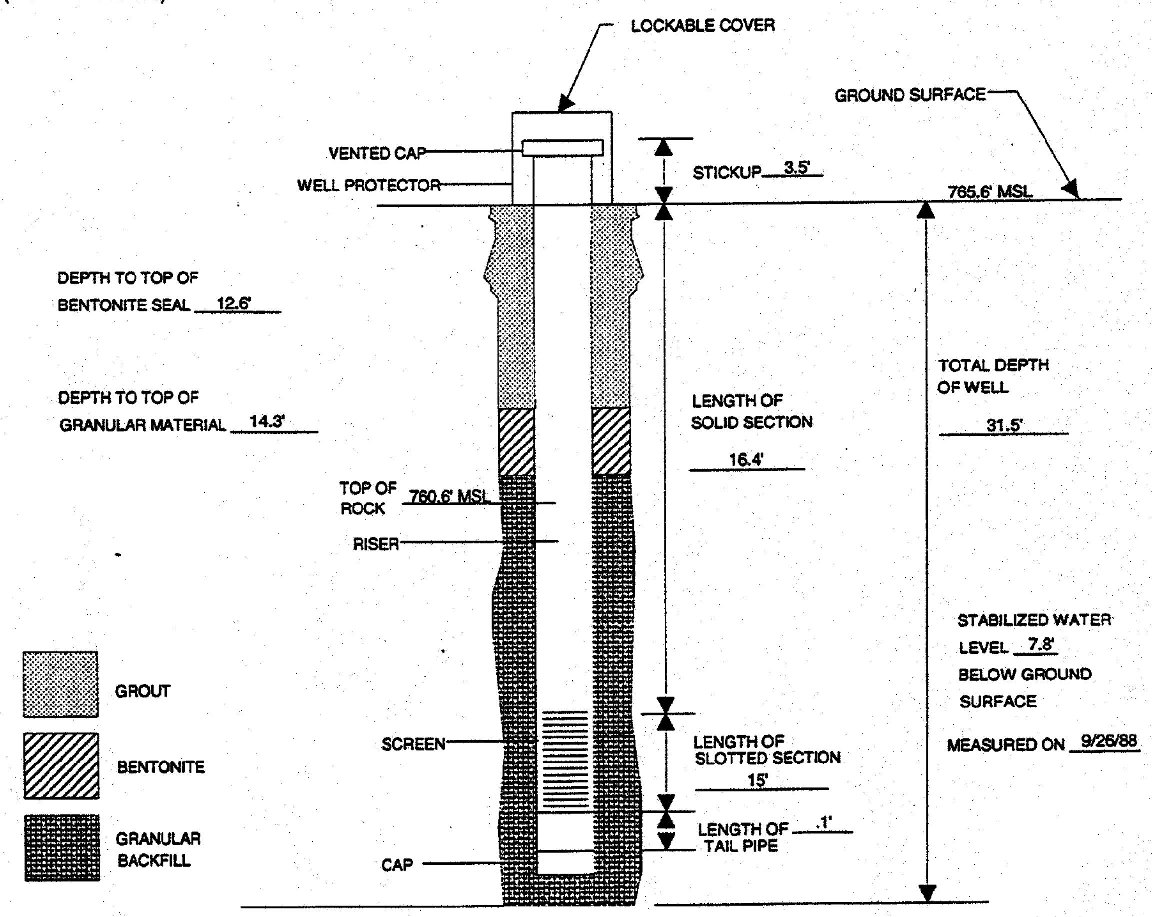



ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-11 B
INSTALLATION DATE: 9-19-88
LOCATION: PLANT COORDINATES W 7+84, N 7+97
GROUND SURFACE ELEVATION: 765.6' MSL
TOP OF INNER CASING: 769.1' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COURSE
SLOT SIZE: 0.10 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AIR/WATER ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING
BOREHOLE DIAMETER: 8 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)

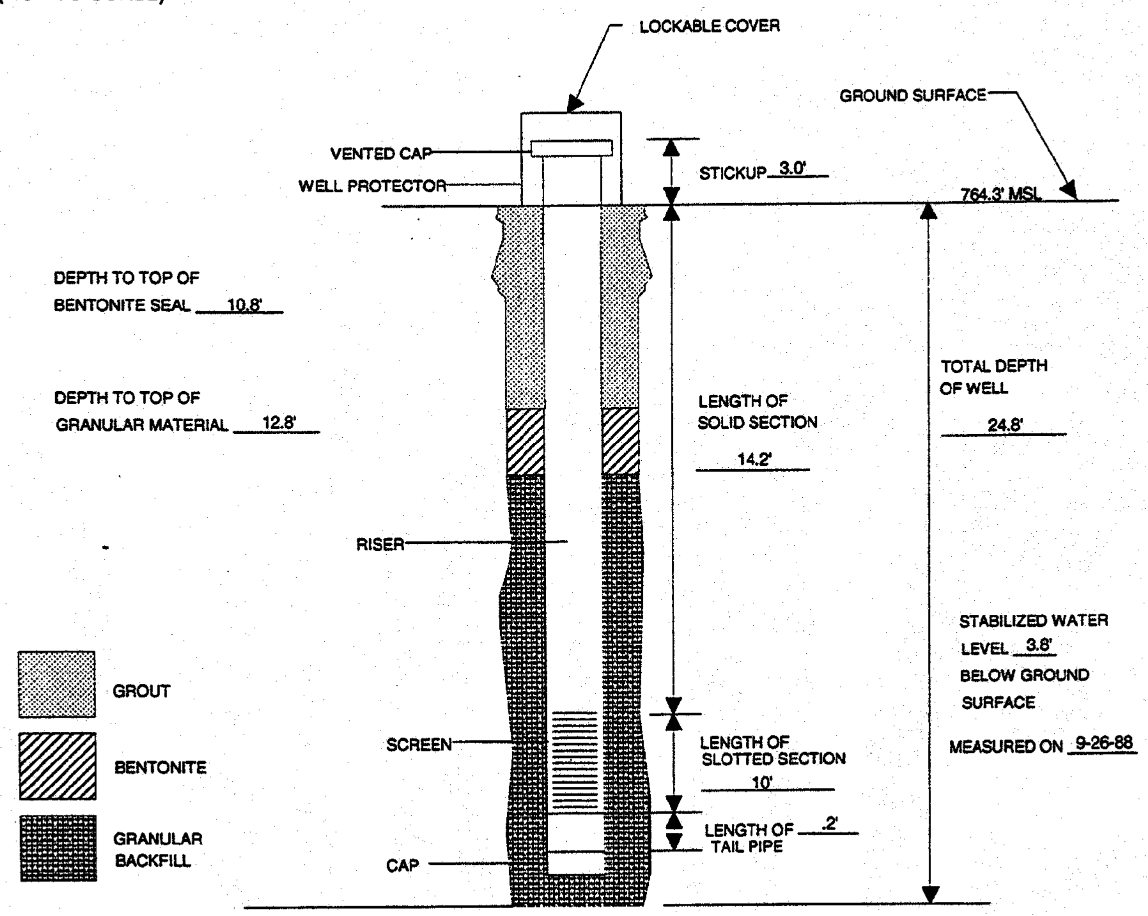



ENG LAB 10/2/80

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-12 A
INSTALLATION DATE: 9-22-88
LOCATION: PLANT COORDINATES W 17+40, N 15+57 Tennessee Lambert NAD83 Easting 2407132.25 Northing 575644
GROUND SURFACE ELEVATION: 764.3' MLS
TOP OF INNER CASING: 767.3' MLS
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COURSE
SLOT SIZE: .010 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: POWER AUGER
DRILLING CONTRACTOR: LAW ENGINEERING
BOREHOLE DIAMETER: 10 1/4 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)

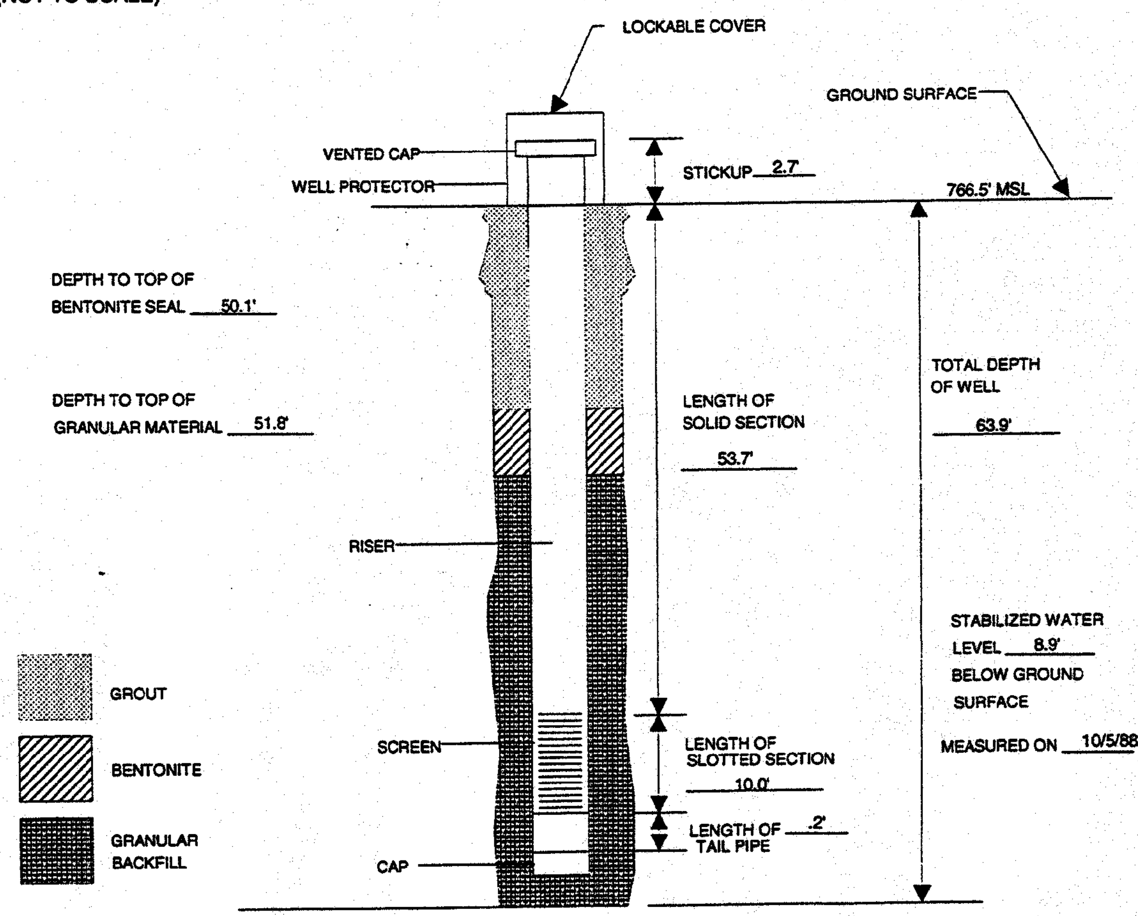



ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-13 A
INSTALLATION DATE: 9-28 TO 9-30-88
LOCATION: PLANT COORDINATES W 7+13, N 31+23 Tennessee Lambert NAD83 Easting 2408856.75 Northing 575872.44
GROUND SURFACE ELEVATION: 766.5' MSL
TOP OF INNER CASING: 769.2' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COARSE
SLOT SIZE: .010 INCH
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: POWER AUGER
DRILLING CONTRACTOR: LAW ENGINEERING
BOREHOLE DIAMETER: APPROXIMATELY 11 INCHES
FIELD REPRESENTATIVE: H. W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)

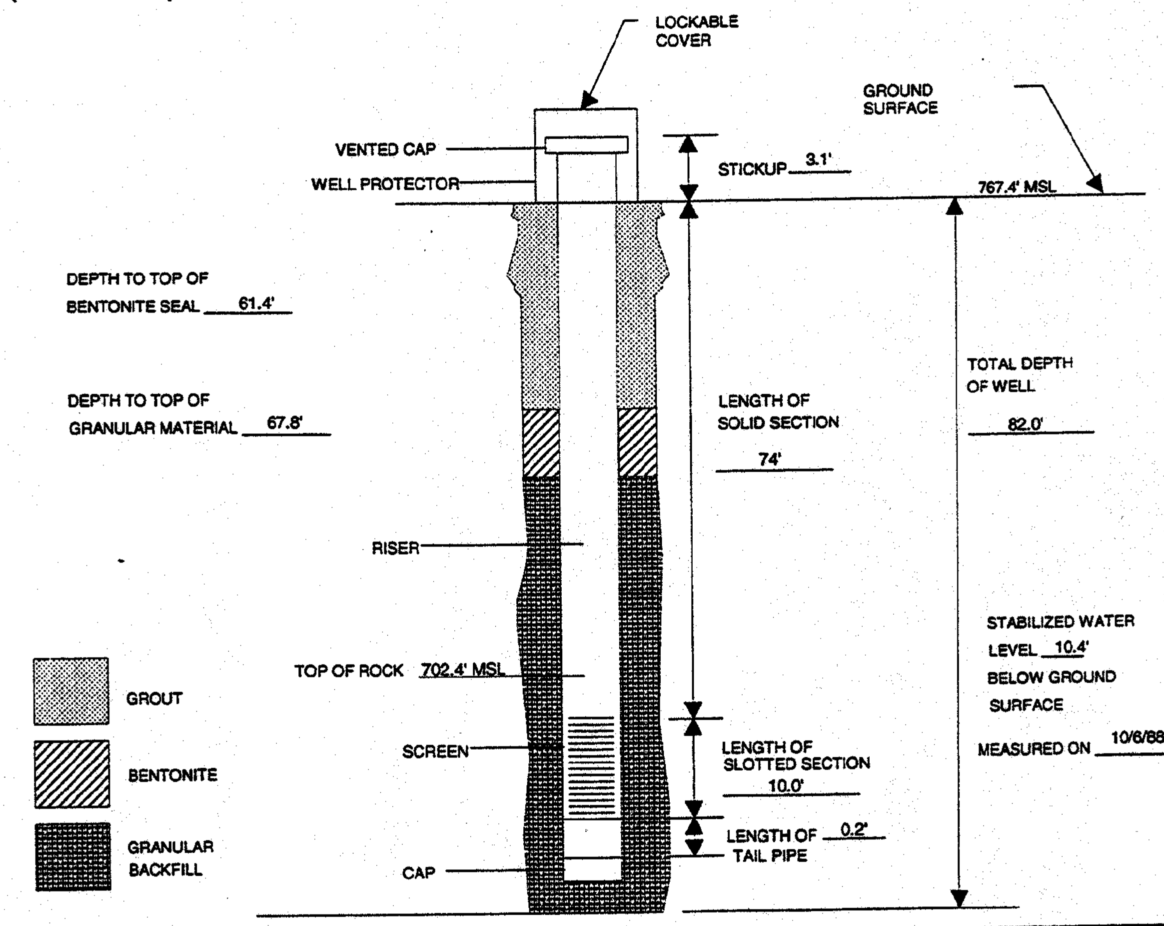



ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-13 B
INSTALLATION DATE: 9-29 TO 9-30-88
LOCATION: PLANT COORDINATES W 7+34, N 31+04 Tennessee Lambert NAD83 Easting 2408856.25 Northing 575872.43
GROUND SURFACE ELEVATION: 767.4' MSL
TOP OF INNER CASING: 770.5' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND
SLOT SIZE: .010 INCH
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AUGER AND AIR ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING
BOREHOLE DIAMETER: 8" AUGER, 5 7/8" (ROLLER CONE)
FIELD REPRESENTATIVE: H.W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)

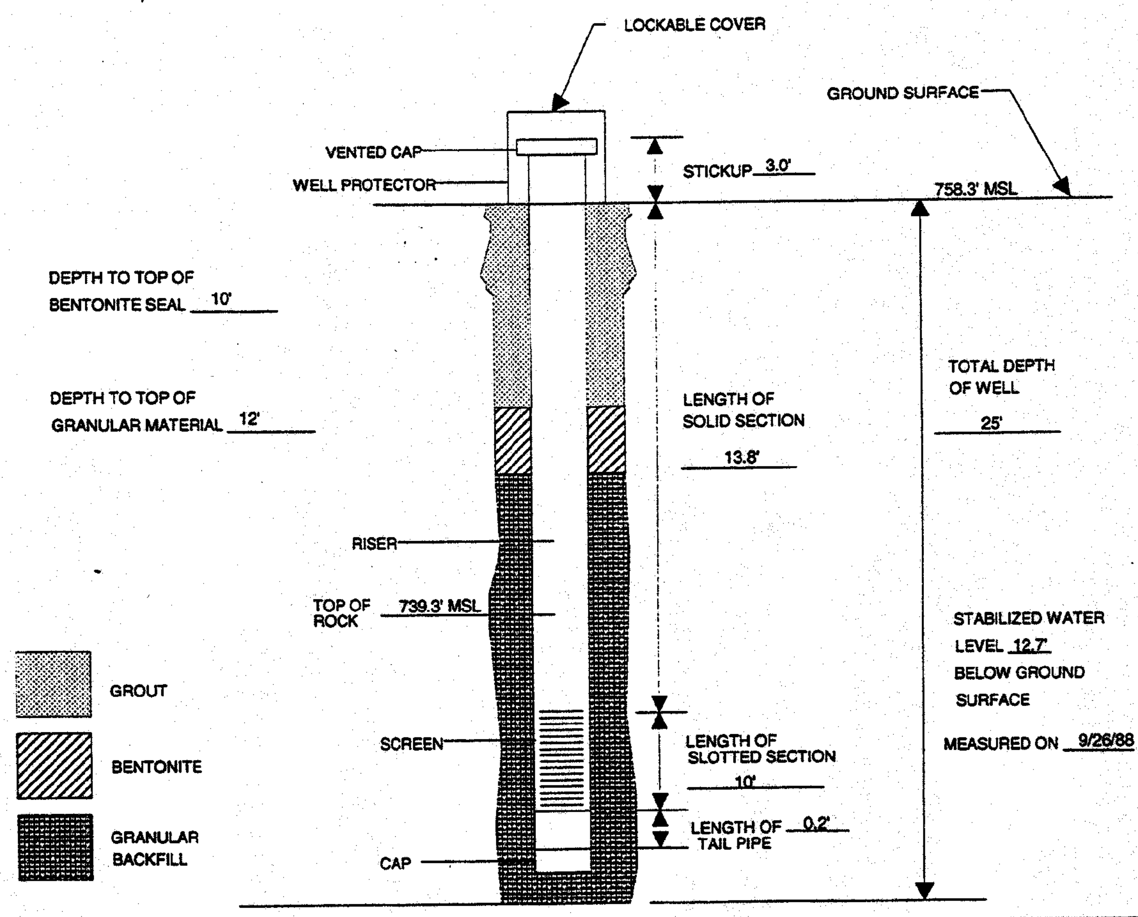



ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-14 A
INSTALLATION DATE: 9-22-88
LOCATION: PLANT COORDINATES W 30+46, N 37+49 Tennessee Lambert NAD83 Easting 2402915.5 Northing 571535.31
GROUND SURFACE ELEVATION: 758.3' MSL
TOP OF INNER CASING: 761.3' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND, COARSE
SLOT SIZE: .010 INCH
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AIR/WATER ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLLING
BOREHOLE DIAMETER: 8 INCHES
FIELD REPRESENTATIVE: H.W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)




ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195

WELL NUMBER: J-14 B
INSTALLATION DATE: 9-22-88

LOCATION: PLANT COORDINATES W 30+56, S 37+60 Tennessee Lambert NAD83 Easting 2402915.5 Northing 571535.31

GROUND SURFACE ELEVATION: 758.3' MSL
TOP OF INNER CASING: 761.3' MSL

GRANULAR BACKFILL MATERIAL: QUARTZ,SAND,COARSE
SLOT SIZE: .010 INCH

CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES

DRILLING TECHNIQUE: AIR/WATER ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING

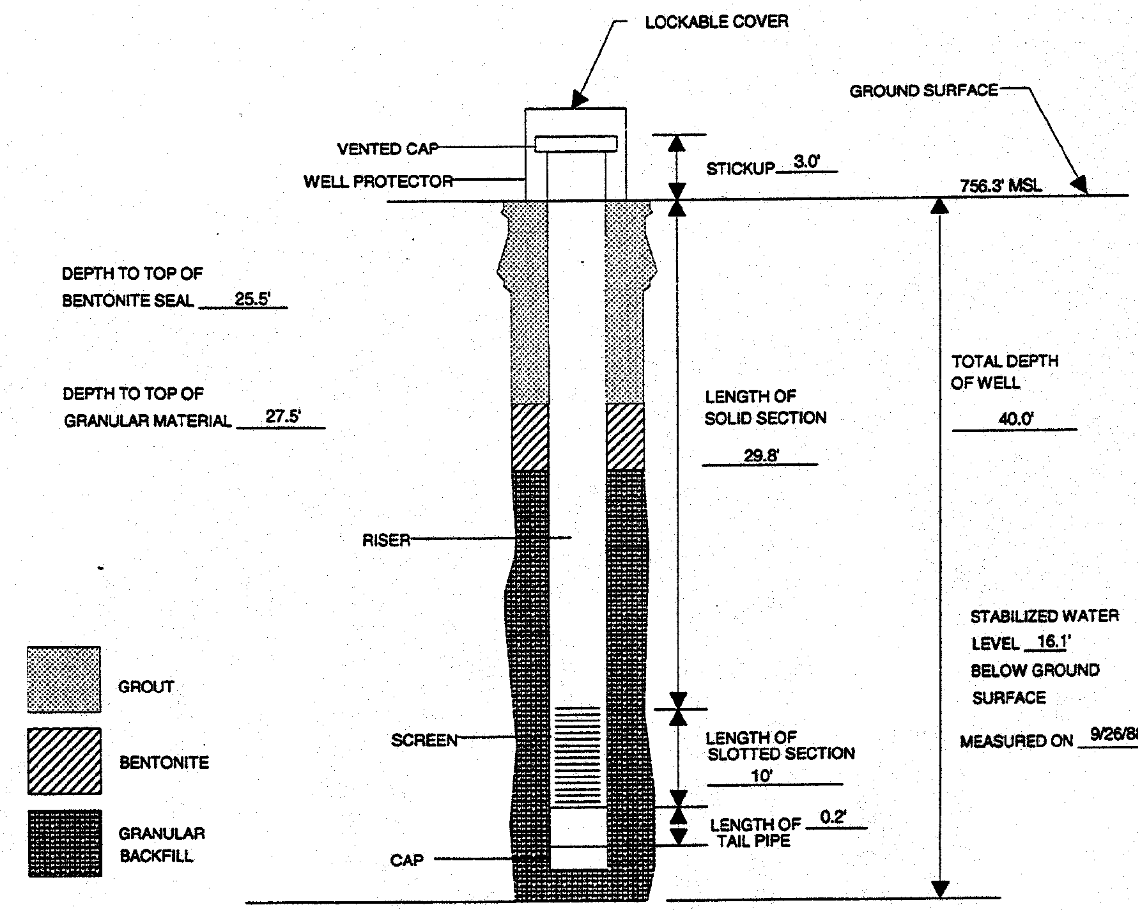
BOREHOLE DIAMETER: 8 INCHES
FIELD REPRESENTATIVE: H.W. ROBINSON

LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043

RISER MATERIAL: PVC
SCREEN MATERIAL: PVC

COMMENTS:

(NOT TO SCALE)




ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195

WELL NUMBER: J-15 A
INSTALLATION DATE: 9-21-88

LOCATION: PLANT COORDINATES W 24+39,N 6+35 Tennessee Lambert NAD83 Easting 2406718 Northing 575840

GROUND SURFACE ELEVATION: 793.1' MSL
TOP OF INNER CASING: 796.1' MSL

GRANULAR BACKFILL MATERIAL: QUARTZ SAND, COURSE
SLOT SIZE: .010 INCH

CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES

DRILLING TECHNIQUE: AIR/WATER ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING

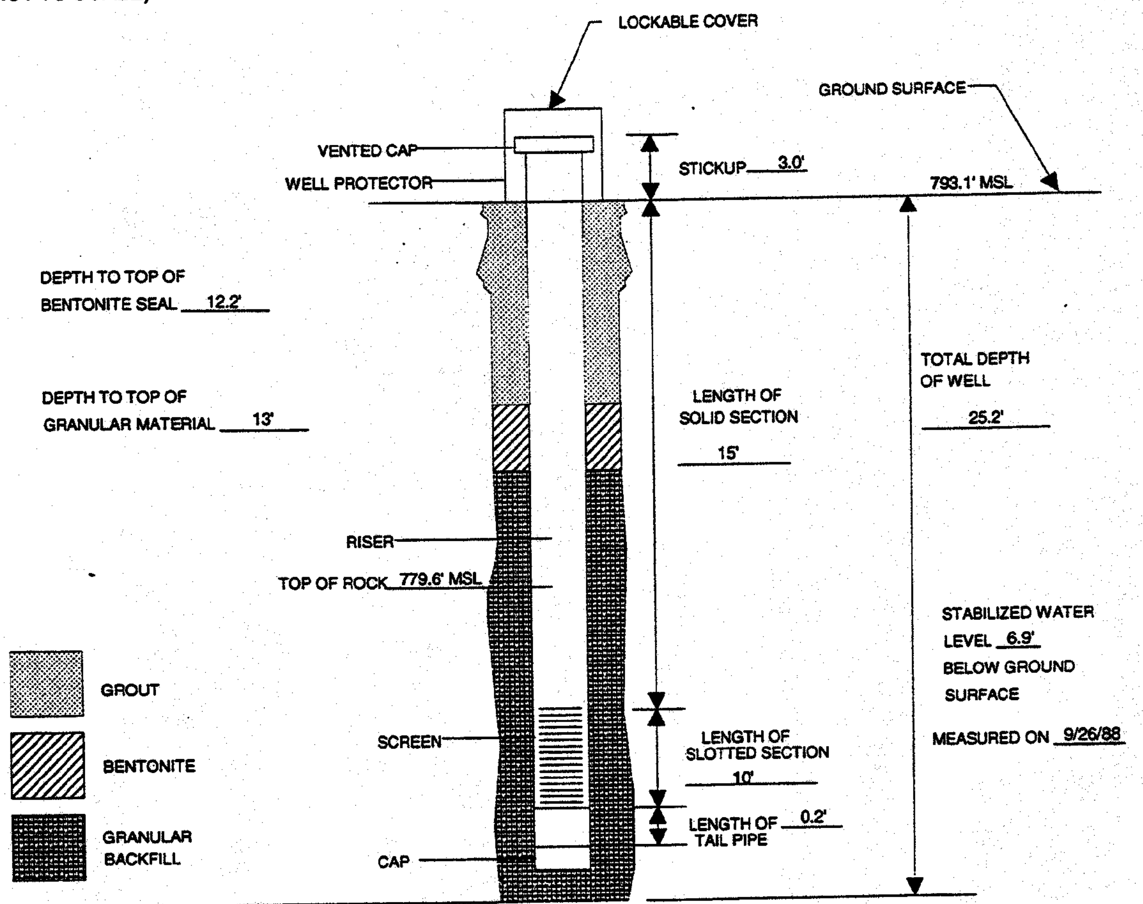
BOREHOLE DIAMETER: 8 INCHES
FIELD REPRESENTATIVE: H.W. ROBINSON

LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043

RISER MATERIAL: PVC
SCREEN MATERIAL: PVC

COMMENTS:

(NOT TO SCALE)




ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT KINGSTON STEAM PLANT

JOB NUMBER K-88195

WELL NUMBER J-15 B

INSTALLATION DATE 9-21-88

LOCATION PLANT COORDINATES W 24+38,N 6+50 Tennessee Lambert NAD83 Easting 2406718 Northing 575840

GROUND SURFACE ELEVATION 792.9' MSL

TOP OF INNER CASING 795.9' MSL

GRANULAR BACKFILL MATERIAL QUARTZ SAND, COARSE

SLOT SIZE .010 INCH

CASING MATERIAL PVC

CASING DIAMETER 2 INCHES

DRILLING TECHNIQUE AIR/WATER ROTARY

DRILLING CONTRACTOR HIGHLAND DRILLING

BOREHOLE DIAMETER 8 INCHES

FIELD REPRESENTATIVE H.W. ROBINSON

LOCKABLE COVER ? YES

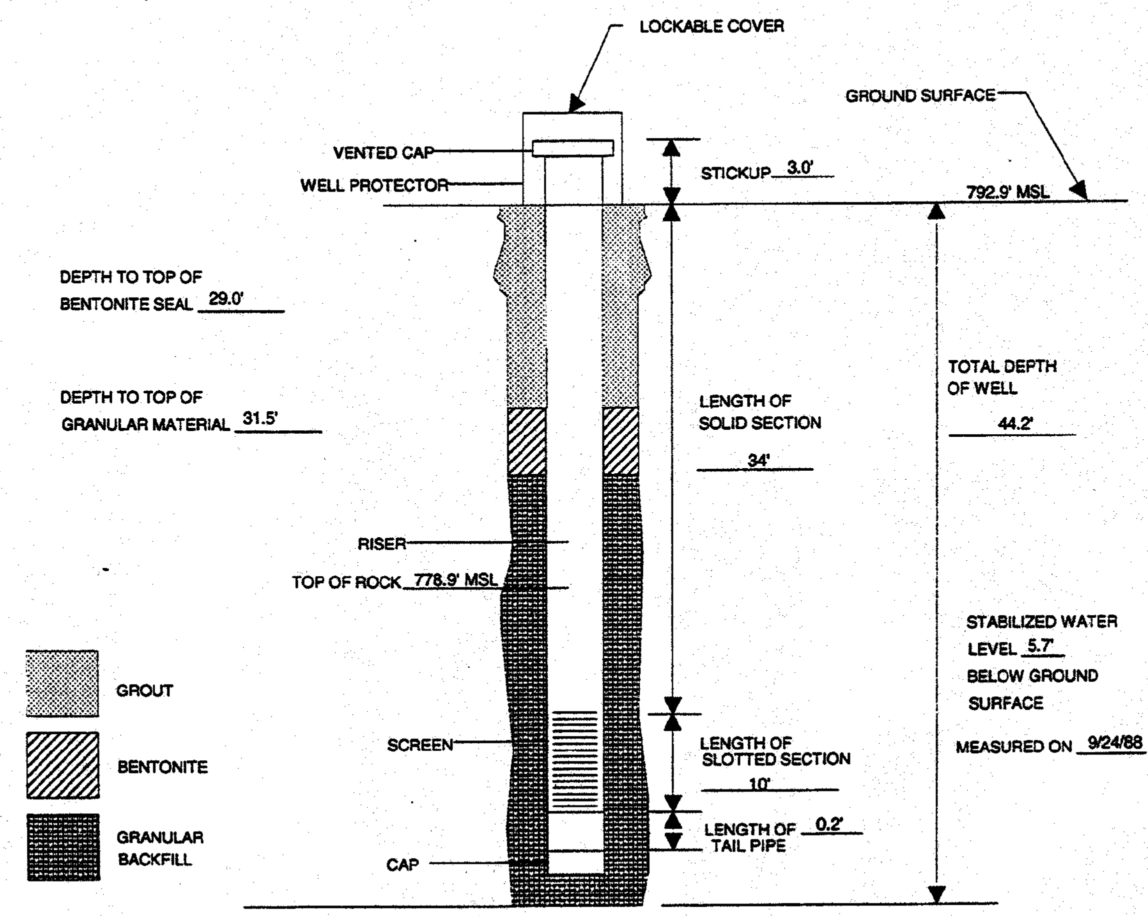
KEY CODE/COMBINATION 2043

RISER MATERIAL PVC

SCREEN MATERIAL PVC

COMMENTS

(NOT TO SCALE)




ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195

WELL NUMBER: J-16 A
INSTALLATION DATE: 10-5-88

LOCATION: PLANT COORDINATES W 27+87,N 40+08 Tennessee Lambert NAD83 Easting 2407752 Northing 578181.56

GROUND SURFACE ELEVATION: 756.6' MSL
TOP OF INNER CASING: 768.6' MSL

GRANULAR BACKFILL MATERIAL: QUARTZ SAND, COARSE
SLOT SIZE: .010 INCH

CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES

DRILLING TECHNIQUE: POWER AUGER
DRILLING CONTRACTOR: HIGHLAND DRILLING

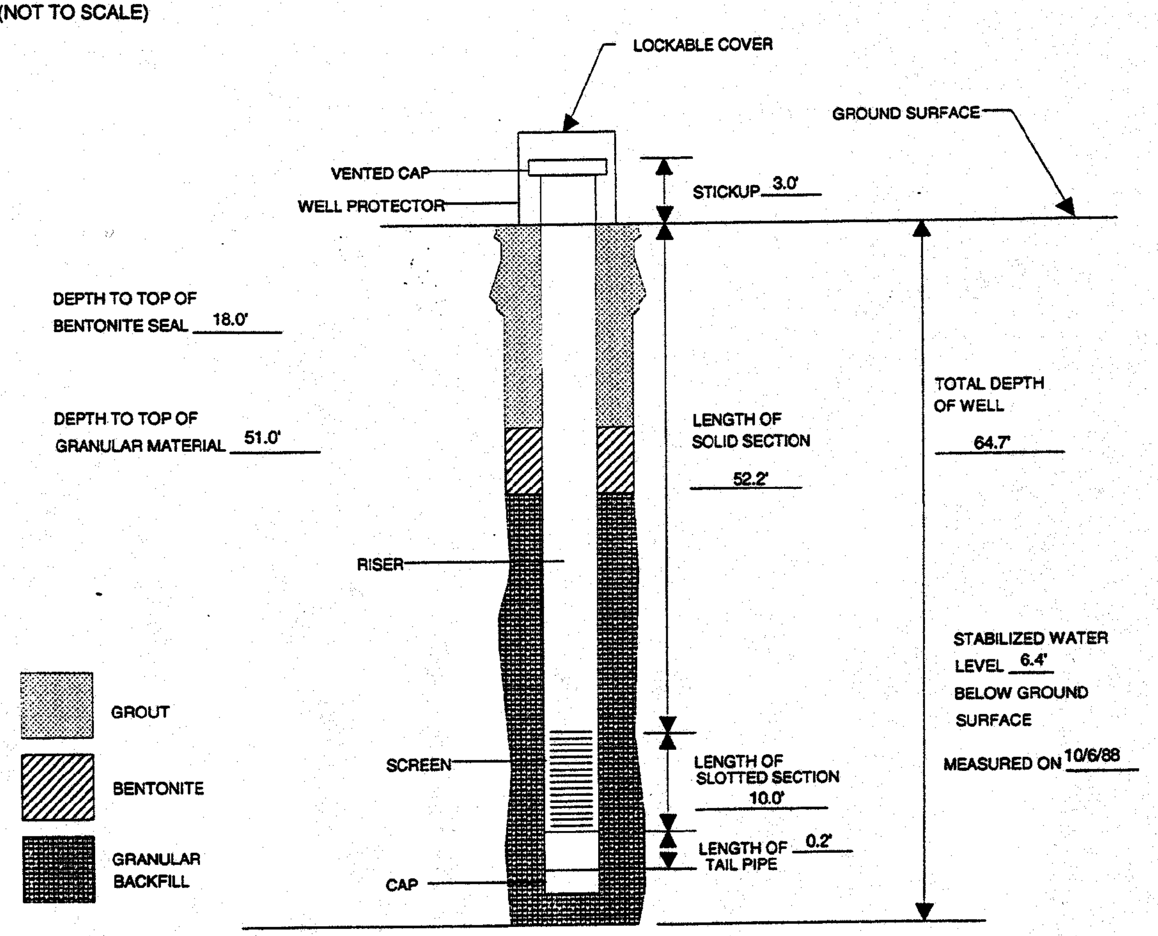
BOREHOLE DIAMETER: 11 INCHES
FIELD REPRESENTATIVE: H.W. ROBINSON

LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043

RISER MATERIAL: PVC
SCREEN MATERIAL: PVC

COMMENTS:

(NOT TO SCALE)

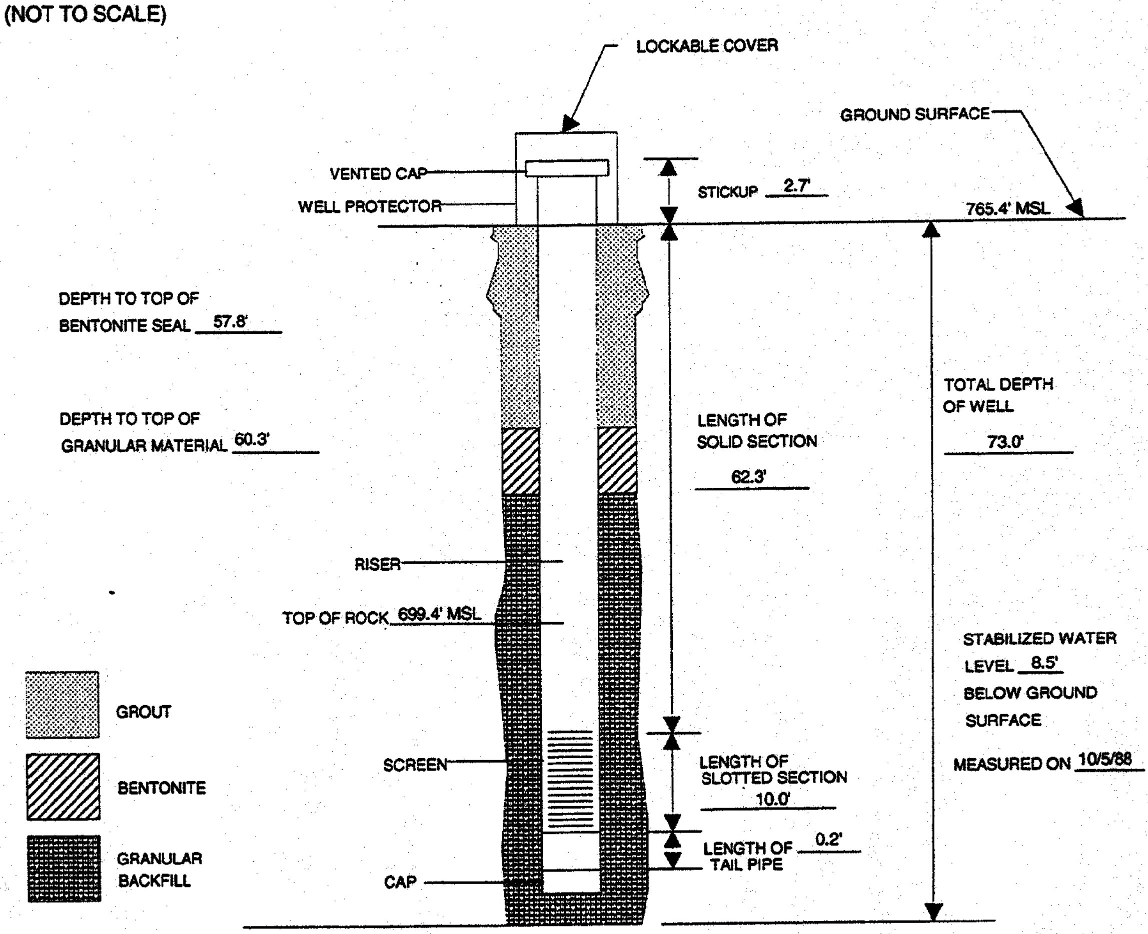



ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: KINGSTON STEAM PLANT
JOB NUMBER: K-88195
WELL NUMBER: J-16 B
INSTALLATION DATE: 9-23-88
LOCATION: PLANT COORDINATES W 27+80,N 40+34 Tennessee Lambert NAD83 Easting 2407751 Northing 578181.05
GROUND SURFACE ELEVATION: 765.4' MSL
TOP OF INNER CASING: 768.1' MSL
GRANULAR BACKFILL MATERIAL: QUARTZ SAND,COARSE
SLOT SIZE: .010 INCHES
CASING MATERIAL: PVC
CASING DIAMETER: 2 INCHES
DRILLING TECHNIQUE: AUGER AND AIR ROTARY
DRILLING CONTRACTOR: HIGHLAND DRILLING
BOREHOLE DIAMETER: 8" AUGER,5 7/8" AIR ROTARY
FIELD REPRESENTATIVE: H.W. ROBINSON
LOCKABLE COVER ?: YES
KEY CODE/COMBINATION: 2043
RISER MATERIAL: PVC
SCREEN MATERIAL: PVC
COMMENTS:

(NOT TO SCALE)




ENG LAB 10/2/90

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: Kingston Fossil Plant

WELL NUMBER: 17 — INSTALLATION DATE: July 8, 1992

LOCATION: Tennessee Lambert NAD83 — Easting 2410795.25 — Northing 578066.65

GROUND SURFACE ELEVATION: 762.42' MSL — TOP OF INNER CASING: 765.42' MSL

GRANULAR BACKFILL MATERIAL: Sand — SLOT SIZE: 0.010 "

CASING MATERIAL: 4" SCH 40 PVC — CASING DIAMETER: 4" SCH 40 PVC

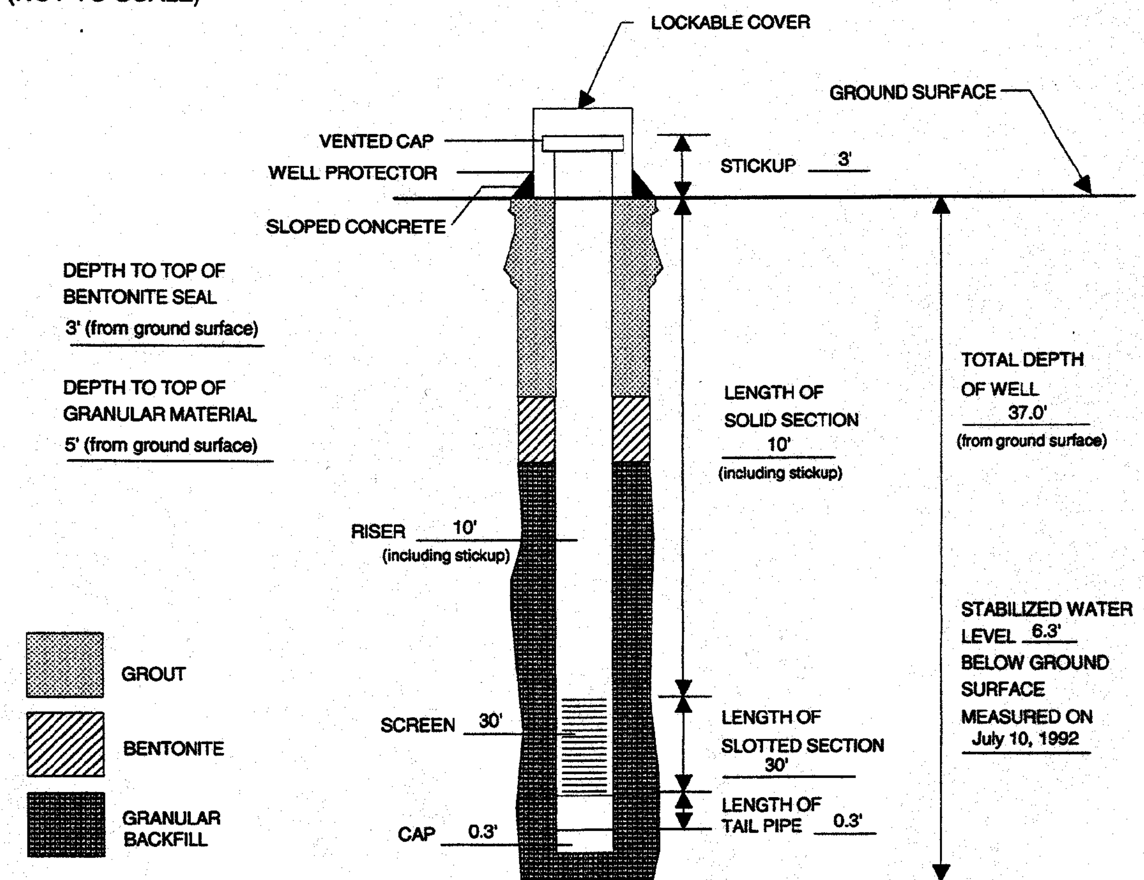
DRILLING TECHNIQUE: HSA — DRILLING CONTRACTOR: John Voekel, Law Engr.

BOREHOLE DIAMETER: 4.25" HSA (ID) — FIELD REPRESENTATIVE: Mel Wagner

LOCKABLE COVER ? Yes — FILTER CLOTH AROUND SCREEN? No

COMMENTS: The 4.25" HSA was used first with the continuous sampling barrel.
Next, the 6.25" (ID) auger was used to provide room for the sand pack around the screen.

(NOT TO SCALE)




ENG LAB 6/19/95

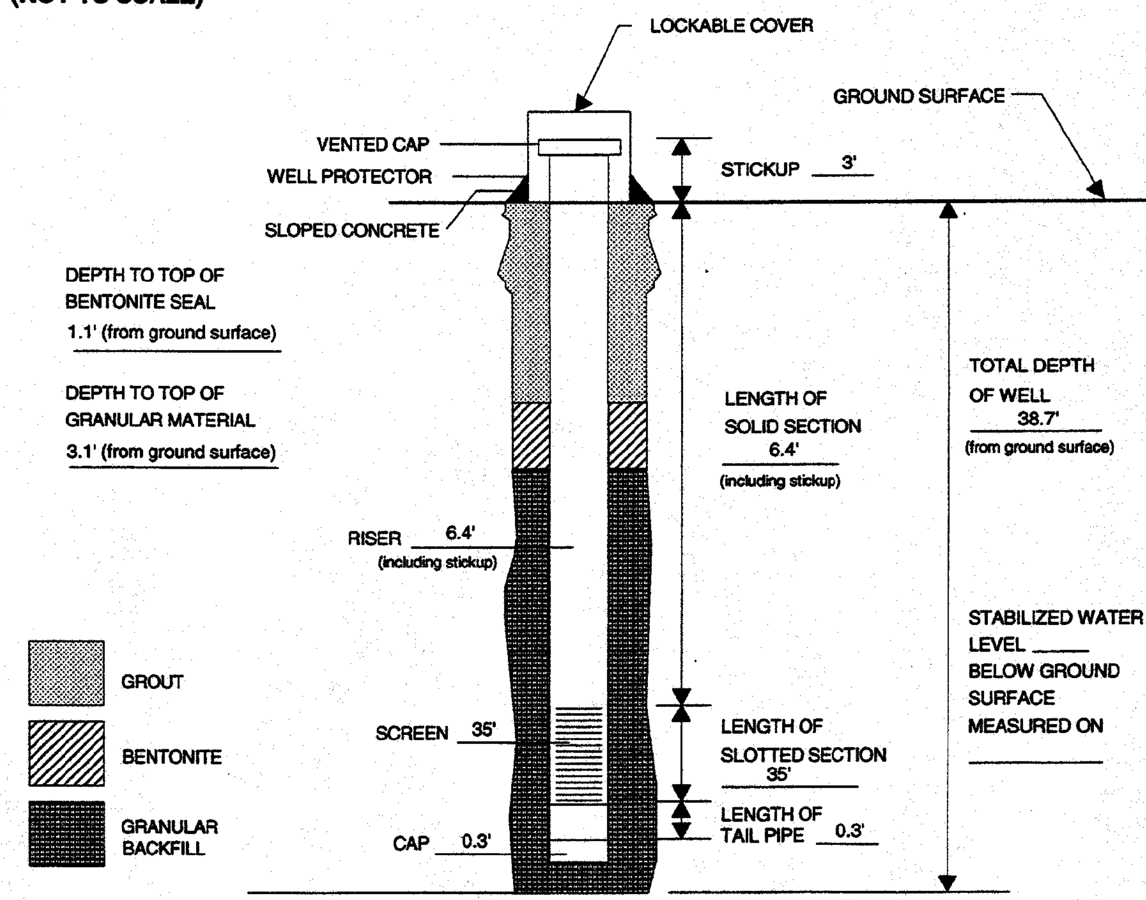
TVA-00015873

# TYPE II MONITORING WELL INSTALLATION RECORD

| | | | |
|---|---|---|---|
| PROJECT | Kingston Fossil Plant | | |
| WELL NUMBER | 18 | INSTALLATION DATE | July 10, 1992 |
| LOCATION | Tennessee Lambert NAD83 | Easting 2410814.93 | Northing 578075.63 |
| GROUND SURFACE ELEVATION | 764.32' MSL | TOP OF INNER CASING | 767.32' MSL |
| GRANULAR BACKFILL MATERIAL | Sand | SLOT SIZE | 0.010 " |
| CASING MATERIAL | 4" SCH 40 PVC | CASING DIAMETER | 4" SCH 40 PVC |
| DRILLING TECHNIQUE | HSA | DRILLING CONTRACTOR | John Voekel, Law Engr. |
| BOREHOLE DIAMETER | 4.25" HSA (ID) | FIELD REPRESENTATIVE | Mel Wagner |
| LOCKABLE COVER ? | Yes | FILTER CLOTH AROUND SCREEN? | No |

COMMENTS The 4.25" HSA was used first with the continuous sampling barrel.
Next, the 6.25" (ID) auger was used to provide room for the sand pack around the screen.

(NOT TO SCALE)




ENG LAB 6/19/96

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: Kingston Fossil Plant

WELL NUMBER: 19 INSTALLATION DATE: July 13, 1992

LOCATION: Tennessee Lambert NAD83 Easting 2410840.11 Northing 578086.78

GROUND SURFACE ELEVATION: 763.90' MSL TOP OF INNER CASING: 766.90' MSL

GRANULAR BACKFILL MATERIAL: Sand SLOT SIZE: 0.010 "

CASING MATERIAL: 4" SCH 40 PVC CASING DIAMETER: 4" SCH 40 PVC

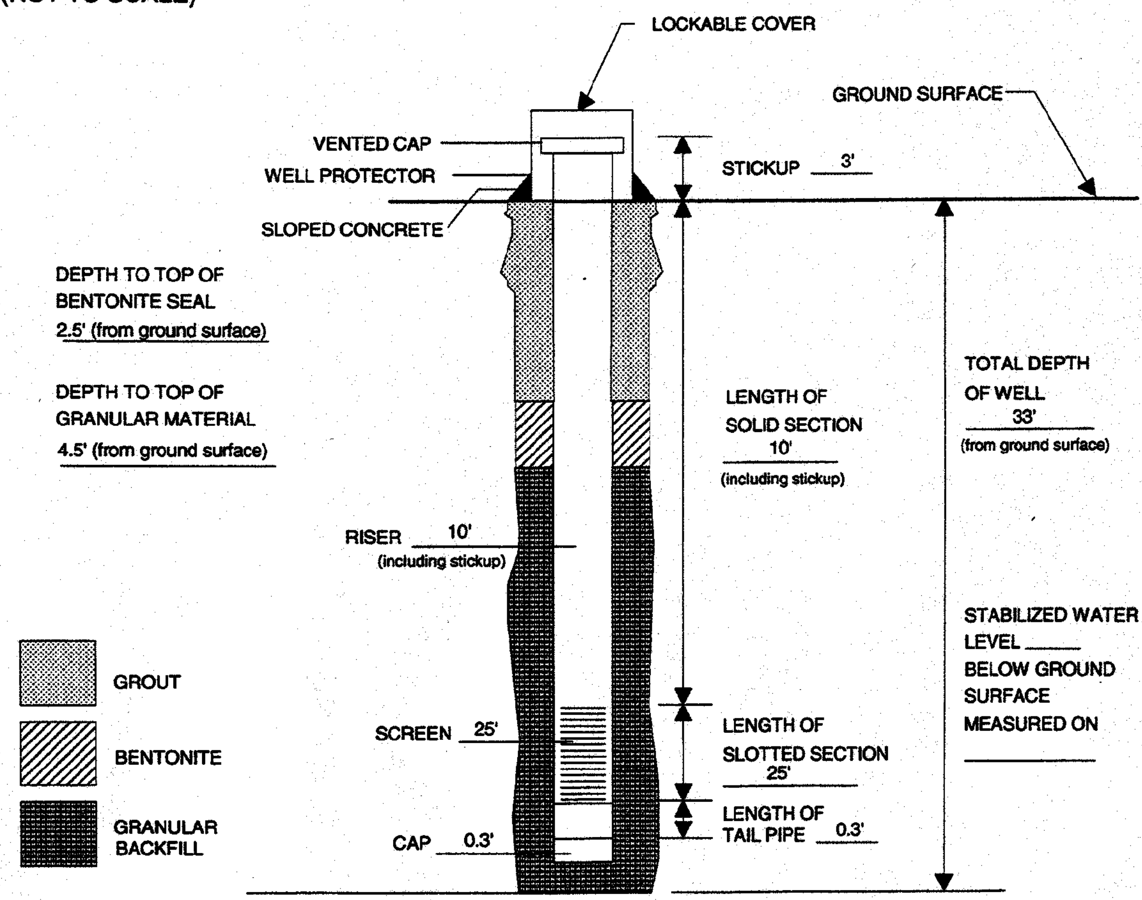
DRILLING TECHNIQUE: HSA DRILLING CONTRACTOR: John Voekel, Law Engr.

BOREHOLE DIAMETER: 4.25" HSA (ID) FIELD REPRESENTATIVE: Mel Wagner

LOCKABLE COVER ? Yes FILTER CLOTH AROUND SCREEN? No

COMMENTS: The 4.25" HSA was used first with the continuous sampling barrel.
Next, the 6.25" (ID) auger was used to provide room for the sand pack around the screen.

(NOT TO SCALE)




ENG LAB 6/19/96

# TYPE II MONITORING WELL INSTALLATION RECORD

PROJECT: Kingston Fossil Plant

WELL NUMBER: 20 — INSTALLATION DATE: July 10, 1992

LOCATION: Tennessee Lambert NAD 83 — Easting 2410890.94 — Northing 578108.22

GROUND SURFACE ELEVATION: 750.06' MSL — TOP OF INNER CASING: 753.06' MSL

GRANULAR BACKFILL MATERIAL: Sand — SLOT SIZE: 0.010 "

CASING MATERIAL: 4" SCH 40 PVC — CASING DIAMETER: 4" SCH 40 PVC

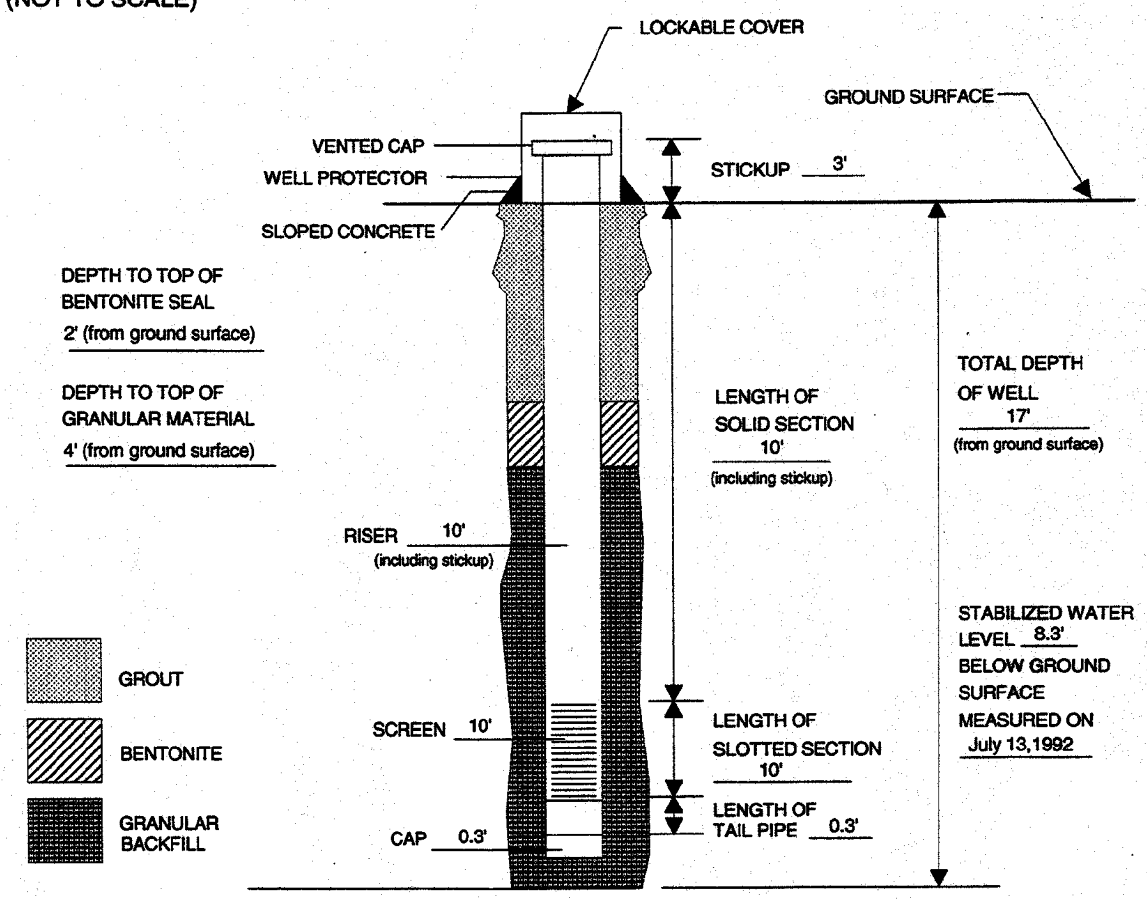
DRILLING TECHNIQUE: HSA — DRILLING CONTRACTOR: John Voekel, Law Engr.

BOREHOLE DIAMETER: 4.25" HSA (ID) — FIELD REPRESENTATIVE: Mel Wagner

LOCKABLE COVER ?: Yes — FILTER CLOTH AROUND SCREEN?: No

COMMENTS: The 4.25" HSA was used first with the continuous sampling barrel.
The 6.25" HSA was not used because the well was drilled in a clay-filled berm.

(NOT TO SCALE)




ENG LAB 6/19/95

# MONITORING WELL INSTALLATION RECORD

PROJECT: Kingston Fossil Plant

WELL NUMBER: KIF-22

INSTALLATION DATE: July 10, 2002

TOP OF INNER CASING: 756.2 ft-msl

CASING MATERIAL: PVC Sch 80

DRILLING TECHNIQUE: Hollow-Stem Auger

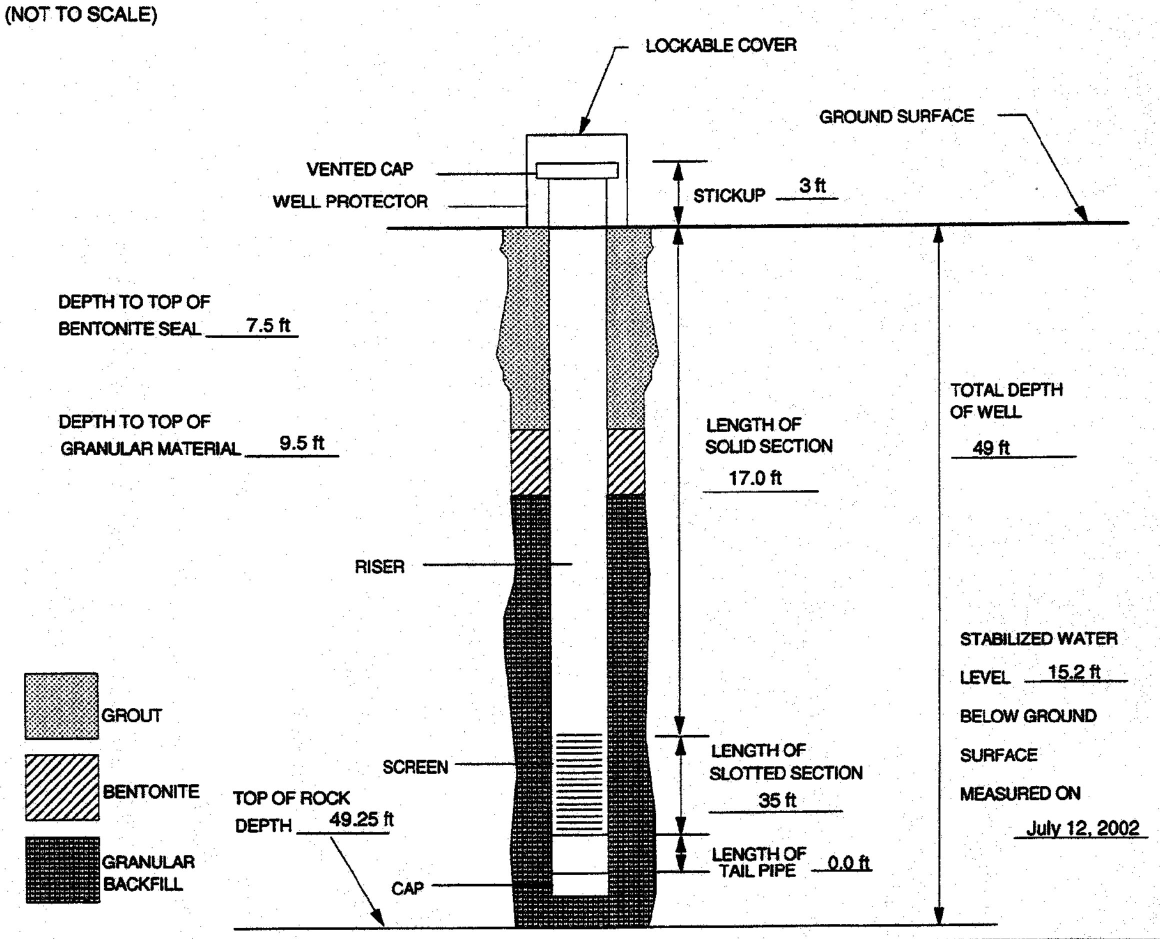
BOREHOLE DIAMETER: 8 1/4 in.

DRILLED BY: Lynn England

LOGGED BY: Jim Overton

COMMENTS: Filter sand was placed into the annulus from the bottom up with a sand injector.
Soil descriptions were taken from split spoon sampler.
Well completed with 4 inch by 4 inch by 5 foot lockable steel well protector and a 4 foot diameter concrete pad.
Four steel bollards were placed around the concrete pad.

(NOT TO SCALE)



# APPENDIX C

## SOIL GRAIN SIZE, MOISTURE CONTENT, AND ATTERBERG LIMITS DATA

**This information taken from "Report of Geotechnical Exploration – Ash Disposal Area – Kingston Fossil Plant, Kingston, Tennessee," MACTEC Engineering and Consulting, Inc., May 4, 2004.**

## LABORATORY TEST PROCEDURES

### Moisture Content

The moisture content in a given mass of soil is the ratio, expressed as a percentage, of the weight of the water to the weight of the solid particles. This test was conducted in accordance with ASTM D 2216.

### Unit Weights

The moist or dry unit weight of a given soil mass is obtained by dividing the weight of the soil mass by the volume. Selected portions of the 3-inch split spoon and Shelby tube samples obtained during the exploration were measured and weighed in our laboratory to determine sample unit weights.

### Specific Gravity of Soil Solids

The specific gravity of soil solids is the ratio of the mass of a unit volume of a soil solid to the mass of the same volume of gas-free distilled water at 20C. The test method for determining the specific gravity of soil solids that passes the 4.75-mm (No. 4) sieve using a water pycnometer is described in ASTM D 854, Method B, and "Test Methods for Specific Gravity of Soil Solids by Water Pycnometer".

### Atterberg Limits

Originally, the Atterberg Limits consisted of seven "limits of consistency" of fine-grained soils. In current engineering usage, the term usually refers only to the liquid limit (LL) and plastic limit (PL). The LL (between the liquid and plastic states) is the water content at which a trapezoidal groove of specified shape, cut in moist soil held in a special cup, is closed after 25 taps on a hard rubber plate. The PL (between plastic and semi-solid states) is the water content at which the soil crumbles when rolled into threads of 1/8 inch in diameter.

The LL has been found to be proportional to the compressibility of the normally consolidated soil. The PI is the calculated difference in water contents between the LL and the PL. Together the LL and PI are used to classify silts and clays according to the Unified Soil Classification System

(ASTM D 2487). The PI is used to predict the potential for volume changes in confined soils beneath foundations or grade slabs. The LL, PL, and PI are determined in accordance with ASTM D 4318.

**Grain Size Distribution**

Grain Size Tests are performed to aid in determining the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D 421 (dry preparation) or ASTM D 2217 (wet preparation). If only the grain size distribution of soils coarser than a number 200 sieve (0.074-mm opening) is desired, the grain size distribution is determined by washing the sample over a number 200 sieve and, after drying, passing the samples through a standard set of nested sieves. If the grain size distribution of the soils finer than the number 200 sieve is also desired, the grain size distribution of the soils coarser than the number 10 sieve is determined by passing the sample through a set of nested sieves. Materials passing the number 10 sieve are dispersed with a dispersing agent and suspended in water, and the grain size distribution calculated from the measured settlement rate of the particles. These tests are conducted in accordance with ASTM D 422.

**Triaxial Shear Tests**

Triaxial shear tests are used to determine the strength characteristics and friction angle of a given soil sample. Triaxial tests are also used to determine the elastic properties of the soil specimen.

Triaxial shear tests are performed on several sections of a relatively undisturbed sample extruded from the sampling tube. The samples are trimmed into cylinders 1.4 to 2.8 inches in diameter and encased in rubber membranes. Each is then placed in a compression chamber and confined by all-around air pressure. The test results are presented in the form of stress-strain curves and Mohr envelopes, or p-q plots on the accompanying Triaxial Shear Test Sheets.

One of three types of triaxial tests is normally performed, the most suitable type being determined by the loading conditions imposed on the soil in the field and the soil characteristics.

1. Consolidated-Undrained (Designated as a CU or R Test)
2. Consolidated-Drained (designated as a CD or S Test)
3. Unconsolidated-Undrained (designated as a UU or Q Test)

**Consolidation Test**

Consolidation tests are conducted on representative soil samples to determine the change in height of the sample with increasing load. The results of these tests are used to estimate the amount and rate of settlement of structures constructed on similar soils.

A consolidation test is conducted according to ASTM D-2435 on a single section of an undisturbed sample extruded from a sample tube. The sample is trimmed into a disc 2.0 or 2.5 inches in diameter and 1 inch thick. The disc is confined in a steel ring and sandwiched between porous plates. Depending on the conditions in the field, the test may be conducted with a sample either at its natural moisture content or saturated. It is then subjected to incrementally increasing vertical loads, and the resulting deformations are measured with a micrometer dial gauge. Void ratios are then calculated from these deformation readings. The test results are presented in the form of pressure-versus-void-ratio curves on the accompanying Consolidation Test Sheet.

**Falling Head Permeability Test**

The test sample was taken from the bottom of the undisturbed sample. The physical dimensions and weight were obtained and the sample was encased in a rubber membrane and placed in a triaxial chamber. The sample was then back-pressure saturated until a B value of 0.95 or greater was reached. After saturation was obtained, the sample was consolidated under 10-psi confining stress. Upon completion of consolidation, a falling head permeability test was performed. The test was conducted in accordance with ASTM D 5084.

## TABLE 3
## NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS LABORATORY TEST RESULTS

| Boring Number | Sample Number | Sample Type | Sample Description/ Origin | Sample Depth (Feet) | Moisture Content (%) | Atterberg Limits Liquid Limit (LL) | Plastic Limit (PL) | Plasticity Index (PI) |
|---|---|---|---|---|---|---|---|---|
| B-1 | UD-1 | UD | ASH | 4-4.5 | 19 | NT | NT | NT |
| B-1 | UD-2 | UD | Alluvium | 65-67 | 20 | NV | NP | NP |
| B-2 | UD-4 | UD | Alluvium | 70-72 | 17 | NV | NP | NP |
| B-3 | 1 | SPT | ASH | 0-1.5 | 24 | NT | NT | NT |
| B-3 | 2 | SPT | ASH | 5-6.5 | 20 | NT | NT | NT |
| B-3 | 3 | SPT | ASH | 10-11.5 | 16 | NT | NT | NT |
| B-3 | 4 | SPT | ASH | 15-16.5 | 17 | NT | NT | NT |
| B-3 | 5 | SPT | ASH | 20-21.5 | 39 | NT | NT | NT |
| B-3 | 6 | SPT | ASH | 25-26.5 | 40 | NT | NT | NT |
| B-3 | 7 | SPT | ASH | 30-31.5 | 34 | NT | NT | NT |
| B-3 | 8 | SPT | ASH | 35-36.5 | 22 | NT | NT | NT |
| B-3 | 9 | SPT | ASH | 40-41.5 | 22 | NT | NT | NT |
| B-3 | 10 | SPT | ASH | 45-46.5 | 31 | NT | NT | NT |
| B-3 | 11 | SPT | ASH | 50-51.5 | 39 | NT | NT | NT |
| B-3 | 12 | SPT | ASH | 55-56.5 | 43 | NT | NT | NT |
| B-3 | 13 | SPT | FILL/ASH | 60-61.5 | 30 | NT | NT | NT |
| B-3 | 14 | SPT | ASH | 65-66.5 | 16 | NT | NT | NT |
| B-4A | UD-1 | UD | ASH | 15-17 | 37 | NT | NT | NT |
| B-4A | UD-3 | UD | ASH | 25-27 | 38 | NT | NT | NT |
| B-5 | 1 | SPT | ASH | 0-1.5 | 22 | NT | NT | NT |
| B-5 | 2 | SPT | ASH | 5-6.5 | 39 | NT | NT | NT |
| B-5 | 3 | SPT | ASH | 10-11.5 | 25 | NT | NT | NT |
| B-5 | 4 | SPT | ASH | 15-16.5 | 32 | NT | NT | NT |
| B-5 | 5 | SPT | ASH | 20-21.5 | 30 | NT | NT | NT |
| B-5 | 6 | SPT | ASH | 25-26.5 | 39 | NT | NT | NT |
| B-5 | 7 | SPT | ASH | 30-31.5 | 41 | NT | NT | NT |
| B-5 | 8 | SPT | ASH | 35-36.5 | 29 | NT | NT | NT |
| B-5 | 9 | SPT | ASH | 40-41.5 | 34 | NT | NT | NT |
| B-8 | 1 | SPT | ASH | 0-1.5 | 25 | NT | NT | NT |
| B-8 | 2 | SPT | ASH | 5.8-7.3 | 20 | NT | NT | NT |
| B-8 | UD-2 | UD | ASH | 10-12 | 19 | NT | NT | NT |
| B-8 | 3 | SPT | ASH | 12-13.5 | 22 | NT | NT | NT |
| B-8 | 4 | SPT | ASH | 15-16.5 | 45 | NT | NT | NT |
| B-8 | UD-3 | UD | ASH | 20-22 | 32 | NT | NT | NT |

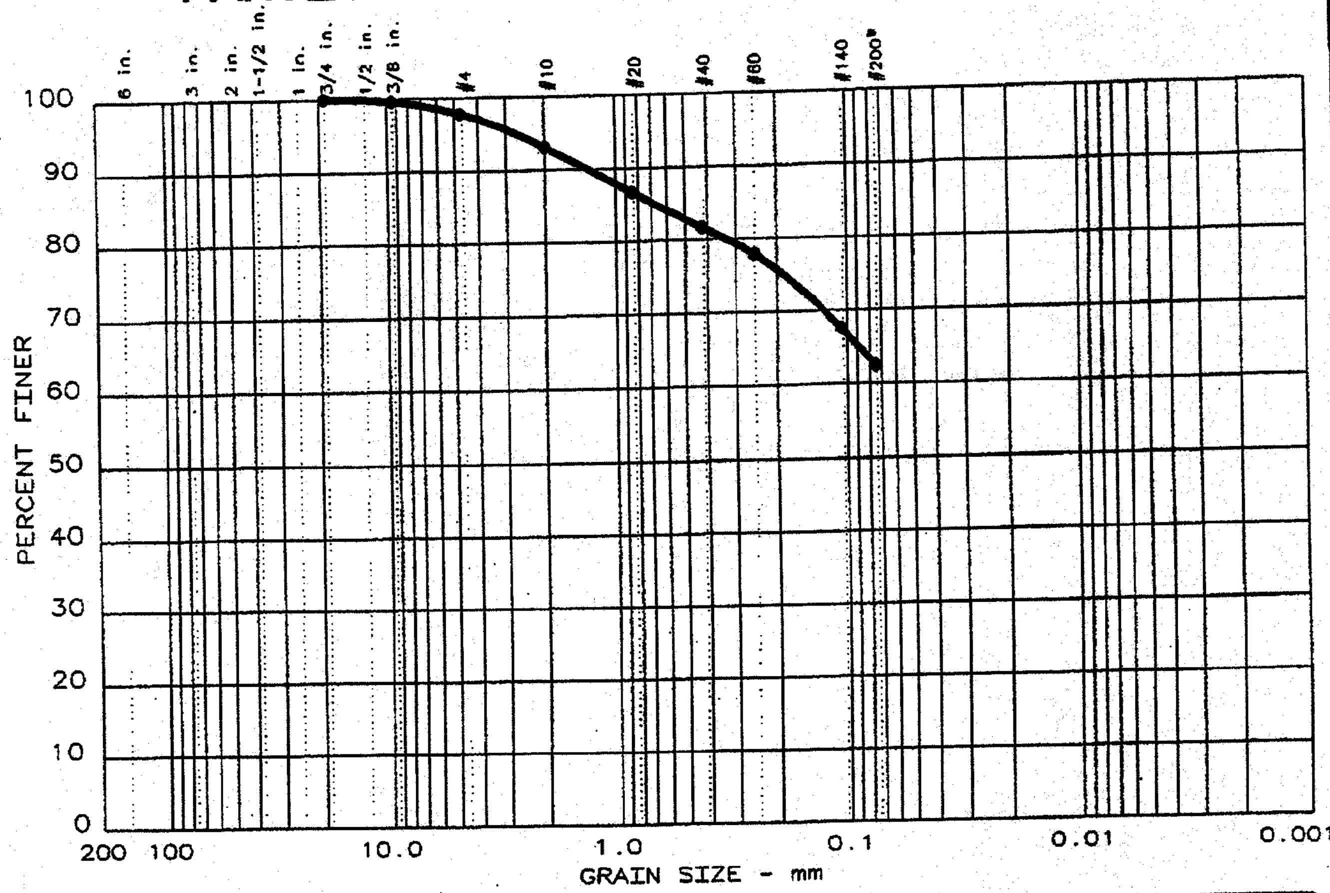
**TABLE 3**
**NATURAL MOISTURE CONTENT AND**
**ATTERBERG LIMITS LABORATORY TEST RESULTS**

| Boring Number | Sample Number | Sample Type | Sample Description/ Origin | Sample Depth (Feet) | Moisture Content (%) | Atterberg Limits | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Liquid Limit (LL) | Plastic Limit (PL) | Plasticity Index (PI) |
| B-8 | 5 | SPT | ASH | 22-23.5 | 43 | NT | NT | NT |
| B-8 | 6 | SPT | ASH | 25.6-27.1 | 27 | NT | NT | NT |
| B-8 | 7 | SPT | ASH | 30-31.5 | 25 | NT | NT | NT |
| B-8A | 1 | SPT | ASH | 35-36.5 | 37 | NT | NT | NT |
| B-8A | 2 | SPT | ASH | 40-41.5 | 47 | NT | NT | NT |
| B-8A | 3 | SPT | ASH | 45-46.5 | 37 | NT | NT | NT |
| B-8A | 4 | SPT | ASH | 50-51.5 | 36 | NT | NT | NT |
| B-8A | 5 | SPT | Alluvium | 57-58.5 | 24 | 26 | 15 | 11 |
| B-8A | 6 | SPT | Alluvium | 62-63.5 | 24 | | | |
| B-8A | UD-2 | UD | Alluvium | 60-62 | 22 | 26 | 16 | 10 |
| B-8A | 7 | SPT | Alluvium | 65-66.5 | 27 | NV | NP | NP |
| B-8A | 8 | SPT | Alluvium | 70-70.9 | 17 | | | |
| B-10 | 1 | SPT | ASH | 0-1.5 | 18 | NT | NT | NT |
| B-10 | UD-1 | UD | ASH | 5-7 | 25 | NT | NT | NT |
| B-10 | 2 | SPT | ASH | 7-8.5 | 28 | NT | NT | NT |
| B-10 | UD-2 | UD | ASH | 10-12 | 25 | NT | NT | NT |
| B-10 | 3 | SPT | ASH | 12-13.5 | 30 | NT | NT | NT |
| B-10 | UD-3 | UD | ASH | 15-17 | 38 | NT | NT | NT |
| B-10 | 4 | SPT | ASH | 17-18.5 | 45 | NT | NT | NT |
| B-10 | UD-4 | UD | ASH | 20-22 | 37 | NT | NT | NT |
| B-10 | 5 | SPT | ASH | 22-23.5 | 32 | NT | NT | NT |
| B-10 | 6 | SPT | ASH | 25-26.5 | 48 | NT | NT | NT |
| B-10 | 7 | SPT | Alluvium | 30-31.5 | 25 | NT | NT | NT |
| B-10 | UD-5 | UD | Alluvium | 35-37 | 22 | NV | NP | NP |
| B-10 | 8 | SPT | Alluvium | 37-38.5 | 20 | NT | NT | NT |

NT - Not Tested
NV – Non-Viscous
NP - Non-Plastic
SPT - Standard Penetration Test

Prepared By CTJ Date 5/4/04 Checked By MBH Date 5/4/04

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 15 | 0.0 | 2.2 | 35.3 | 62.5 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 0.668 | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Bottom Ash with Fly Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1A & B Bulk @ 0'-5'

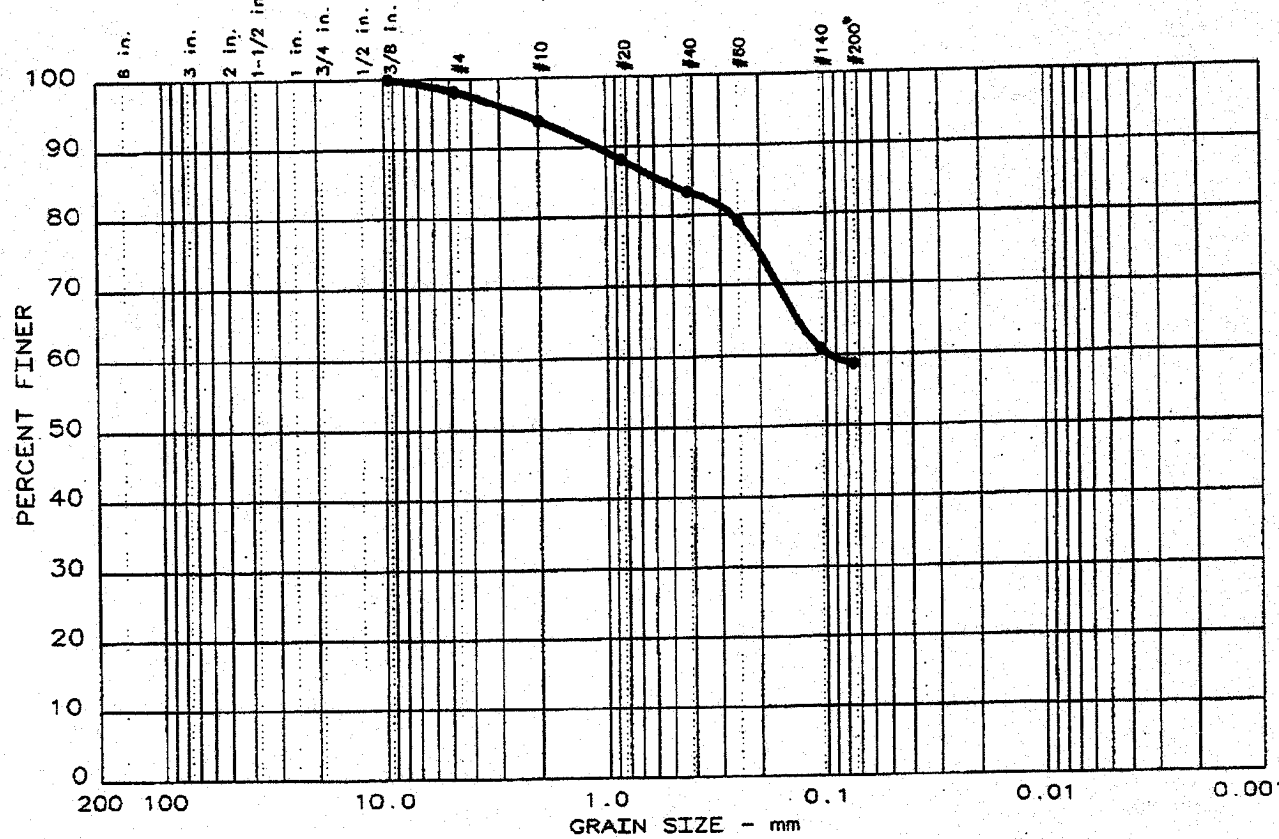
Date: 04-19-04

Remarks:
Specific Gravity: 2.35

PARTICLE SIZE ANALYSIS REPORT
LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 6 | 0.0 | 1.8 | 39.4 | 58.8 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 0.550 | 0.0966 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Fly Ash with Bottom Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1 UD @ 4'-4.5'

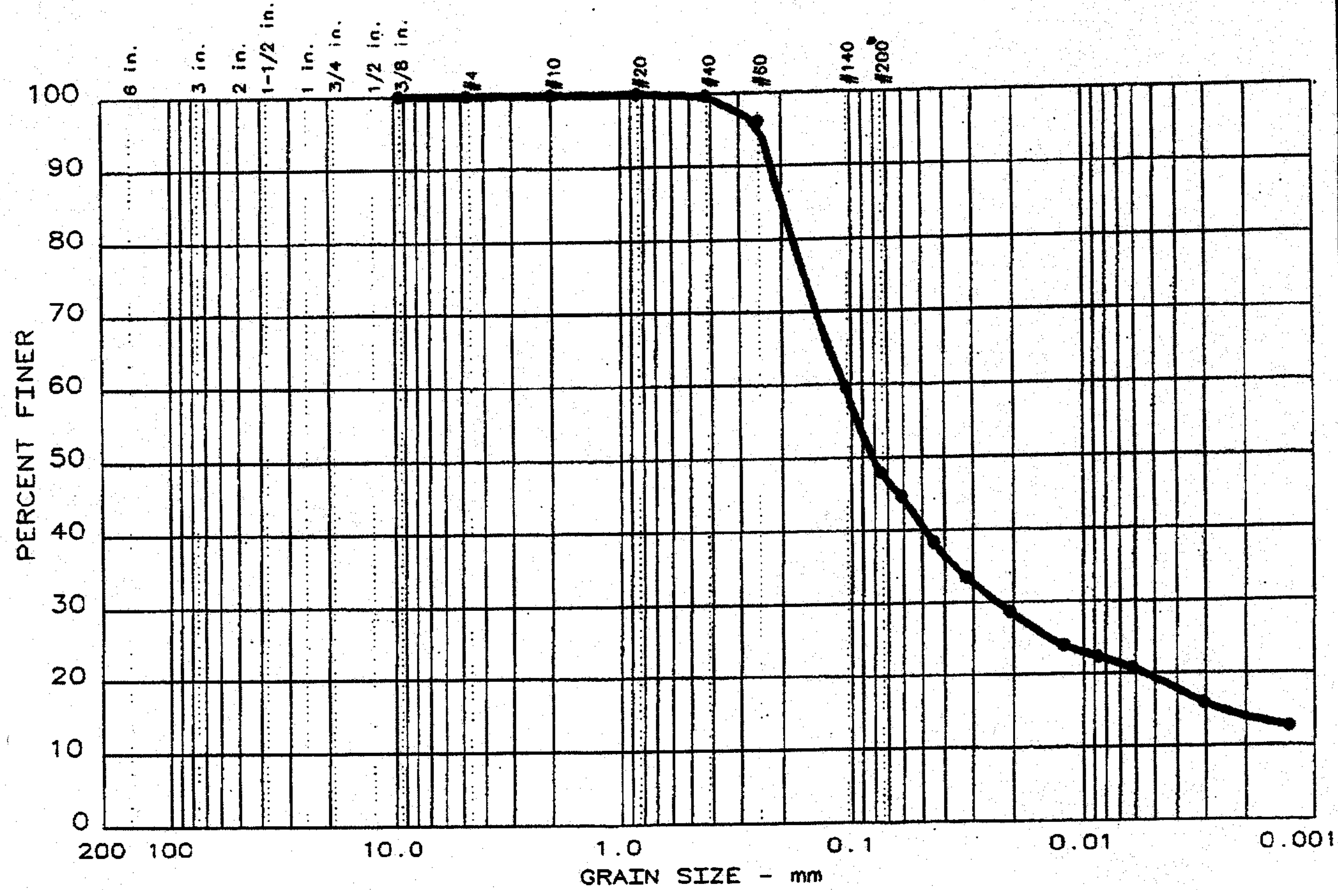
Date: 04-19-04

Remarks:
Moisture Content: 19.0%

PARTICLE SIZE ANALYSIS REPORT
LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 5 | 0.0 | 0.0 | 52.1 | 28.6 | 19.3 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 0.198 | 0.107 | 0.0814 | 0.0235 | 0.0026 | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Orange-Grey Silty Fine Sand | SM | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1 UD @ 65'-67'

Date: 04-19-04

Remarks:

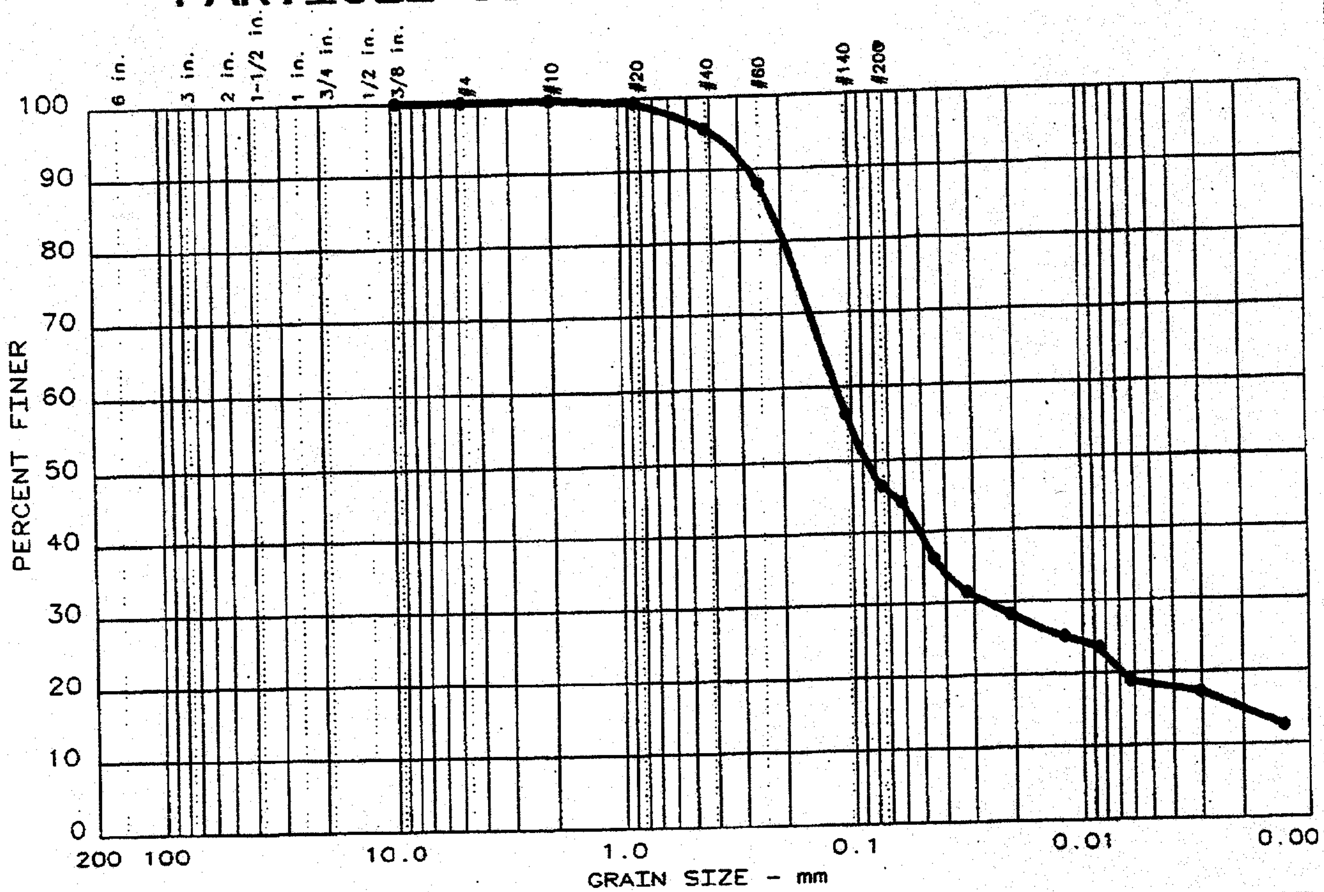
Moisture Content: 20.0%

PARTICLE SIZE ANALYSIS REPORT

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 2 | 0.0 | 0.0 | 53.5 | 28.1 | 18.4 |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 0.224 | 0.116 | 0.0878 | 0.0265 | 0.0020 | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Orange-Brown Silty Fine Sand | SM | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-2 UD @ 70'-72'

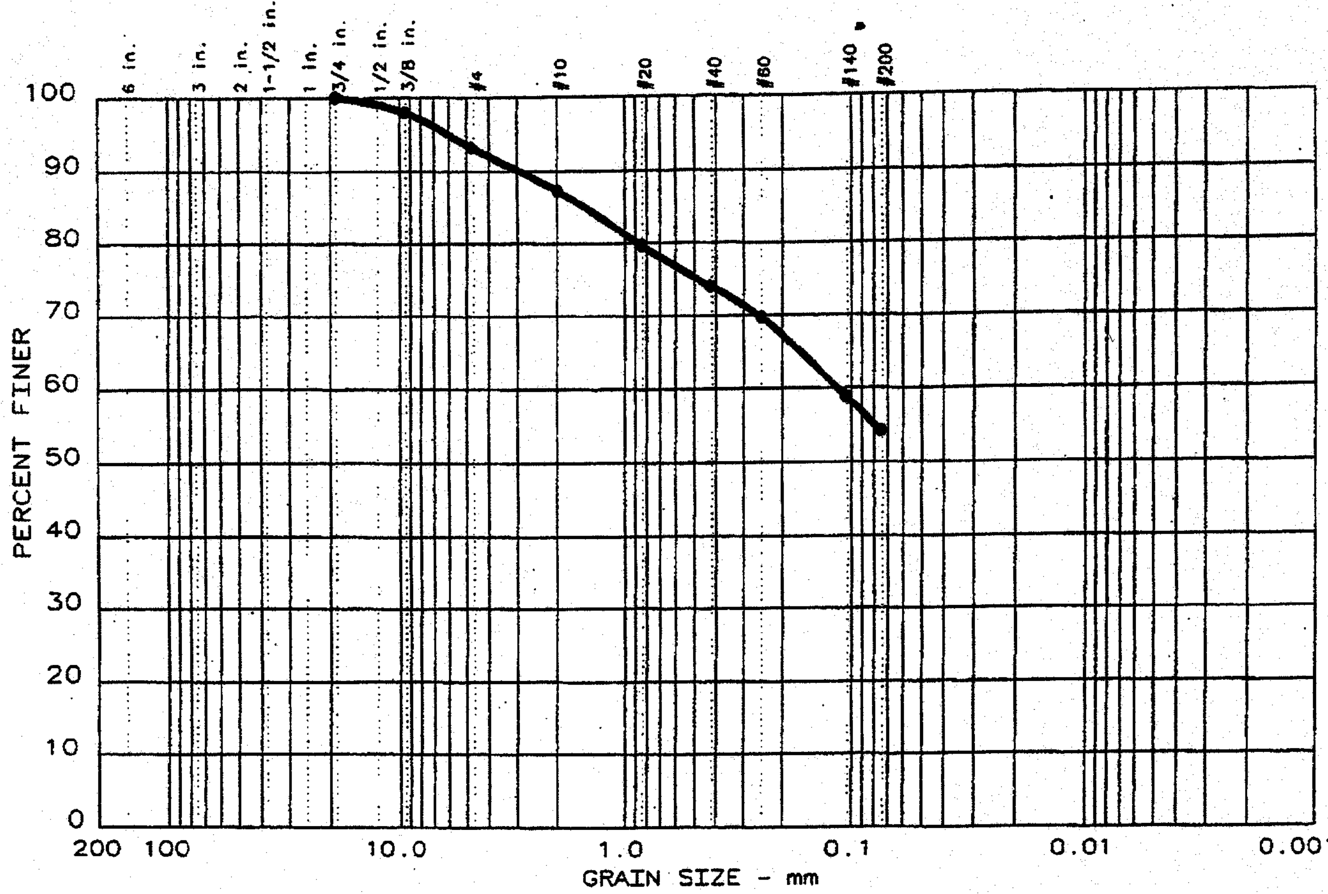
Date: 04-19-04

Remarks:
Moisture Content: 16.8%

PARTICLE SIZE ANALYSIS REPORT
**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 16 | 0.0 | 6.8 | 38.9 | 54.3 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 1.51 | 0.114 | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Bottom Ash with Fly Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-2A Bulk @ 0'-5'

Date: 04-19-04

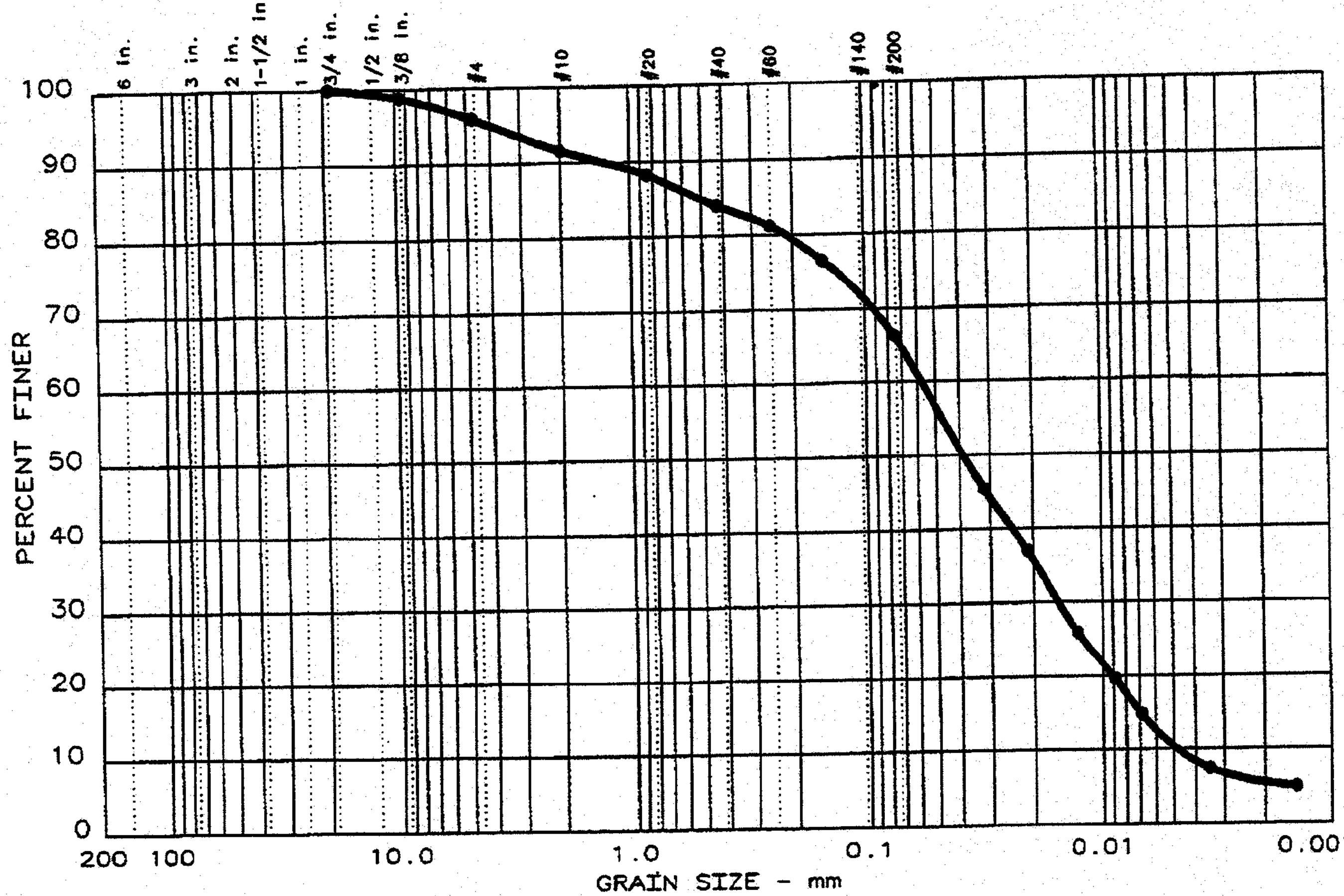
Remarks:
Specific Gravity: 2.40

PARTICLE SIZE ANALYSIS REPORT

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: ______

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 4 | 0.0 | 4.0 | 29.7 | 56.0 | 10.3 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.75 | 100.0 | | |
| 0.375 | 98.8 | | |
| | GRAIN SIZE | | |
| $D_{60}$ | 0.0569 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0048 | | |
| | COEFFICIENTS | | |
| $C_c$ | 0.89 | | |
| $C_u$ | 11.8 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 96.0 | | |
| 10 | 91.6 | | |
| 20 | 88.3 | | |
| 40 | 84.0 | | |
| 60 | 81.3 | | |
| 100 | 76.5 | | |
| 200 | 66.3 | | |

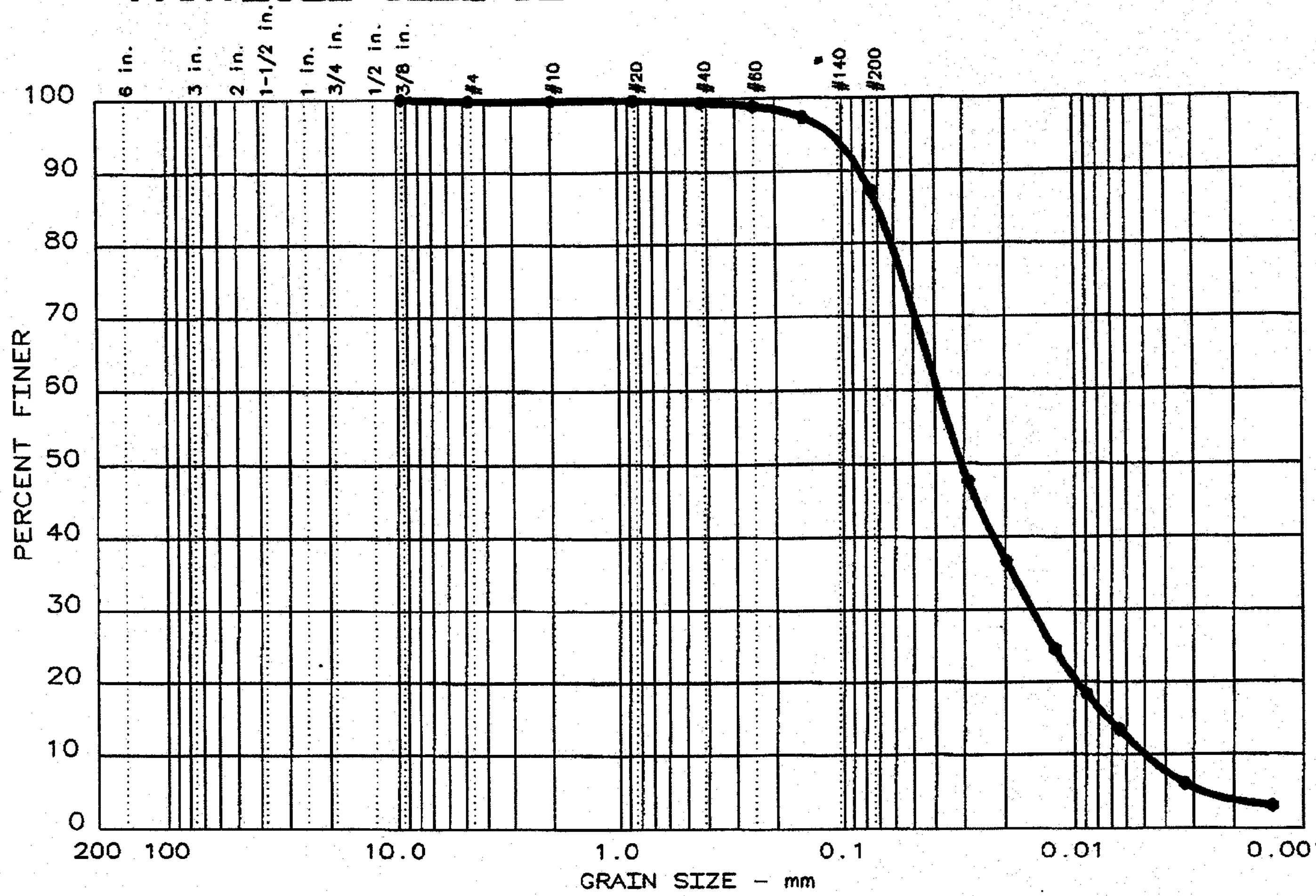
Sample information:
● B-3, 5-6.5' & 10-11.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size:
ASTM D 422-63(2002);
Specific Gravity of
Portion < No. 10: 2.40

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B3

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 5 | 0.0 | 0.2 | 12.6 | 77.1 | 10.1 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.375 | 100.0 | | |
| | GRAIN SIZE | | |
| $D_{60}$ | 0.0391 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0049 | | |
| | COEFFICIENTS | | |
| $C_c$ | 1.23 | | |
| $C_u$ | 8.0 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 99.8 | | |
| 10 | 99.7 | | |
| 20 | 99.7 | | |
| 40 | 99.4 | | |
| 60 | 98.9 | | |
| 100 | 97.3 | | |
| 200 | 87.2 | | |

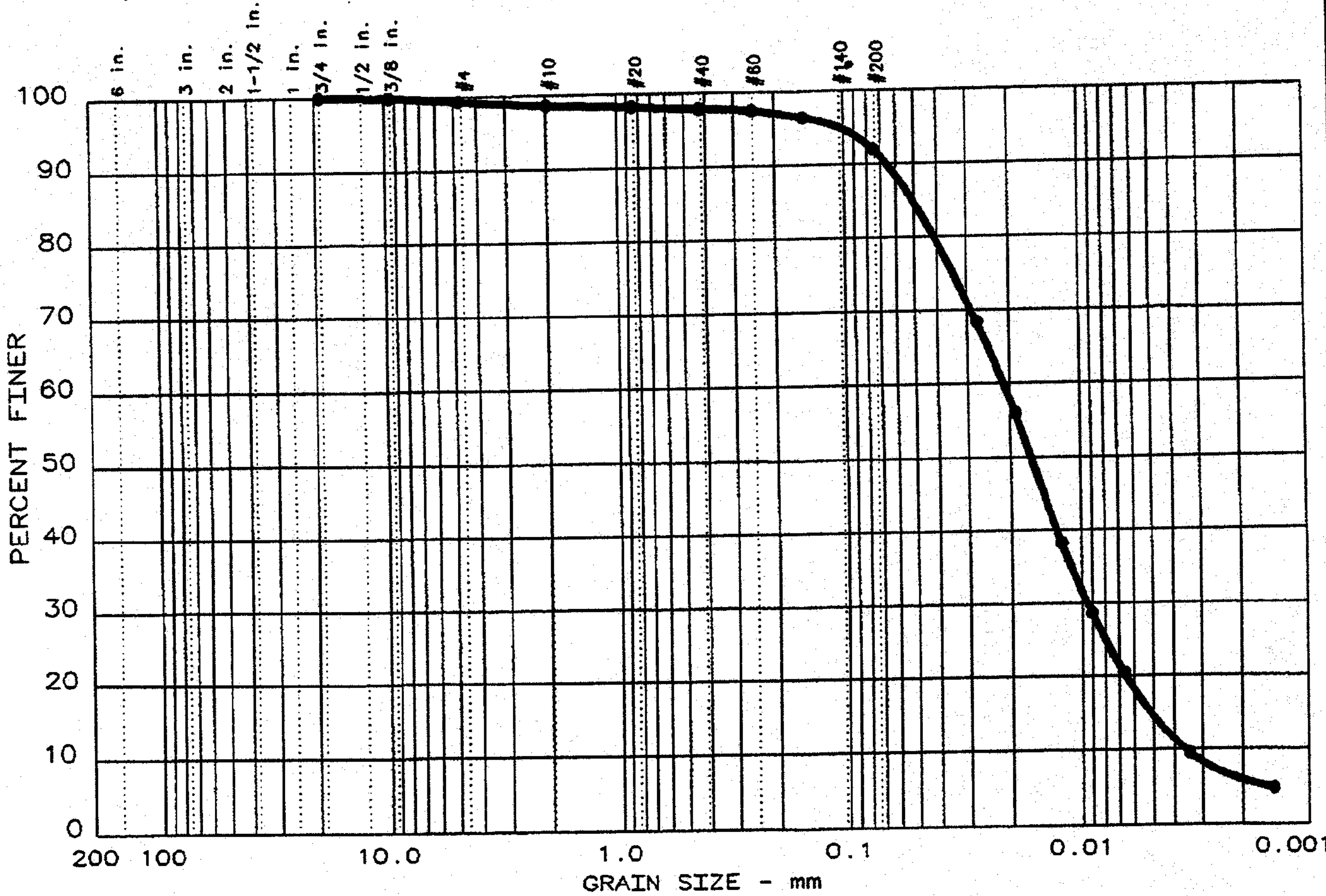
Sample information:
● B-3, 15-16.5' & 20-21.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.58

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B3

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 6 | 0.0 | 0.7 | 7.3 | 77.4 | 14.6 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.75 | 100.0 | | |
| 0.375 | 99.9 | | |

| | GRAIN SIZE | | |
|---|---|---|---|
| $D_{60}$ | 0.0211 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0036 | | |

| | COEFFICIENTS | | |
|---|---|---|---|
| $C_c$ | 1.20 | | |
| $C_u$ | 5.9 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 99.3 | | |
| 10 | 98.6 | | |
| 20 | 98.3 | | |
| 40 | 97.9 | | |
| 60 | 97.5 | | |
| 100 | 96.4 | | |
| 200 | 92.0 | | |

Sample information:
● B-3,25-26.5' & 30-31.5'
Gray ash
SPT Samples

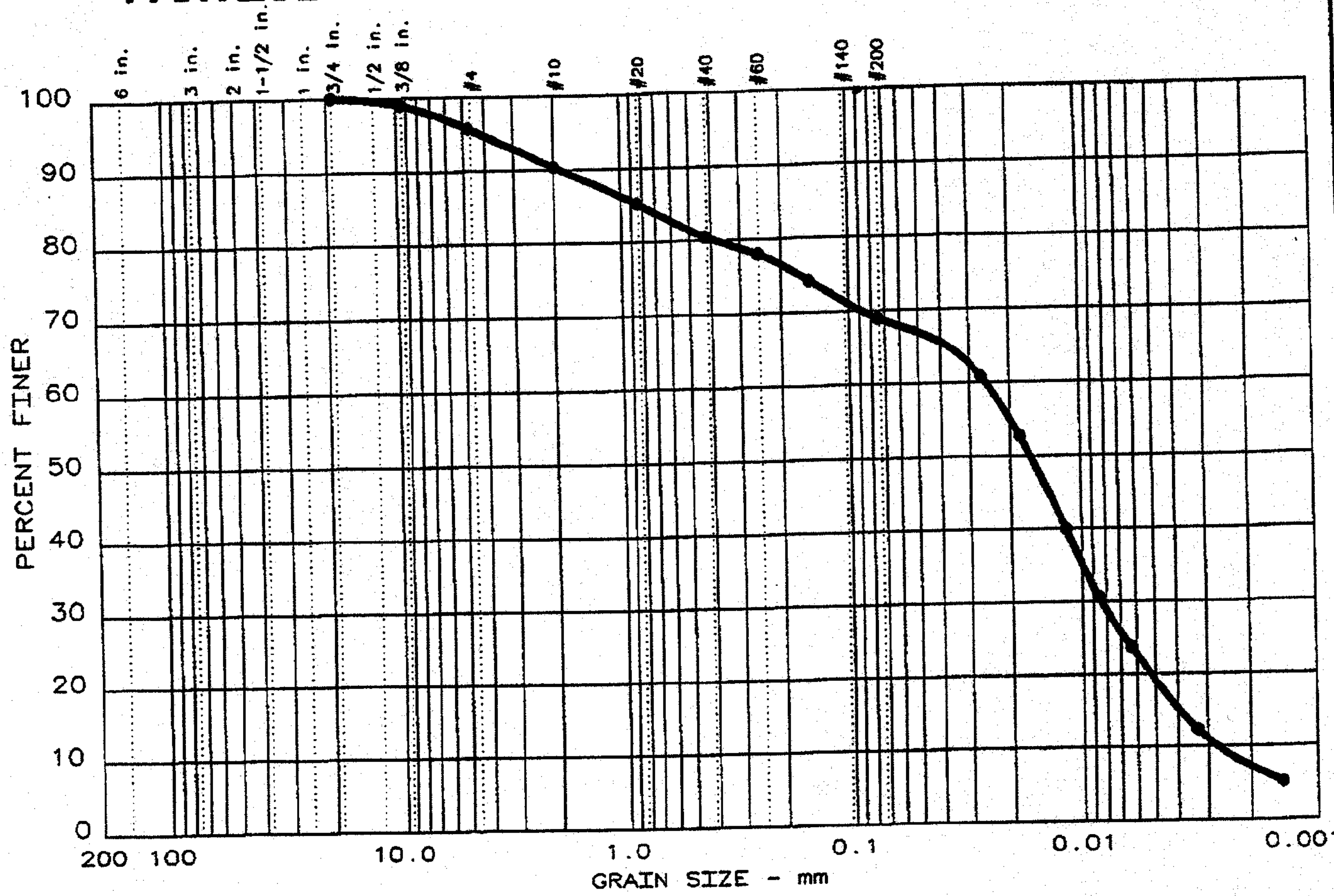
Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.42

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 21, 2004 Fig. No.: B3

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 7 | 0.0 | 4.2 | 26.8 | 49.7 | 19.3 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.75 | 100.0 | | |
| 0.375 | 99.0 | | |
| | GRAIN SIZE | | |
| $D_{60}$ | 0.0251 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0027 | | |
| | COEFFICIENTS | | |
| $C_c$ | 1.01 | | |
| $C_u$ | 9.2 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 95.8 | | |
| 10 | 90.4 | | |
| 20 | 85.2 | | |
| 40 | 80.5 | | |
| 60 | 78.0 | | |
| 100 | 74.3 | | |
| 200 | 69.0 | | |

Sample information:
● B-3, 40-41.5' & 45-46.5'
Gray ash
SPT Samples

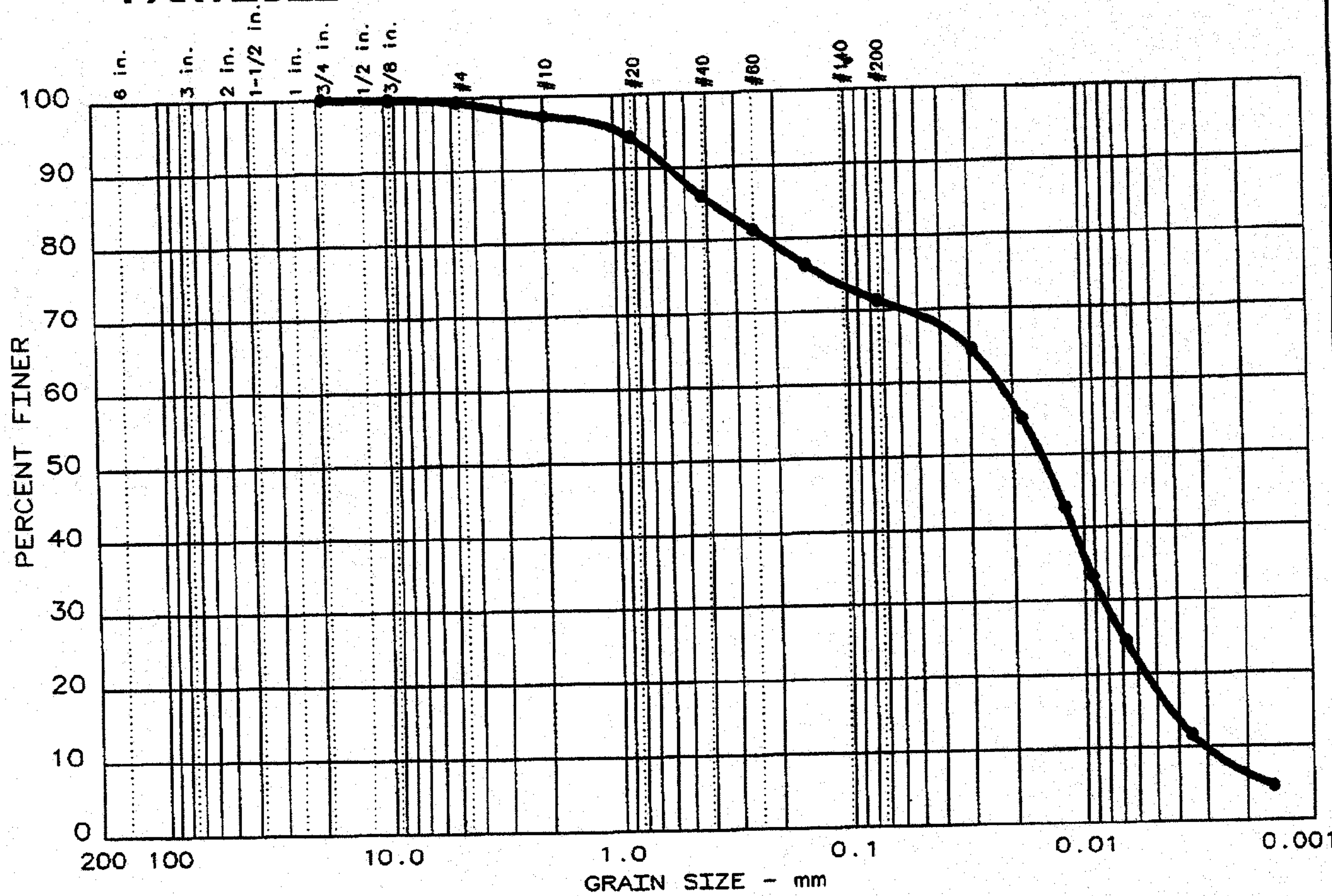
Remarks:
Methods: Particle Size:
ASTM D 422-63(2002);
Specific Gravity of
Portion < No. 10: 2.40

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 21, 2004 Fig. No.: B3

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 11 | 0.0 | 0.7 | 27.9 | 53.6 | 17.8 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.75 | 100.0 | | |
| 0.375 | 99.8 | | |
| | GRAIN SIZE | | |
| $D_{60}$ | 0.0226 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0031 | | |
| | COEFFICIENTS | | |
| $C_c$ | 1.01 | | |
| $C_u$ | 7.4 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 99.3 | | |
| 10 | 97.3 | | |
| 20 | 94.3 | | |
| 40 | 86.0 | | |
| 60 | 81.3 | | |
| 100 | 76.4 | | |
| 200 | 71.4 | | |

Sample information:
● B-3,50-51.5. & 55-56.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size:
ASTM D 422-63(2002);
Specific Gravity of
Portion < No. 10: 2.27

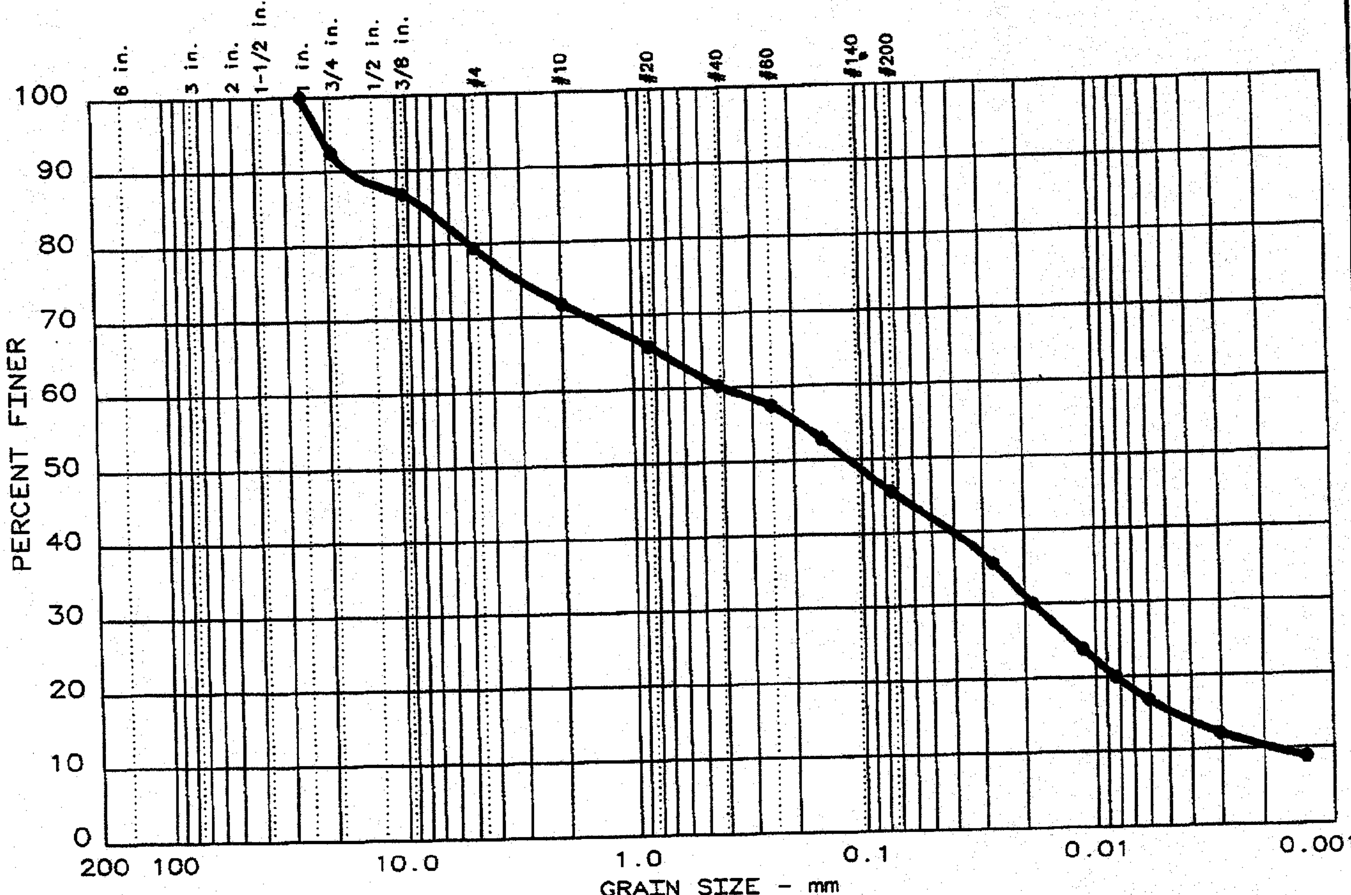
**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 15, 2004

Fig. No.: B3

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 8 | 0.0 | 20.6 | 33.8 | 30.3 | 15.3 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 1 | 100.0 | | |
| 0.75 | 92.5 | | |
| 0.375 | 86.8 | | |

| | GRAIN SIZE | | |
|---|---|---|---|
| $D_{60}$ | 0.403 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0017 | | |

| | COEFFICIENTS | | |
|---|---|---|---|
| $C_c$ | 0.48 | | |
| $C_u$ | 234.4 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 79.4 | | |
| 10 | 71.8 | | |
| 20 | 65.7 | | |
| 40 | 60.3 | | |
| 60 | 57.4 | | |
| 100 | 52.8 | | |
| 200 | 45.6 | | |

Sample information:
● B-3, 60-61.5' & 65-66.5'
Gray and brown ash
SPT Samples

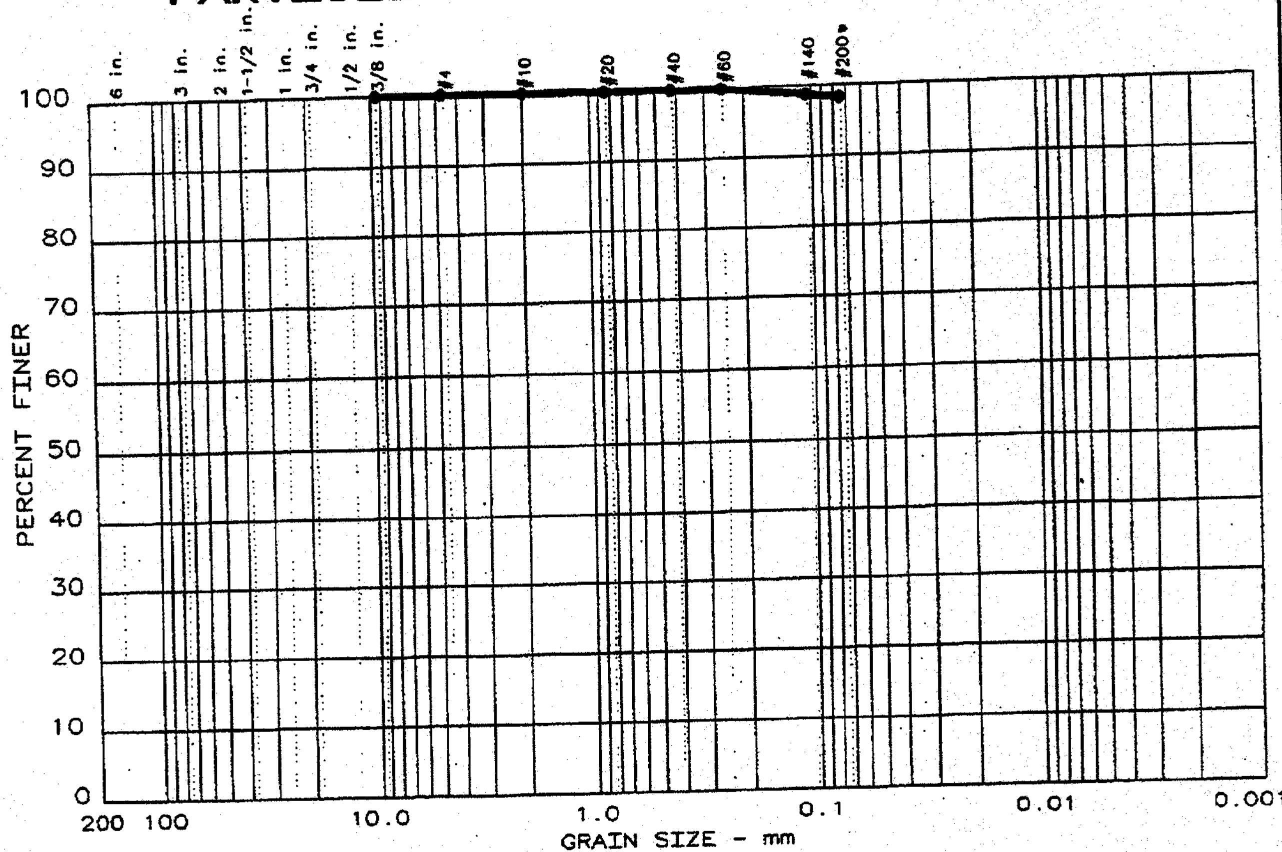
Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.54

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 21, 2004 Fig. No.: B3

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 7 | 0.0 | 0.0 | 1.8 | 98.2 | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Fly Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-4A UD @ 15'-17'

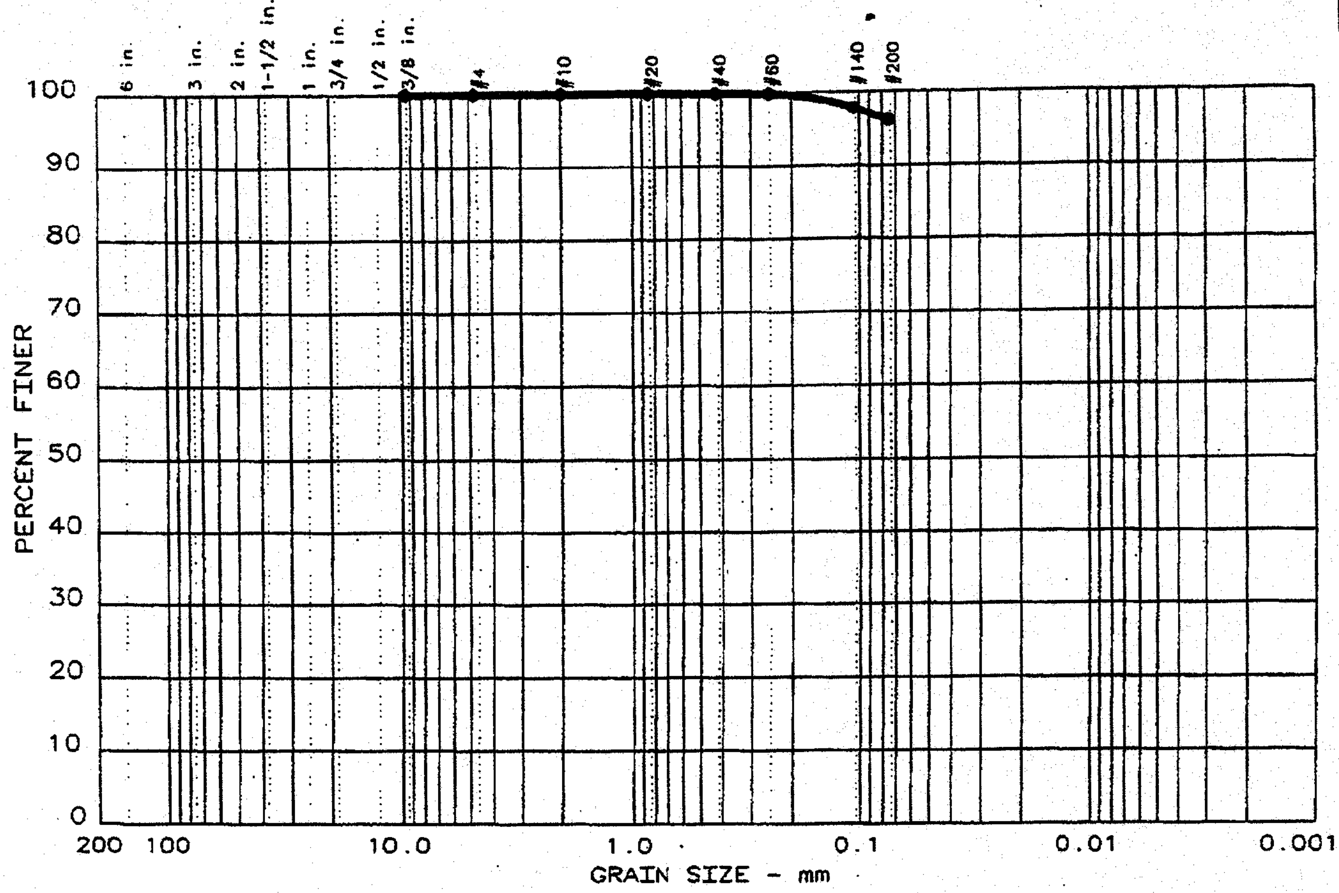
Date: 04-19-04

Remarks:
Moisture Content: 37.2%

PARTICLE SIZE ANALYSIS REPORT
**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 8 | 0.0 | 0.0 | 3.8 | 96.2 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Fly Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-4A UD @ 25'-27'

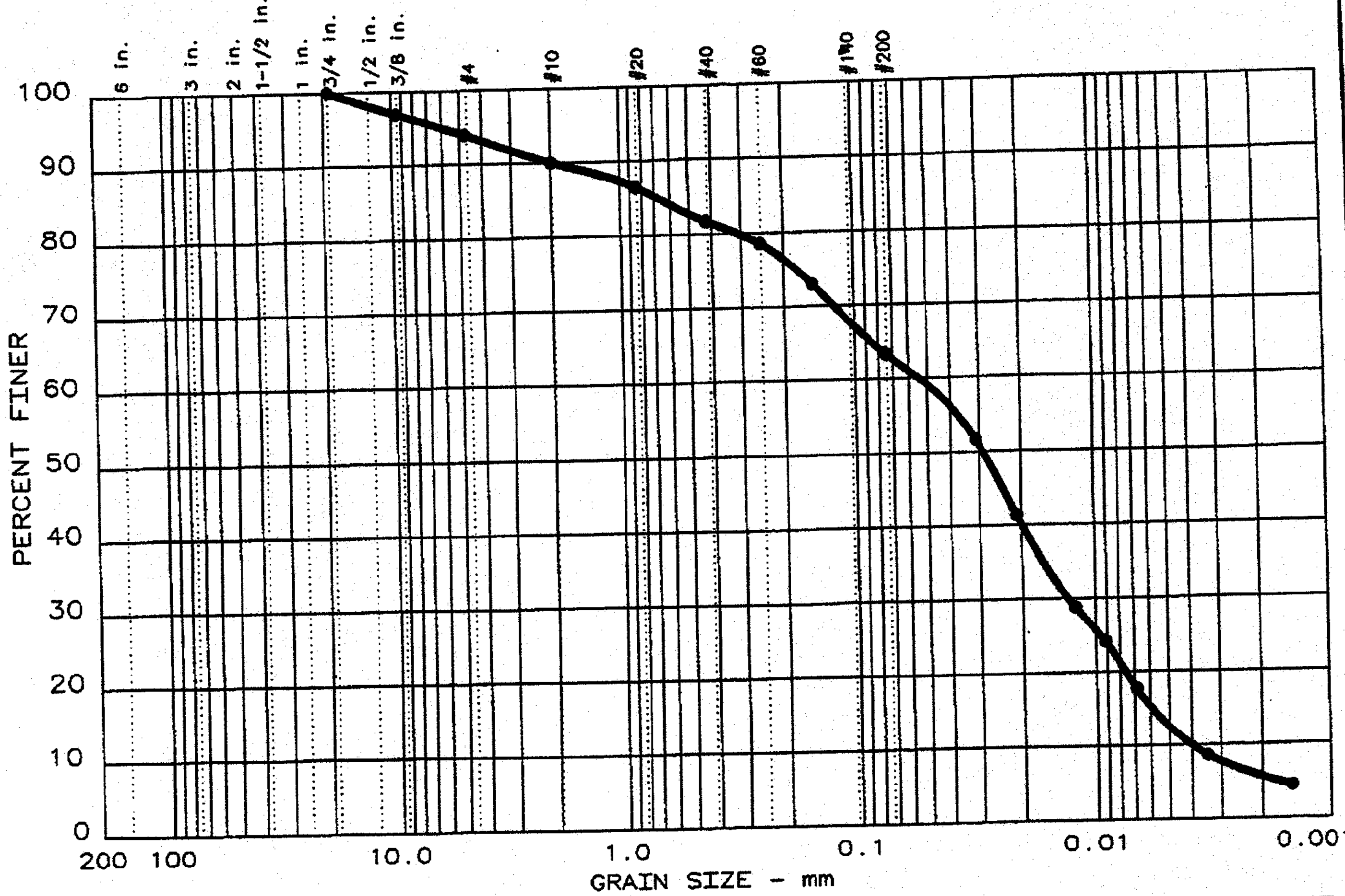
Date: 04-19-04

Remarks:
Moisture Content: 32.0%
Specific Gravity: 2.32

PARTICLE SIZE ANALYSIS REPORT
**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: ______

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 9 | 0.0 | 6.0 | 30.6 | 51.0 | 12.4 | NT | NT | NT |
| | | | | | | | | | |
| | | | | | | | | | |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.75 | 100.0 | | |
| 0.375 | 97.0 | | |
| | GRAIN SIZE | | |
| $D_{60}$ | 0.0543 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0040 | | |
| | COEFFICIENTS | | |
| $C_c$ | 0.77 | | |
| $C_u$ | 13.6 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 94.0 | | |
| 10 | 90.0 | | |
| 20 | 86.5 | | |
| 40 | 81.7 | | |
| 60 | 78.6 | | |
| 100 | 73.0 | | |
| 200 | 63.4 | | |

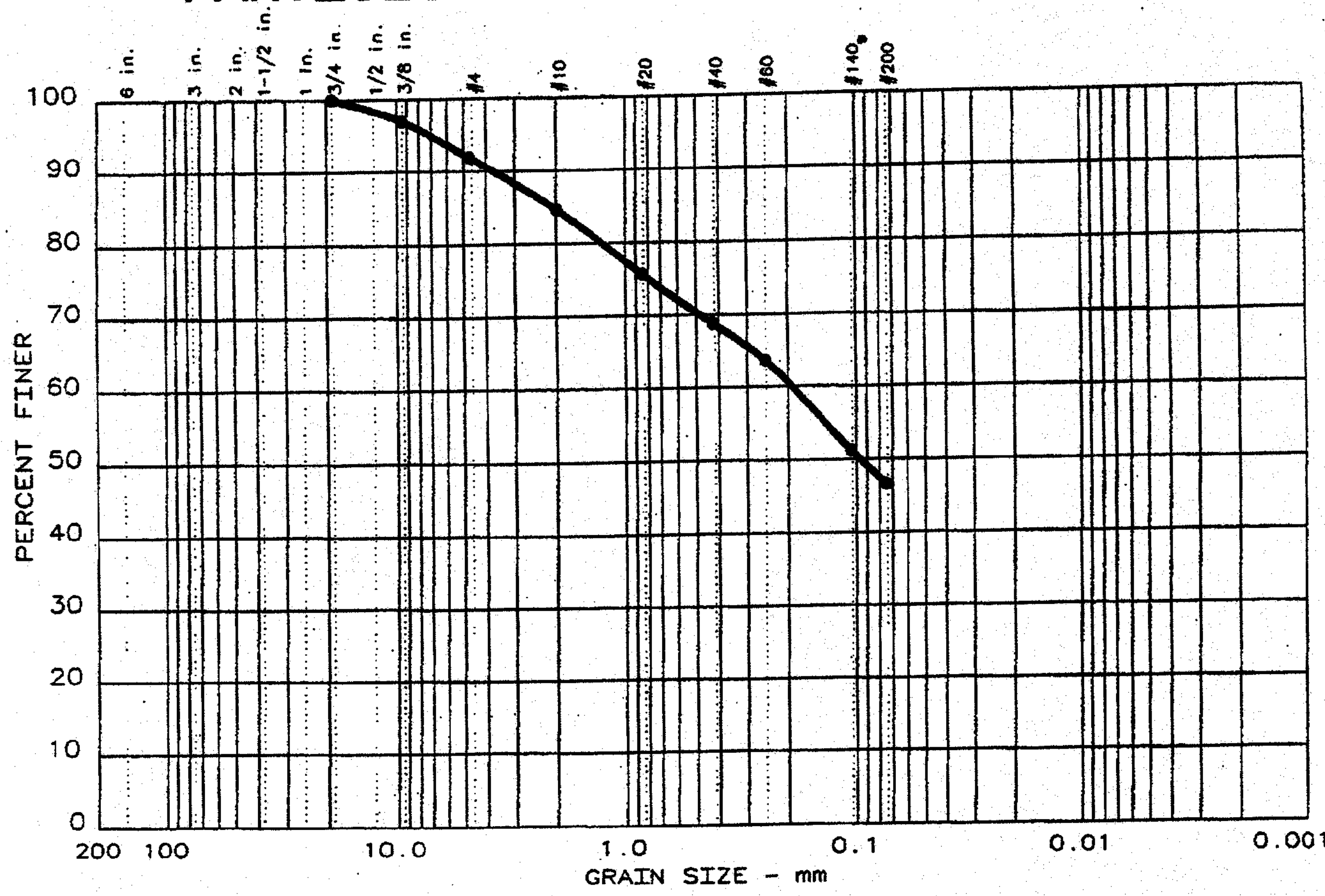
Sample information:
● B-8, 0-1.5' & 5.8-7.3'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size:
ASTM D 422-63(2002);
Specific Gravity of
Portion < No. 10: 2.35

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 9 | 0.0 | 8.1 | 45.3 | 46.6 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 2.07 | 0.188 | 0.0966 | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Bottom Ash with Fly Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8 UD @ 10'-12'

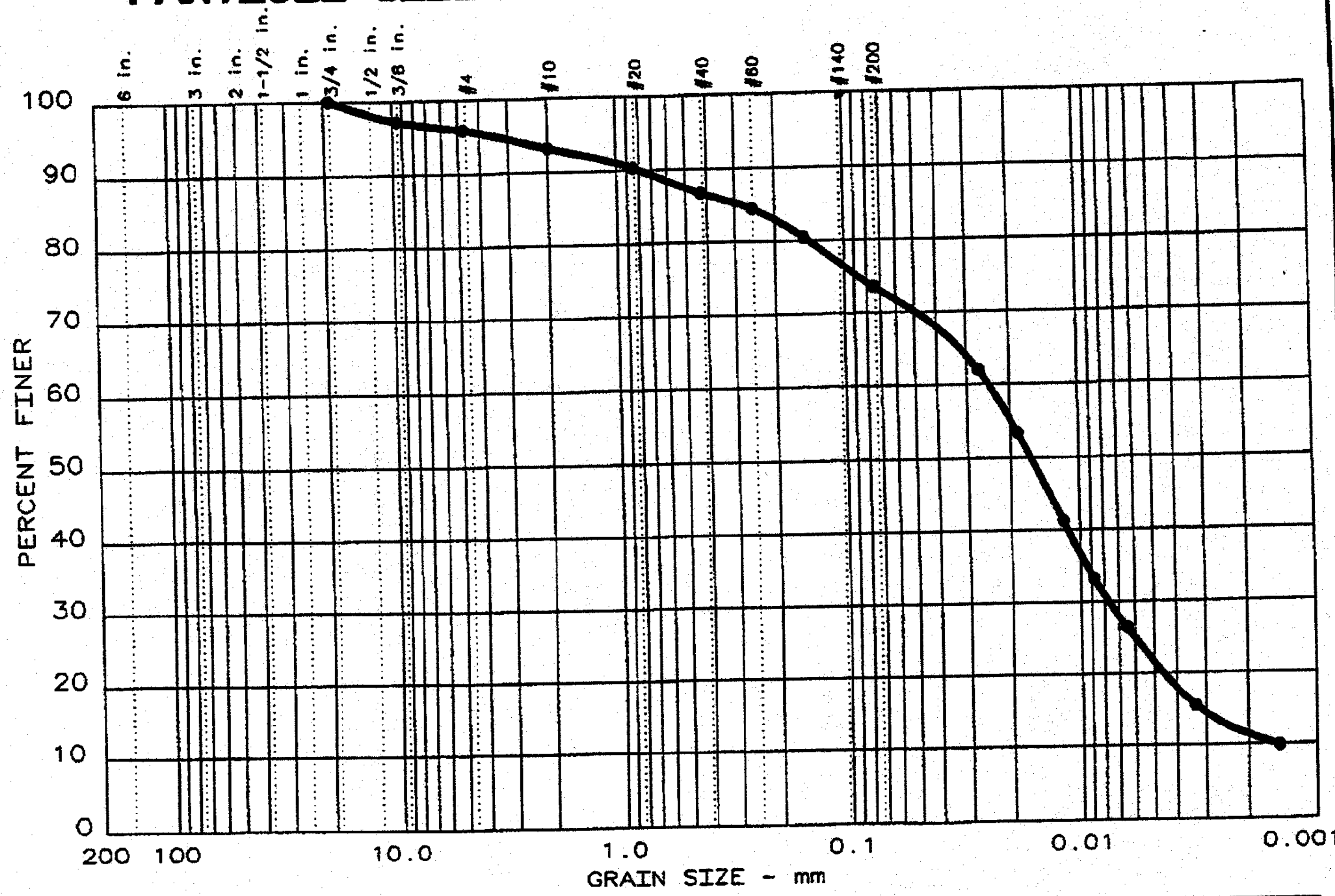
Date: 04-19-04

Remarks:
Moisture Content: 19.4%

PARTICLE SIZE ANALYSIS REPORT
**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: ______

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 12 | 0.0 | 4.1 | 22.3 | 52.0 | 21.6 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.75 | 100.0 | | |
| 0.375 | 97.2 | | |
| | GRAIN SIZE | | |
| $D_{60}$ | 0.0243 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0015 | | |
| | COEFFICIENTS | | |
| $C_c$ | 1.62 | | |
| $C_u$ | 16.2 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 95.9 | | |
| 10 | 93.2 | | |
| 20 | 90.3 | | |
| 40 | 86.7 | | |
| 60 | 84.5 | | |
| 100 | 80.5 | | |
| 200 | 73.6 | | |

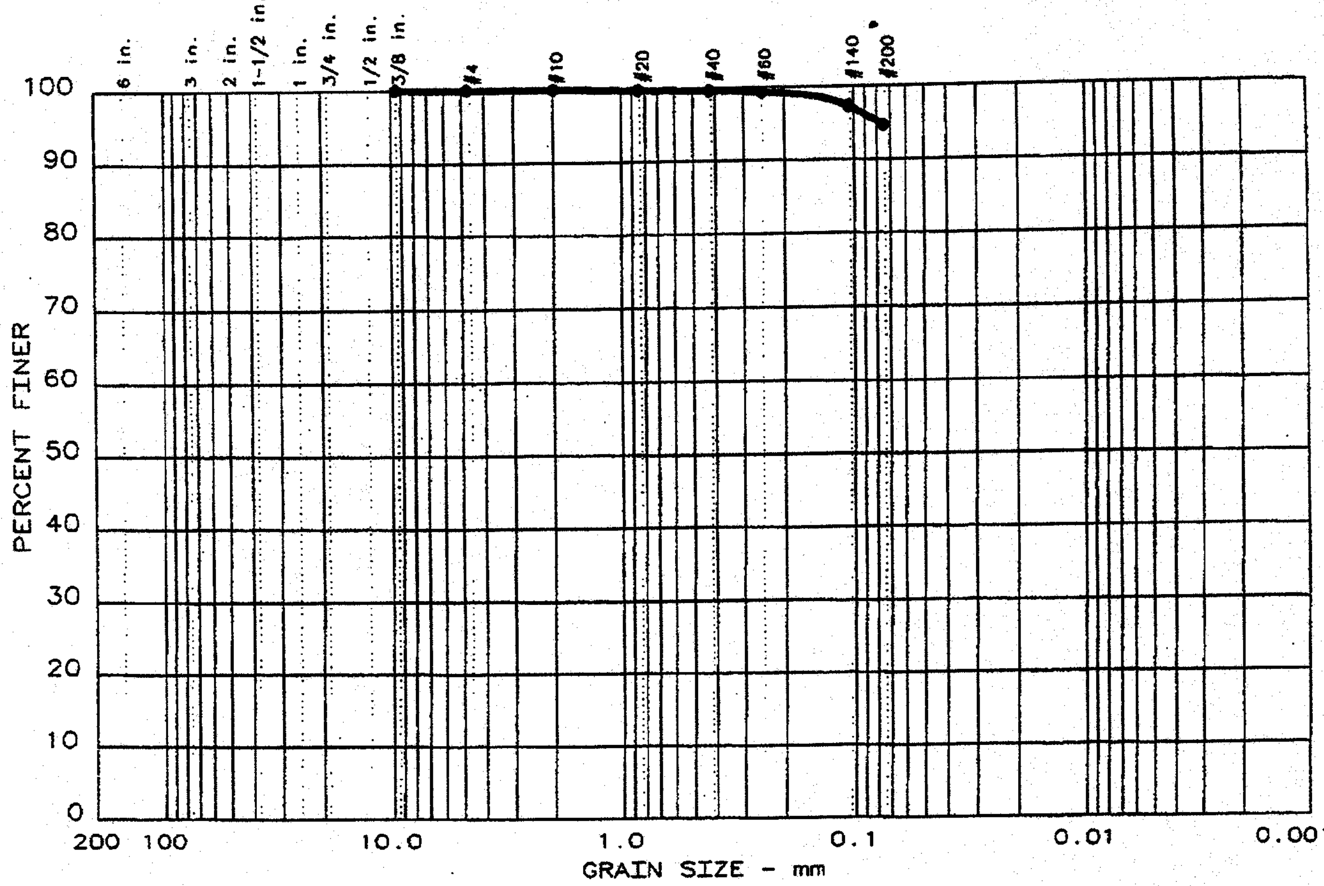
Sample information:
● B-8, 12-13.5' & 15-16.5'
Gray brown ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.38

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 10 | 0.0 | 0.0 | 5.3 | 94.7 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Fly Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8 UD @ 20'-22'

Date: 04-19-04

PARTICLE SIZE ANALYSIS REPORT

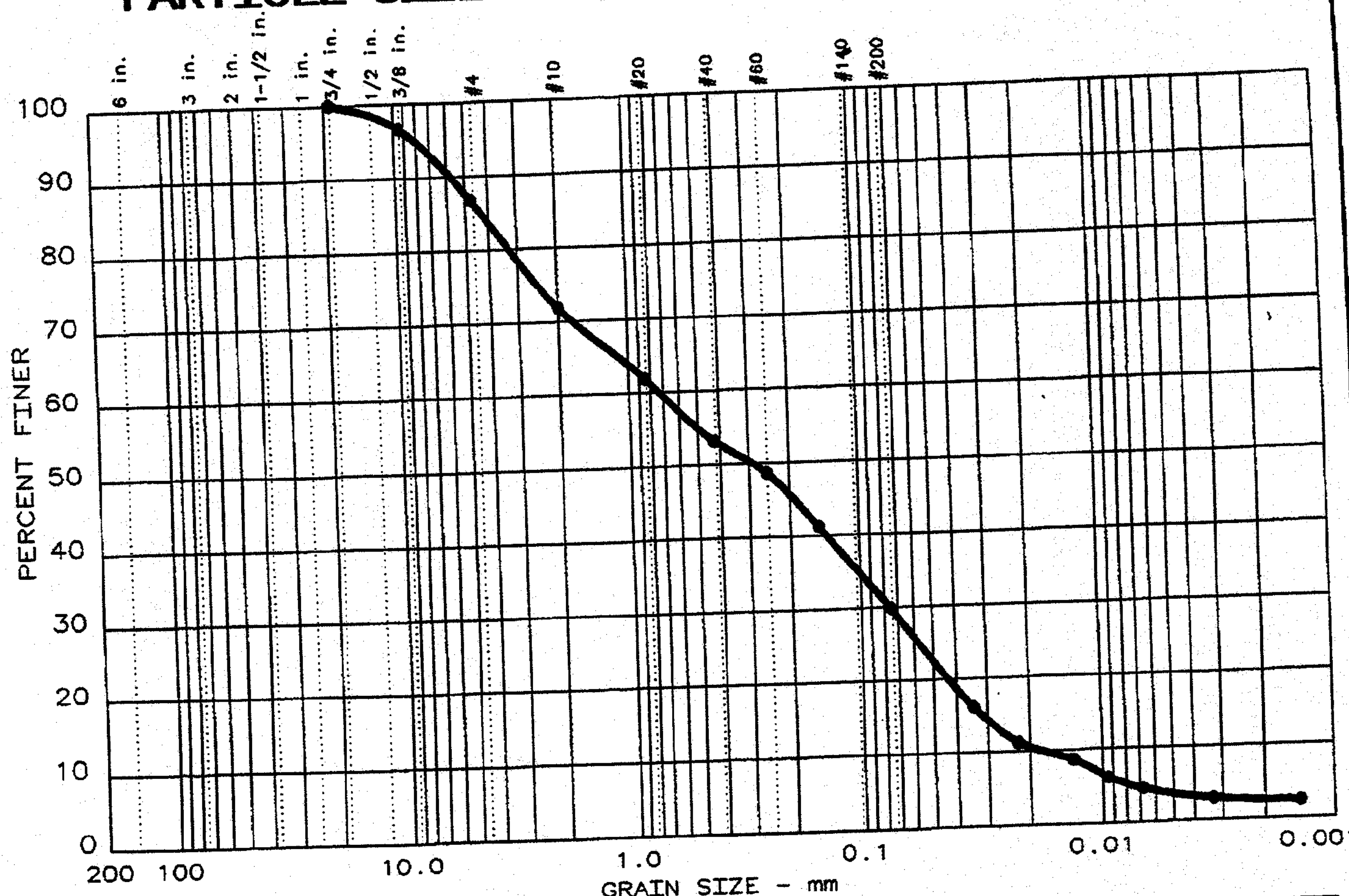
**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Remarks:

Moisture Content: 32.2%

Fig. No.: ______

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 10 | 0.0 | 13.2 | 56.9 | 26.2 | 3.7 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.75 | 100.0 | | |
| 0.375 | 96.7 | | |

| | GRAIN SIZE | | |
|---|---|---|---|
| $D_{60}$ | 0.733 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0178 | | |

| | COEFFICIENTS | | |
|---|---|---|---|
| $C_c$ | 0.43 | | |
| $C_u$ | 41.2 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 86.8 | | |
| 10 | 71.9 | | |
| 20 | 61.9 | | |
| 40 | 53.2 | | |
| 60 | 48.7 | | |
| 100 | 41.2 | | |
| 200 | 29.9 | | |

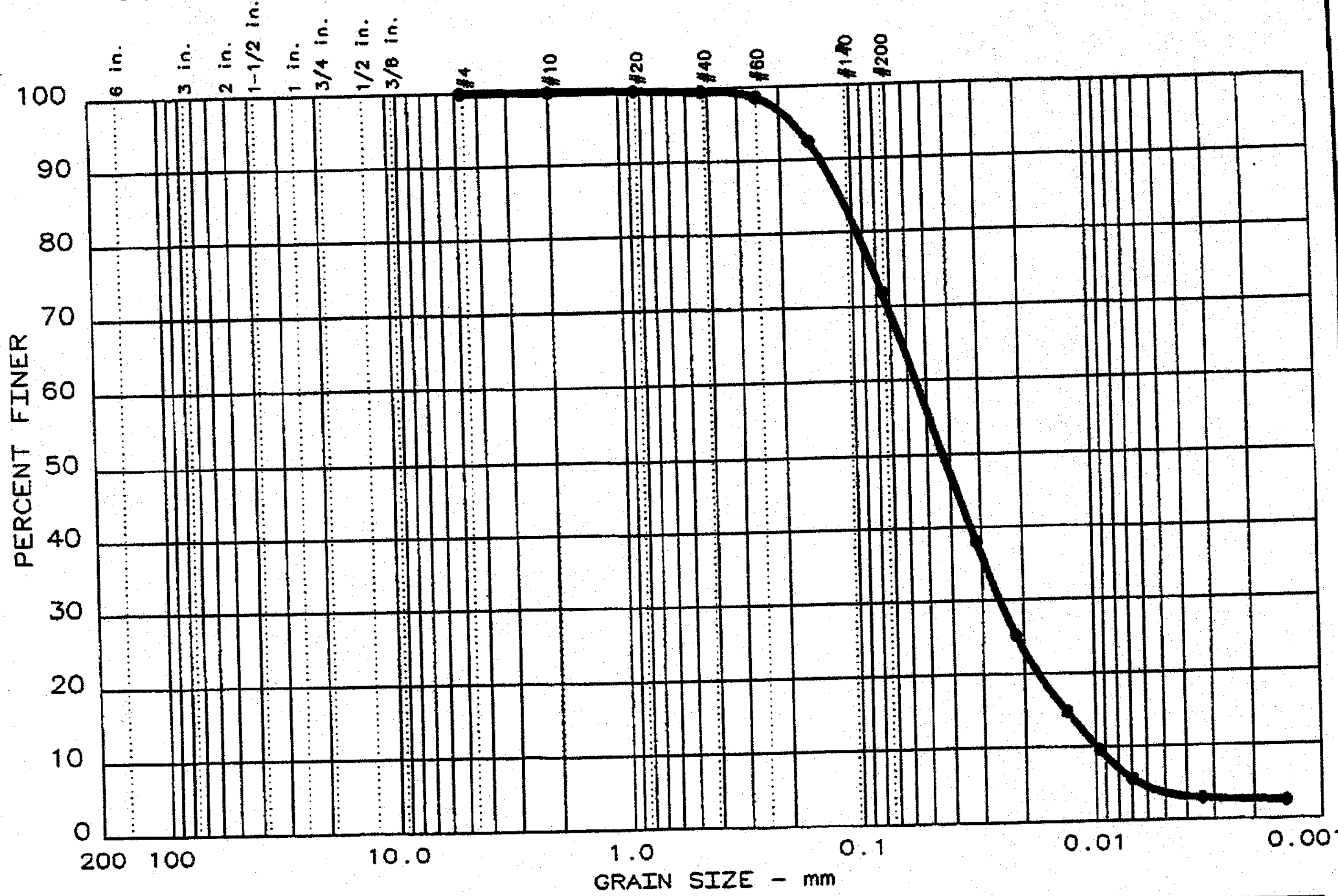
Sample information:
● B-8, 25.6-27.1' & 30-31.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size:
ASTM D 422-63(2002):
Specific Gravity of
Portion < No. 10: 2.49

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 13 | 0.0 | 0.0 | 28.2 | 68.2 | 3.6 | NT | NT | NT |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| | | | |

| | GRAIN SIZE | | |
|---|---|---|---|
| $D_{60}$ | 0.0550 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0098 | | |

| | COEFFICIENTS | | |
|---|---|---|---|
| $C_c$ | 1.18 | | |
| $C_u$ | 5.6 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 100.0 | | |
| 10 | 99.9 | | |
| 20 | 99.8 | | |
| 40 | 99.5 | | |
| 60 | 98.6 | | |
| 100 | 92.4 | | |
| 200 | 71.8 | | |

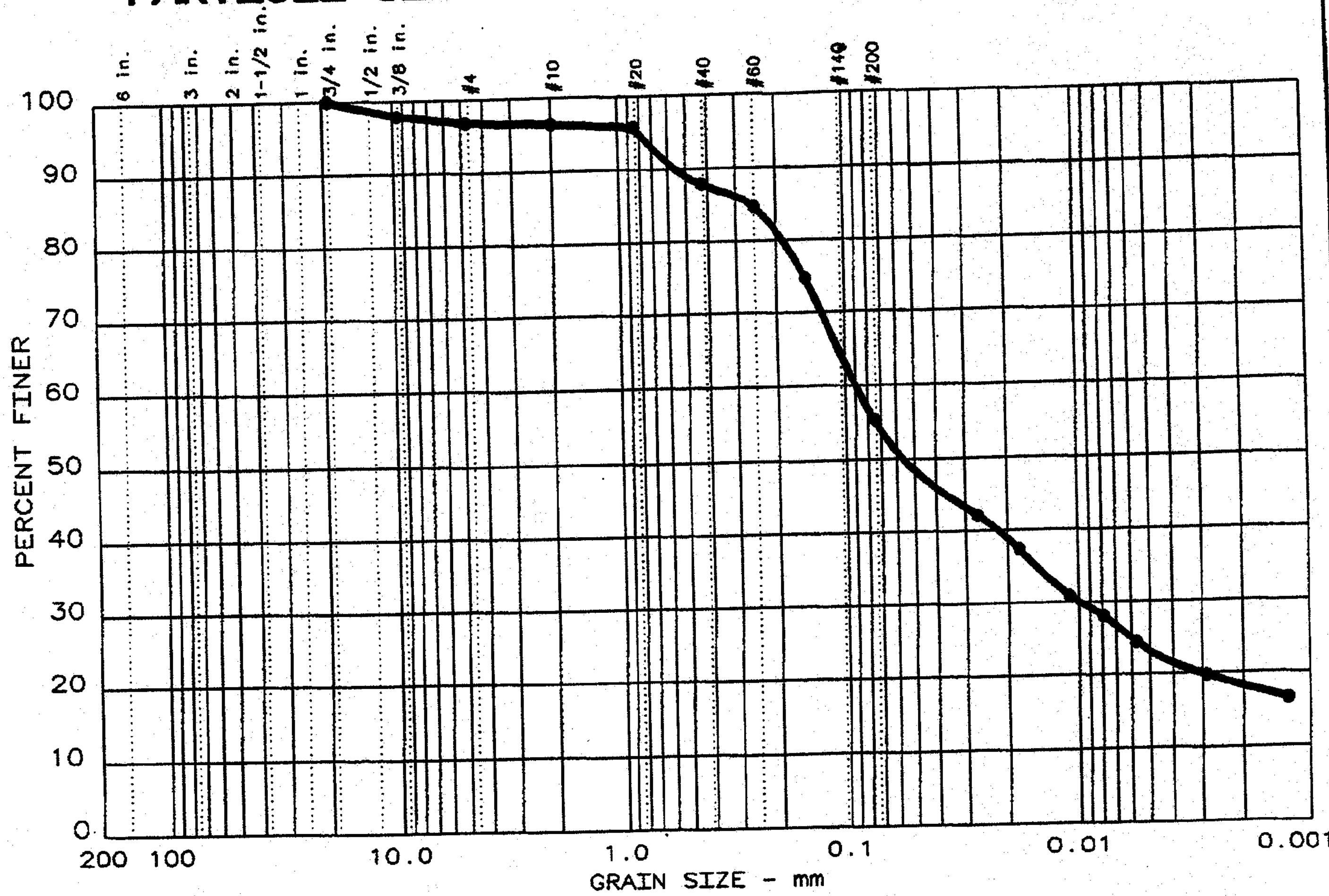
Sample information:
● B-8A, 40-41.5' & 45-46.5'
Dark gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002): Specific Gravity of Portion < No. 10: 2.52

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8A

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 15 | 0.0 | 3.2 | 41.4 | 32.4 | 23.0 | CL | 25 | 11 |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| 0.75 | 100.0 | | |
| 0.375 | 97.9 | | |
| | GRAIN SIZE | | |
| $D_{60}$ | 0.0901 | | |
| $D_{30}$ | | | |
| $D_{10}$ | | | |
| | COEFFICIENTS | | |
| $C_c$ | | | |
| $C_u$ | | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 4 | 96.8 | | |
| 10 | 96.4 | | |
| 20 | 95.8 | | |
| 40 | 87.9 | | |
| 60 | 84.7 | | |
| 100 | 74.7 | | |
| 200 | 55.4 | | |

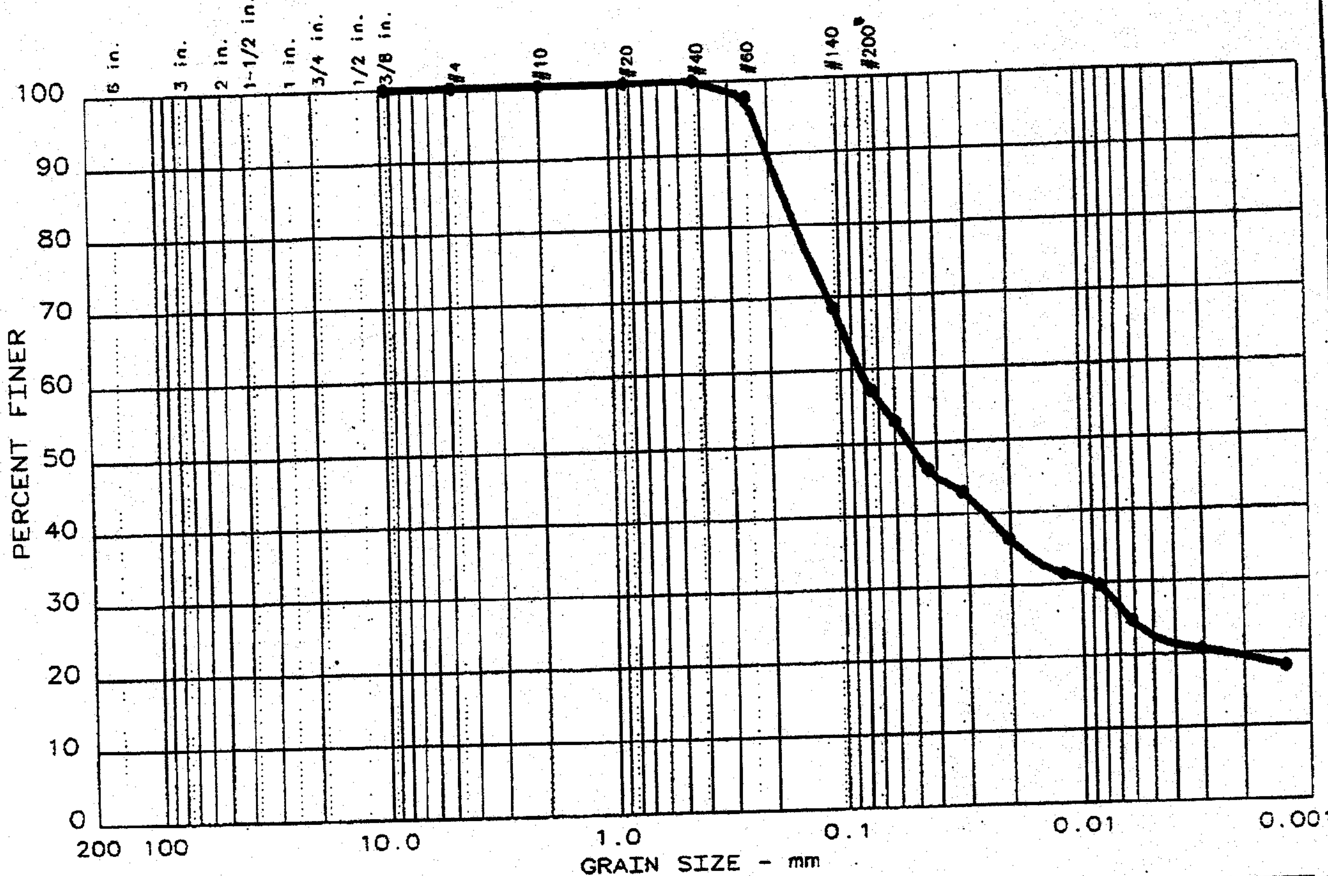
Sample information:
● B-8A, 57-58.5' & 62-63.5'
Tan sandy lean clay
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002);
Specific Gravity of Portion < No. 40: 2.68

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8A

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 4 | 0.0 | 0.0 | 42.8 | 34.7 | 22.5 |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | 26 | 10 | 0.176 | 0.0832 | 0.0524 | 0.0088 | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey-Brown Sandy Lean Clay | CL | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8A UD @ 60'-62'

Date: 04-19-04

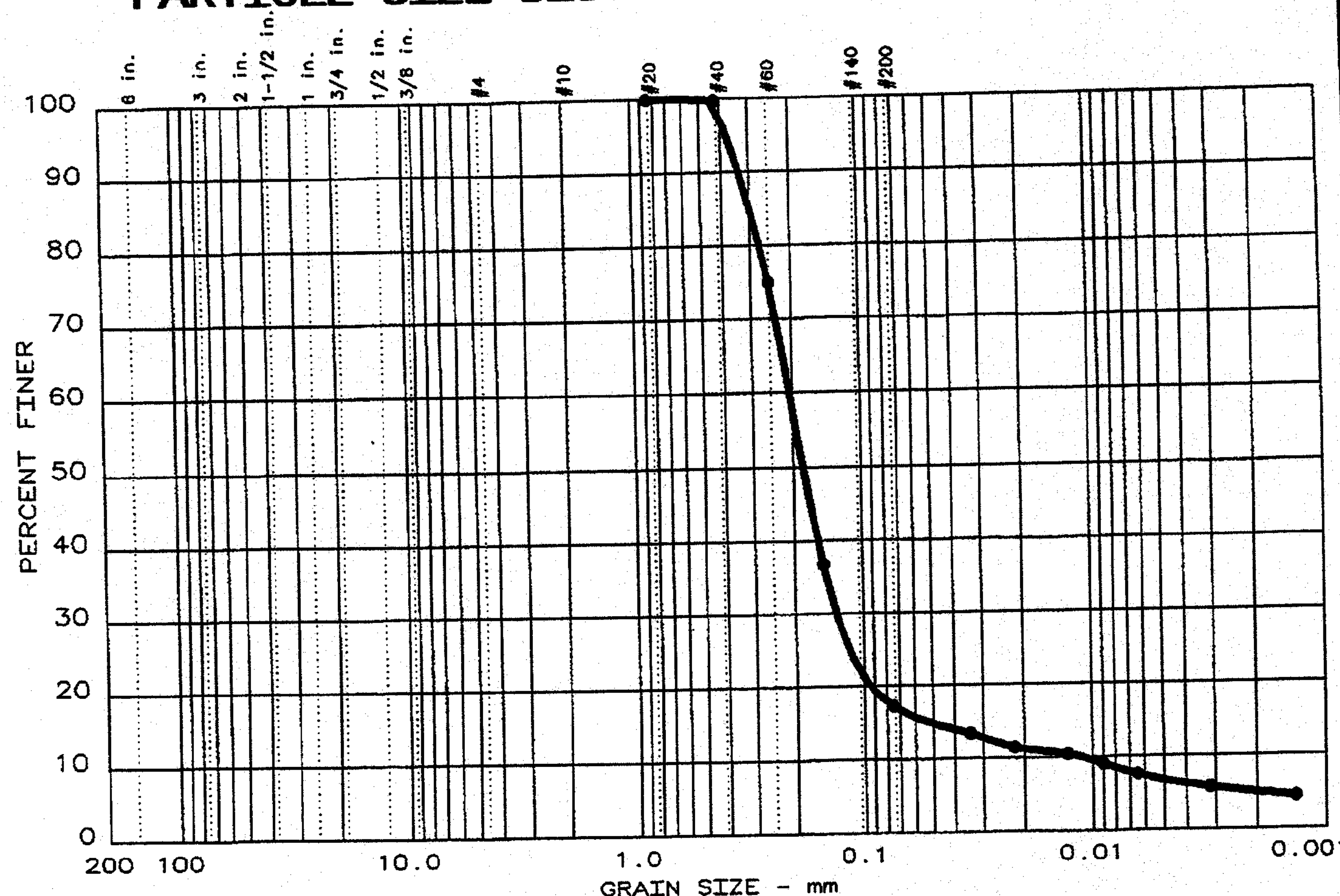
PARTICLE SIZE ANALYSIS REPORT

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Remarks:
Moisture Content: 21.9%
Specific Gravity: 2.67

Fig. No.: ______

# PARTICLE SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY | USCS | LL | PI |
|---|---|---|---|---|---|---|---|---|---|
| ● | 14 | 0.0 | 0.0 | 82.7 | 10.5 | 6.8 | SM | NP | NP |
| | | | | | | | | | |
| | | | | | | | | | |

| SIEVE inches size | PERCENT FINER ● | | |
|---|---|---|---|
| | | | |
| | GRAIN SIZE | | |
| $D_{60}$ | 0.206 | | |
| $D_{30}$ | | | |
| $D_{10}$ | 0.0111 | | |
| | COEFFICIENTS | | |
| $C_c$ | 7.62 | | |
| $C_u$ | 18.5 | | |

| SIEVE number size | PERCENT FINER ● | | |
|---|---|---|---|
| 20 | 100.0 | | |
| 40 | 99.7 | | |
| 60 | 75.0 | | |
| 100 | 36.7 | | |
| 200 | 17.3 | | |

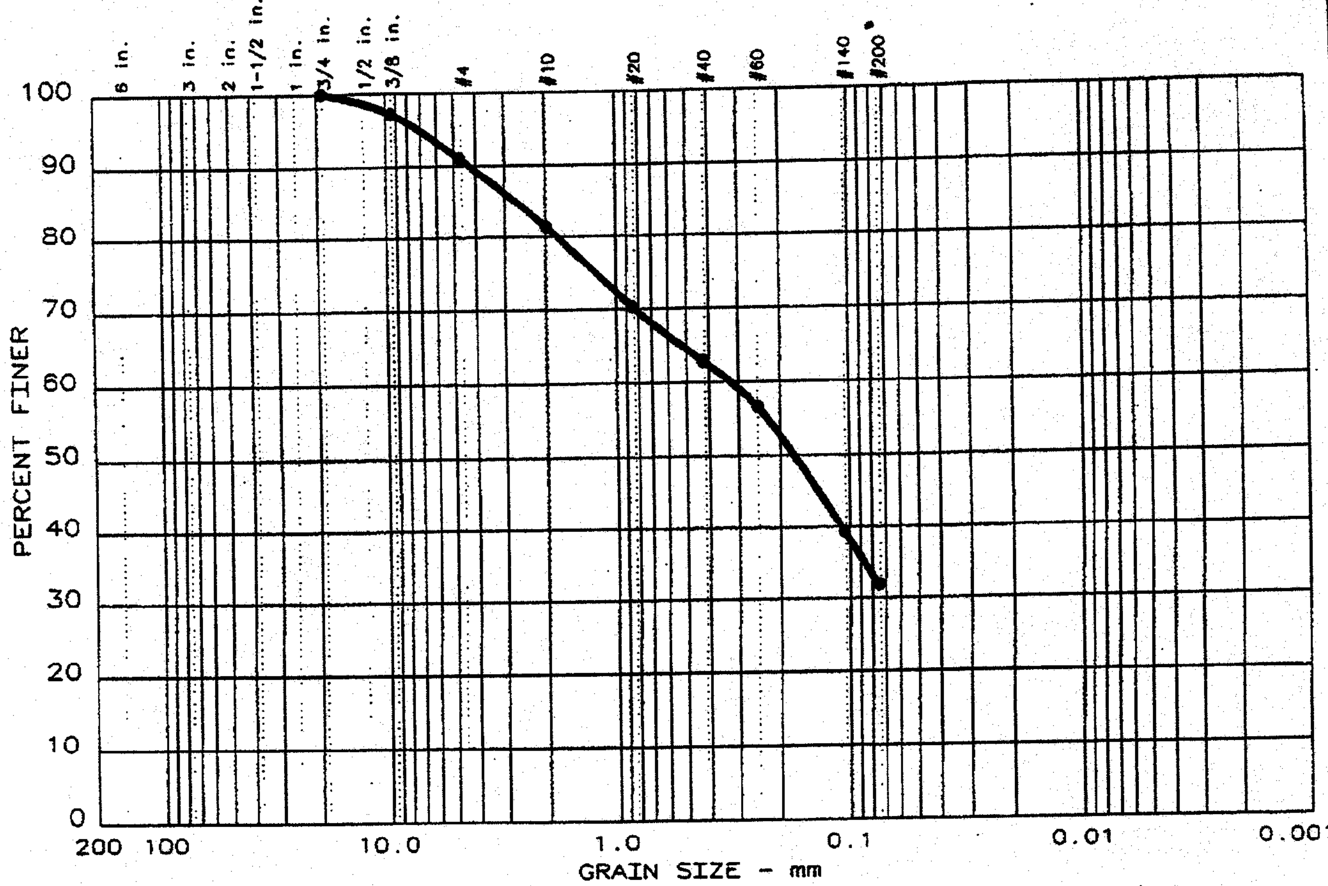
Sample information:
● B-8A, 65-66.5' & 70-70.9'
Gray brown silty sand
SPT Samples

Remarks:
Methods: Particle Size:
ASTM D 422-63(2002);
Specific Gravity of
Portion < No. 40: 2.67

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.**

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8A

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 11 | 0.0 | 9.0 | 59.1 | 31.9 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 2.66 | 0.320 | 0.172 | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Fly Ash with Bottom Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 5'-7'

Date: 04-19-04

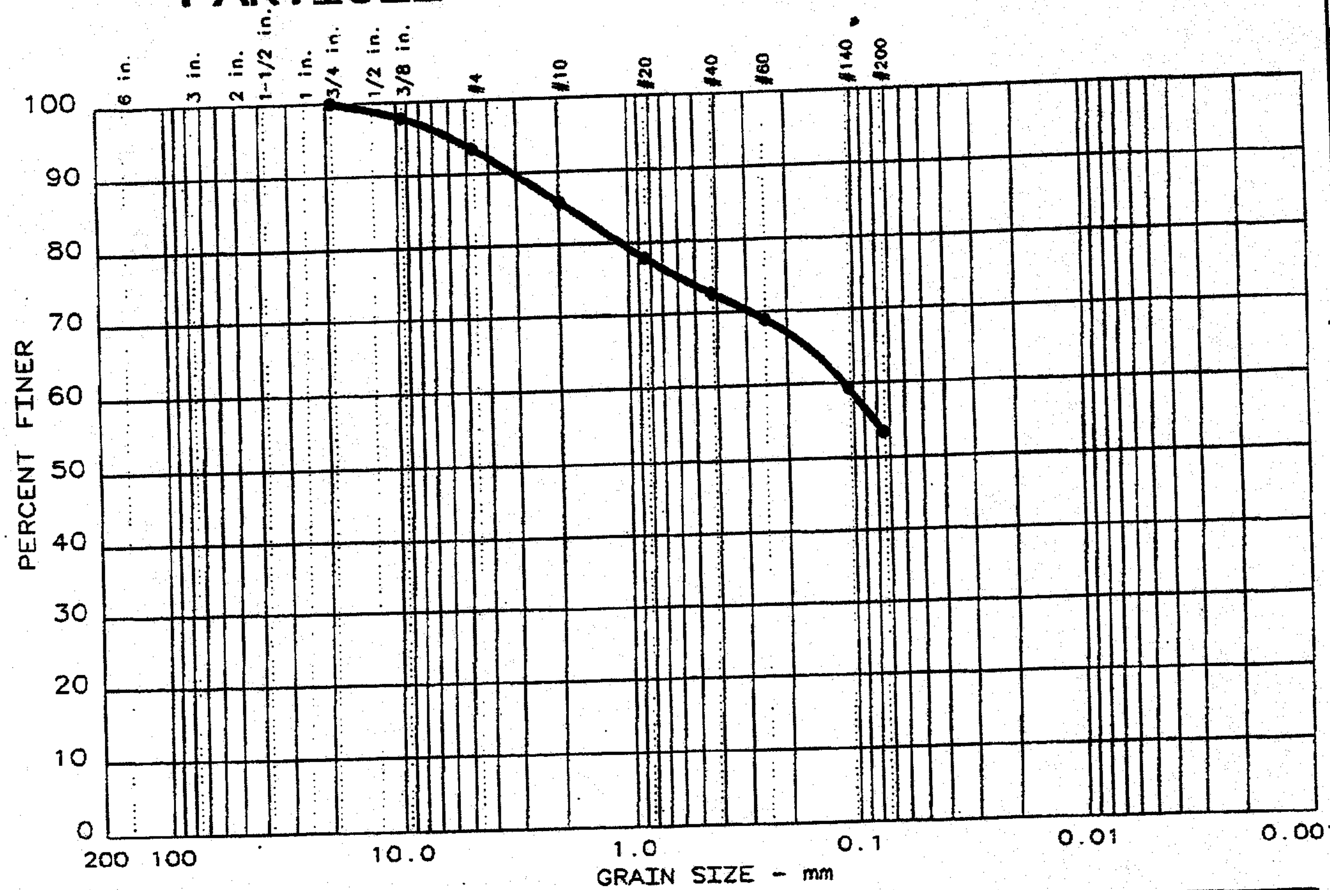
Remarks:
Moisture Content: 24.7%
Specific Gravity: 2.29

PARTICLE SIZE ANALYSIS REPORT

**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 12 | 0.0 | 6.6 | 40.0 | 53.4 | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 1.82 | 0.110 | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Fly Ash with Bottom Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 10'-12'

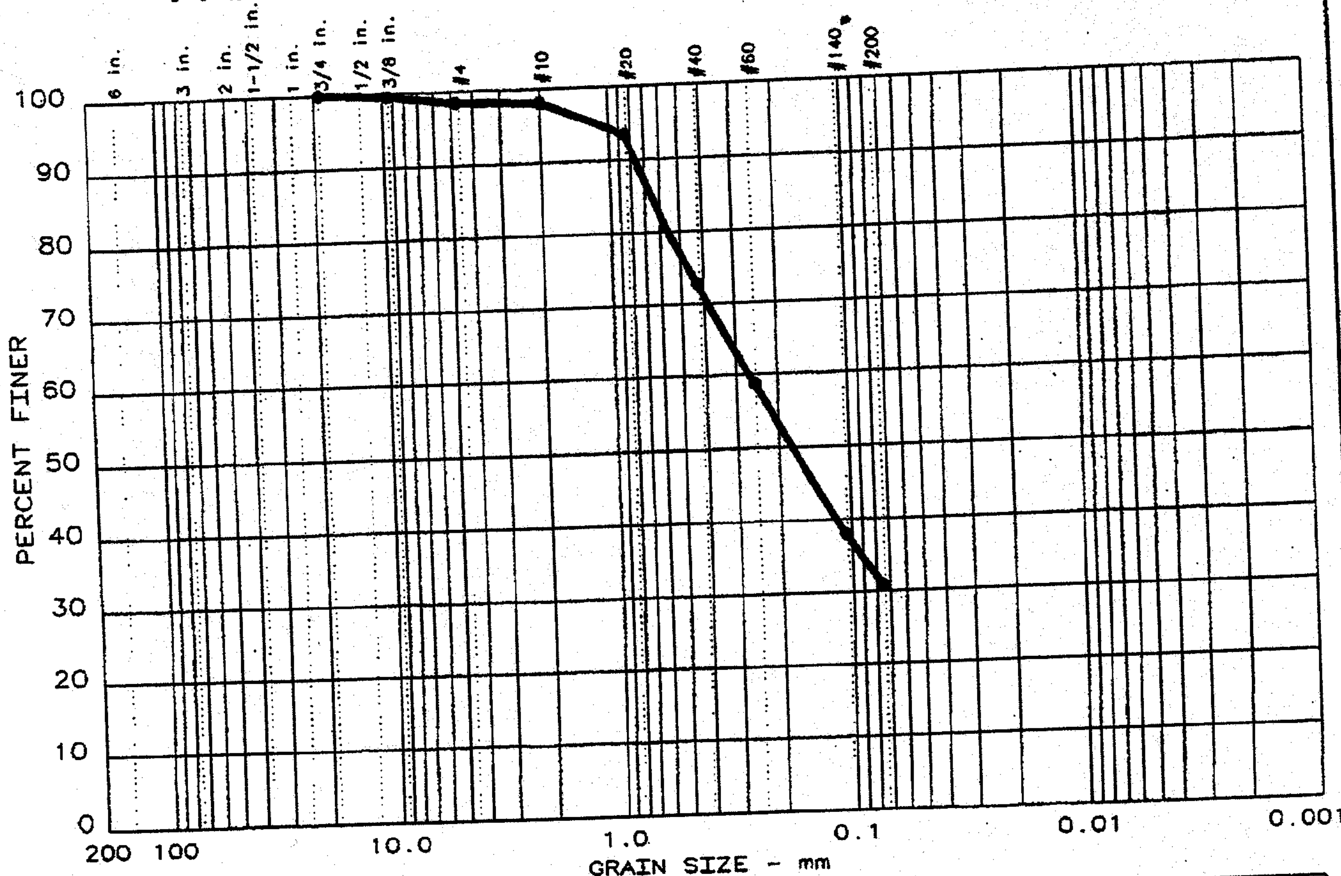
Date: 04-19-04

Remarks:
Moisture Content: 24.5%

PARTICLE SIZE ANALYSIS REPORT
**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 13 | 0.0 | 1.5 | 67.6 | 30.9 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 0.653 | 0.263 | 0.176 | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Fly Ash with Bottom Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 15'-17'

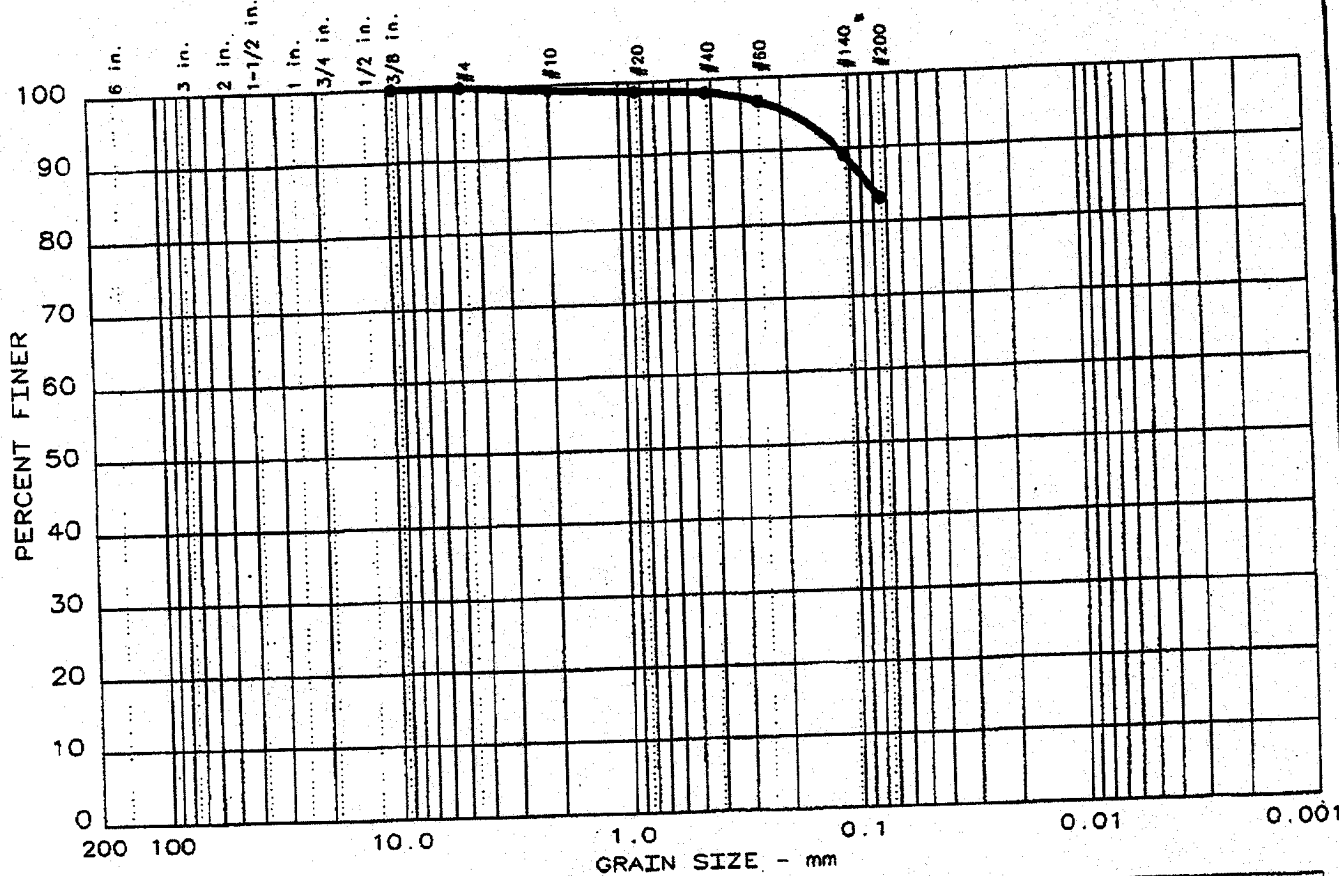
Date: 04-19-04

PARTICLE SIZE ANALYSIS REPORT
**LAW ENGINEERING AND ENVIRONMENTAL SERVICES**

Remarks:
Moisture Content: 38.1%

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 14 | 0.0 | 0.0 | 16.9 | 83.1 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 0.0832 | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Grey Fly Ash | | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 20'-22'

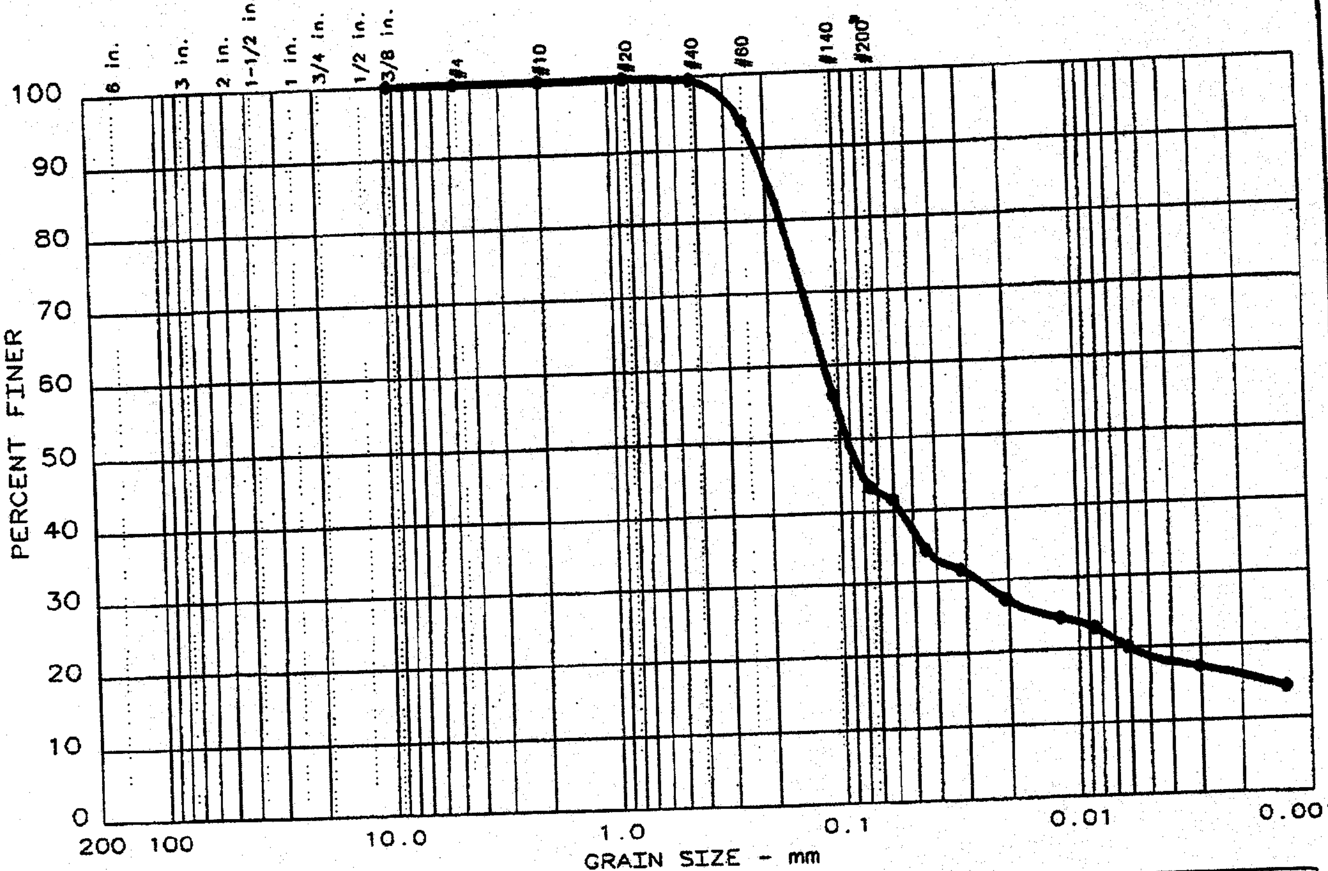
Date: 04-19-04

Remarks:
Moisture Content: 36.5%
Specific Gravity: 2.28

PARTICLE SIZE ANALYSIS REPORT
LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ______

# PARTICLE SIZE ANALYSIS REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 3 | 0.0 | 0.0 | 56.7 | 24.6 | 18.7 |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | NV | NP | 0.193 | 0.115 | 0.0931 | 0.0265 | 0.0015 | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● Tan-Brown Silty Fine Sand | SM | |

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 35'-37'

Date: 04-19-04

Remarks:
Moisture Content: 21.9%

PARTICLE SIZE ANALYSIS REPORT
LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ______

**This information taken from "Kingston Fossil Plant – Dredge Cells/Closure Soil Investigation," Singleton Laboratories Report 015-672-142A, September 29, 1994.**

## LABORATORY TESTING

All split-spoon samples obtained were visually classified and tested for moisture content in accordance with ASTM D 2216, while Atterberg limits, grain-size analysis, and specific gravity tests were performed on representative SPT soil samples in accordance with ASTM D 4318, D 422, and D 854, respectively. Test results are shown in the field logs. Individual test data sheets are enclosed in Appendix C.

All twenty-five (25) undisturbed soil samples obtained from the dike areas were tested for moisture content, classification, grain-size, Atterberg limits, specific gravity, and unit weight in accordance with ASTM D 2216, D 2488, D 422, D 4318, D 854, and SLP-2, respectively. Unconsolidated-undrained triaxial (Q) and consolidated-undrained triaxial (R) with pore water pressure measurements were performed on five (5) selected undisturbed soil samples in accordance with ASTM D 4767 and D 5084, respectively. Test results are also summarized in Table 1. Individual test data sheets are enclosed in Appendix D. Under Q test conditions, angles of internal friction ranged from zero (with 1.85 tsf cohesion) to 37.4 degrees, and cohesions varied from zero to 1.85 tsf. Under R test conditions, apparent angles of internal friction and cohesions ranged from 4.4 to 35.8 degrees and from 0.32 to 3.65 tsf, respectively, and effective angles of internal friction and cohesions varied from 9.2 to 37.5 degrees and from zero to 2.91 tsf, respectively.

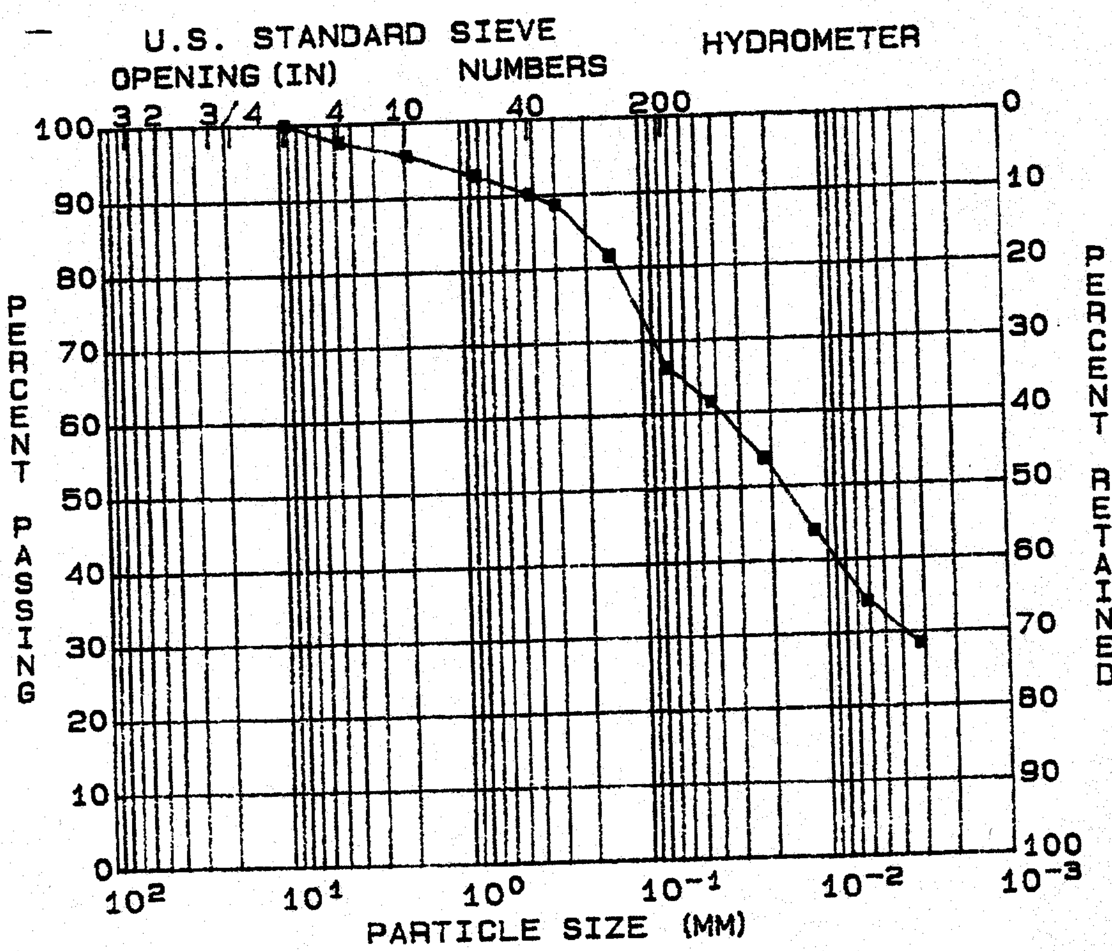
All bulk soil samples obtained from the Dredge Cell 2 were visually classified as a gray silty sand (fly ash) and tested for moisture content on representative samples. Natural moisture contents ranged from 34.5 to 39.9 percent with an average of 37.6 percent. Two (2) soil classes were identified from all the bulk samples. Compaction tests were performed in accordance with ASTM D 698 Method A. Optimum moisture contents and maximum dry densities were determined to be 25.4 percent and 79.8 pcf, respectively for soil Class I, and 24.5 percent and 79.9 pcf, respectively for soil Class II. As indicated from the test results, Soil Classes I and II are very similar. A family of compaction curves was established for each soil class and the compaction curves are enclosed. For each soil class, classification tests including grain-size analysis, specific gravity, and Atterberg Limits were performed. Test results are summarized in Table 2 and also shown in the attached compaction curves. Individual test data sheets and compaction curves are enclosed in Appendix E.

Unconsolidated-undrained triaxial (Q) and consolidated-undrained triaxial (R) with pore water pressure measurements tests were performed on the soil samples remolded to the optimum moisture content with 95 and 100 percent maximum dry density. Test results are also summarized in Table 2. Individual test data sheets are also enclosed in Appendix E. Under Q test conditions, angles of internal friction ranged from 23.7 to 24.0 degrees and cohesions varied from 1.04 to 1.10 tsf. Under R test conditions, apparent angles of internal friction and cohesions ranged from 17.9 to 17.9 degrees and from 0.19 to 0.21 tsf, respectively, and effective angles of internal friction and cohesions varied from 28.3 to 38.3 degrees and from 0.06 to 0.27 tsf, respectively.

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 1
DATE : 09-29-94




GRAVEL (%) = 2
SAND (%) = 32
SILT (%) = 34
CLAY (%) = 32

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= CL-ML
MOISTURE (%) =
SP. GR. = 2.65

L.L. (%) = 26
P.I. (%) = 4

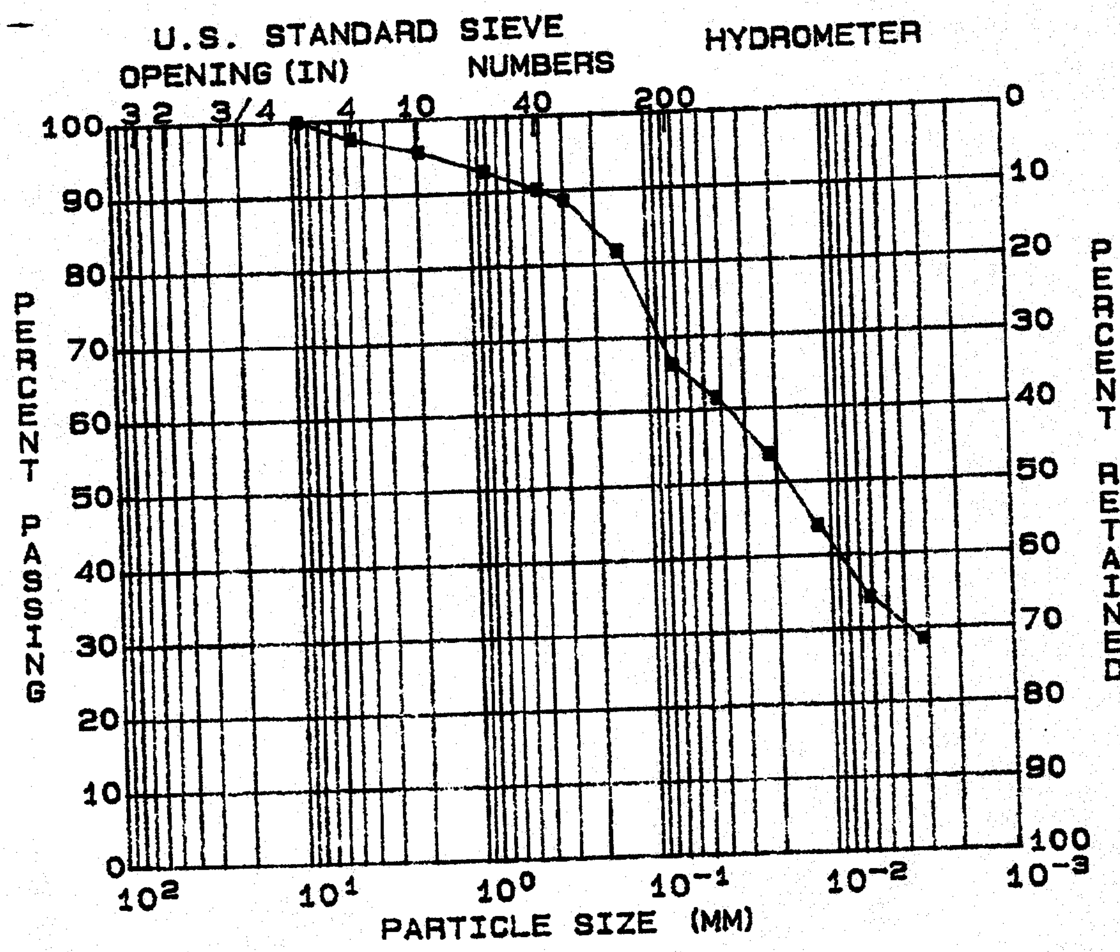
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 1
DATE : 09-29-94




GRAVEL (%) = 2
SAND (%) = 32
SILT (%) = 34
CLAY (%) = 32

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= CL-ML
MOISTURE (%) =
SP. GR. = 2.65

L.L. (%) = 25
P.I. (%) = 4

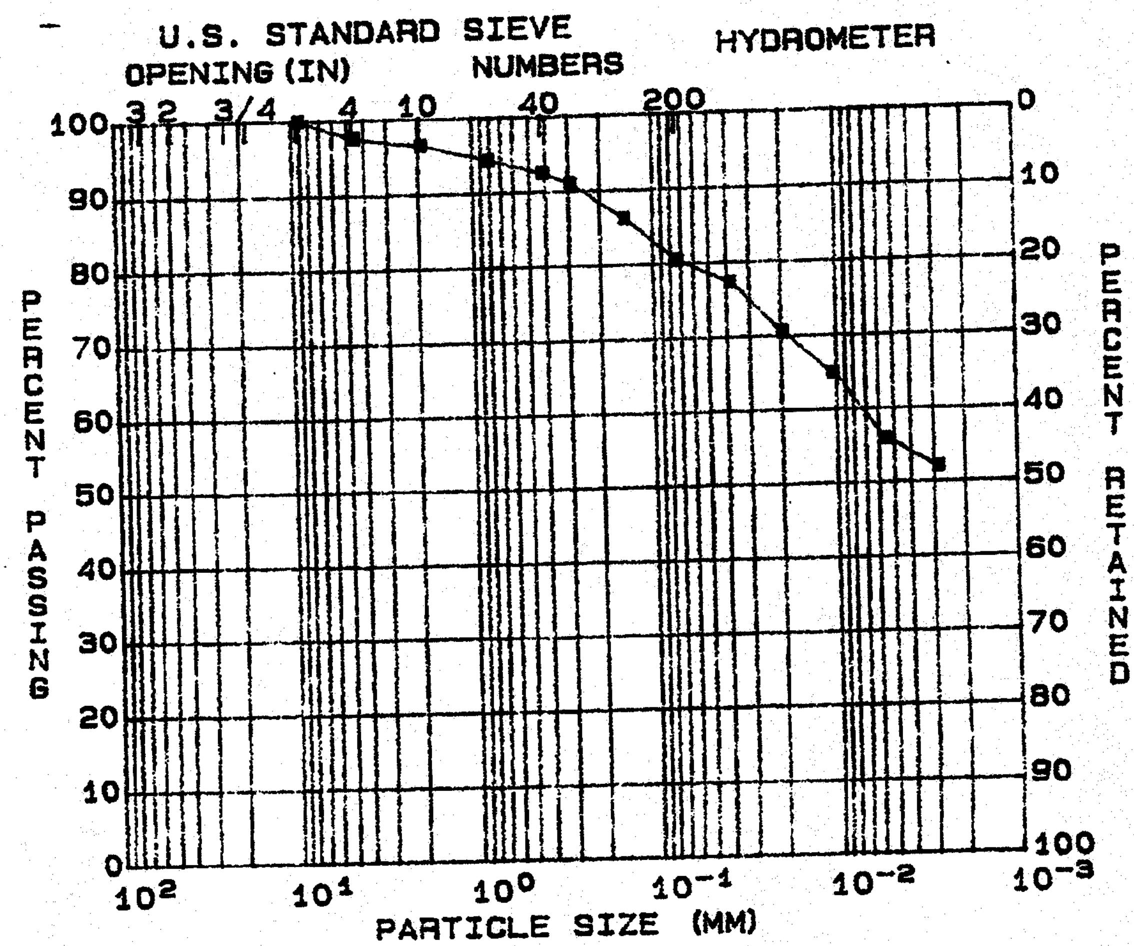
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 2
DATE : 09-29-94




GRAVEL (%) = 1
SAND (%) = 18
SILT (%) = 25
CLAY (%) = 56

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= MH/CH
MOISTURE (%) =
SP. GR. = 2.73

L.L. (%) = 59
P.I. (%) = 28

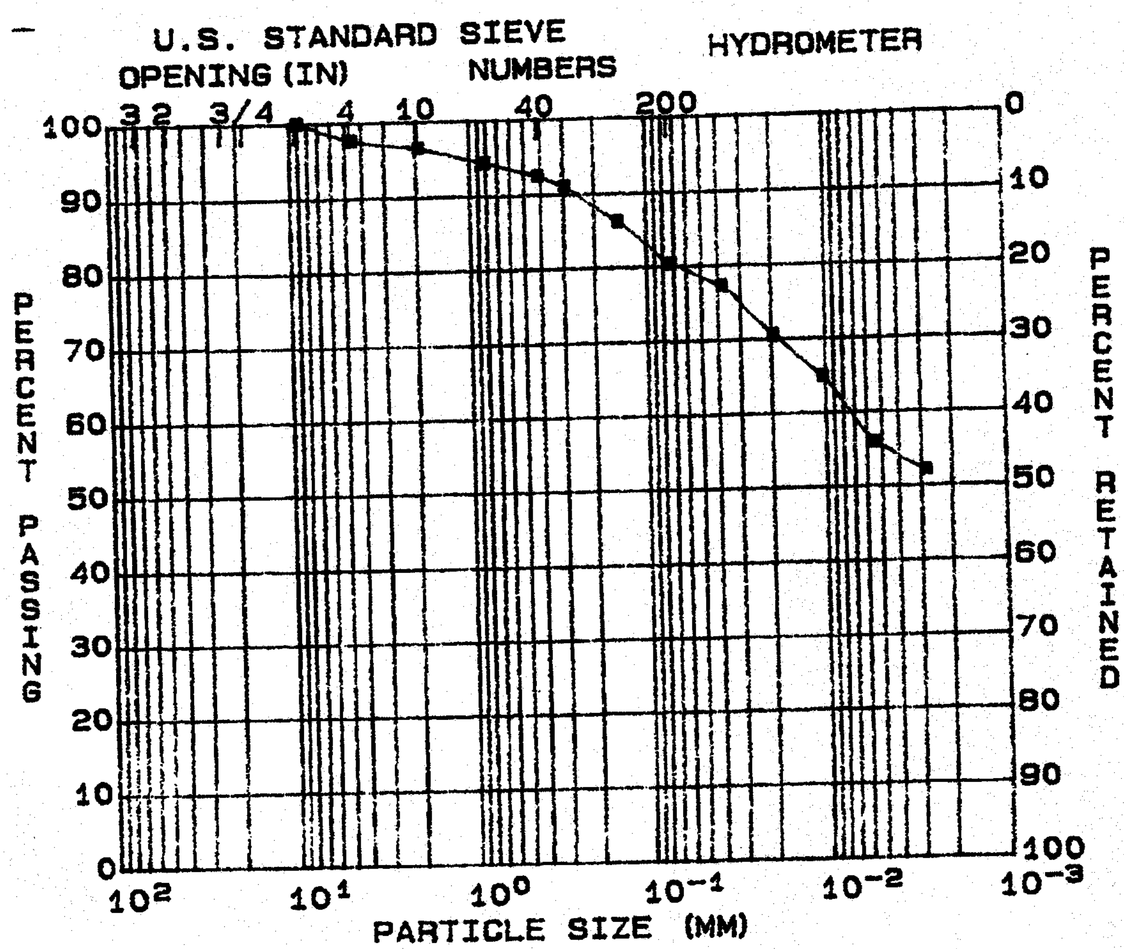
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 2
DATE : 09-29-94




GRAVEL (%) = 1
SAND (%) = 18
SILT (%) = 25
CLAY (%) = 56

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= MH/CH
MOISTURE (%) =
SP. GR. = 2.73

L.L. (%) = 59
P.I. (%) = 27

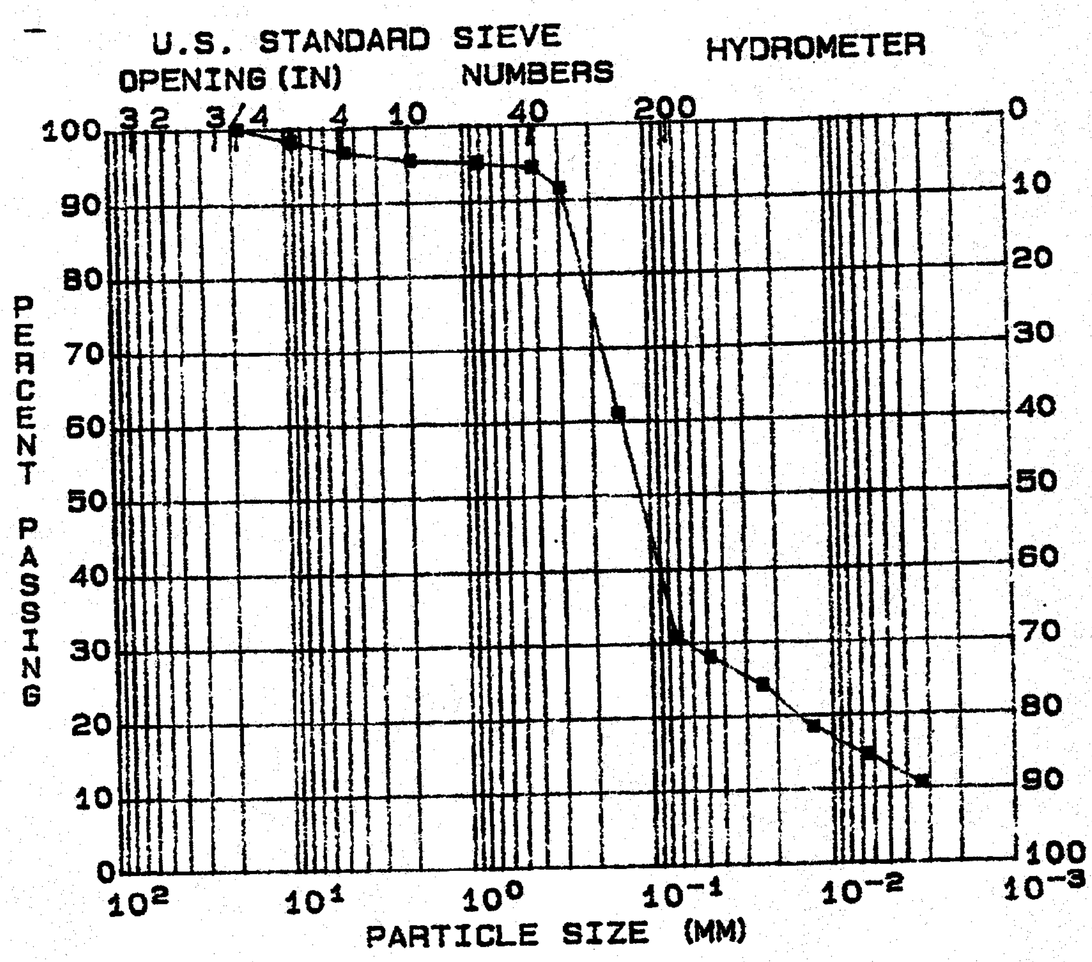
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 3
DATE : 09-29-94




GRAVEL (%) = 3
SAND (%) = 66
SILT (%) = 18
CLAY (%) = 13

D10 (MM) = 0.0029
D30 (MM) = 0.0648
D60 (MM) = 0.1456
COEF UNIF=49.4

SOIL SYMBOL= SM
MOISTURE (%) =
SP. GR. = 2.64

L.L. (%) = NP
P.I. (%) = NP

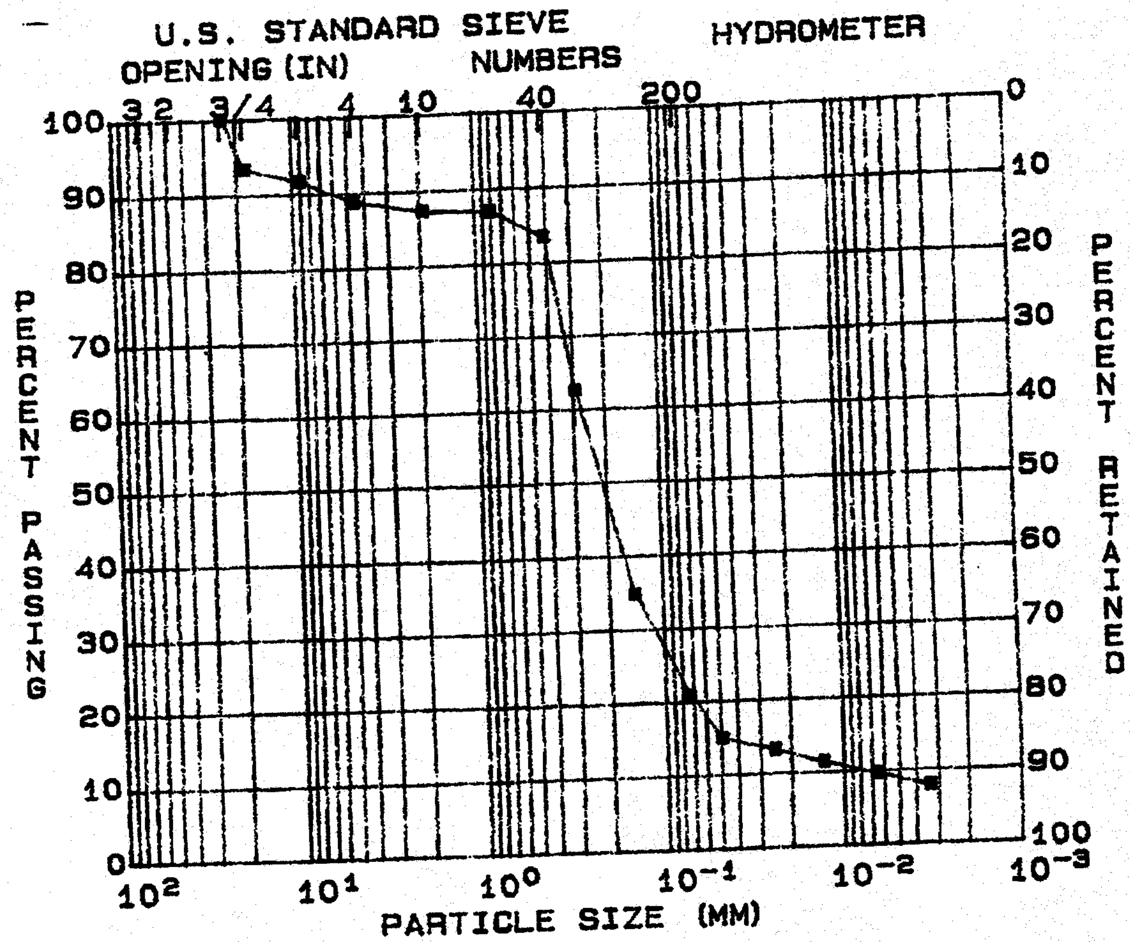
DENSITY (pcf) = ---
SATURATION (%) = ---
VOID RATIO = ---

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 4
DATE : 09-29-94




GRAVEL (%) = 11
SAND (%) = 68
SILT (%) = 12
CLAY (%) = 9

D10 (MM) = 0.0076
D30 (MM) = 0.1176
D60 (MM) = 0.2804
COEF UNIF=37.1

SOIL SYMBOL= SC/SM
MOISTURE (%) =
SP. GR. = 2.66

L.L. (%) = NP
P.I. (%) = NP

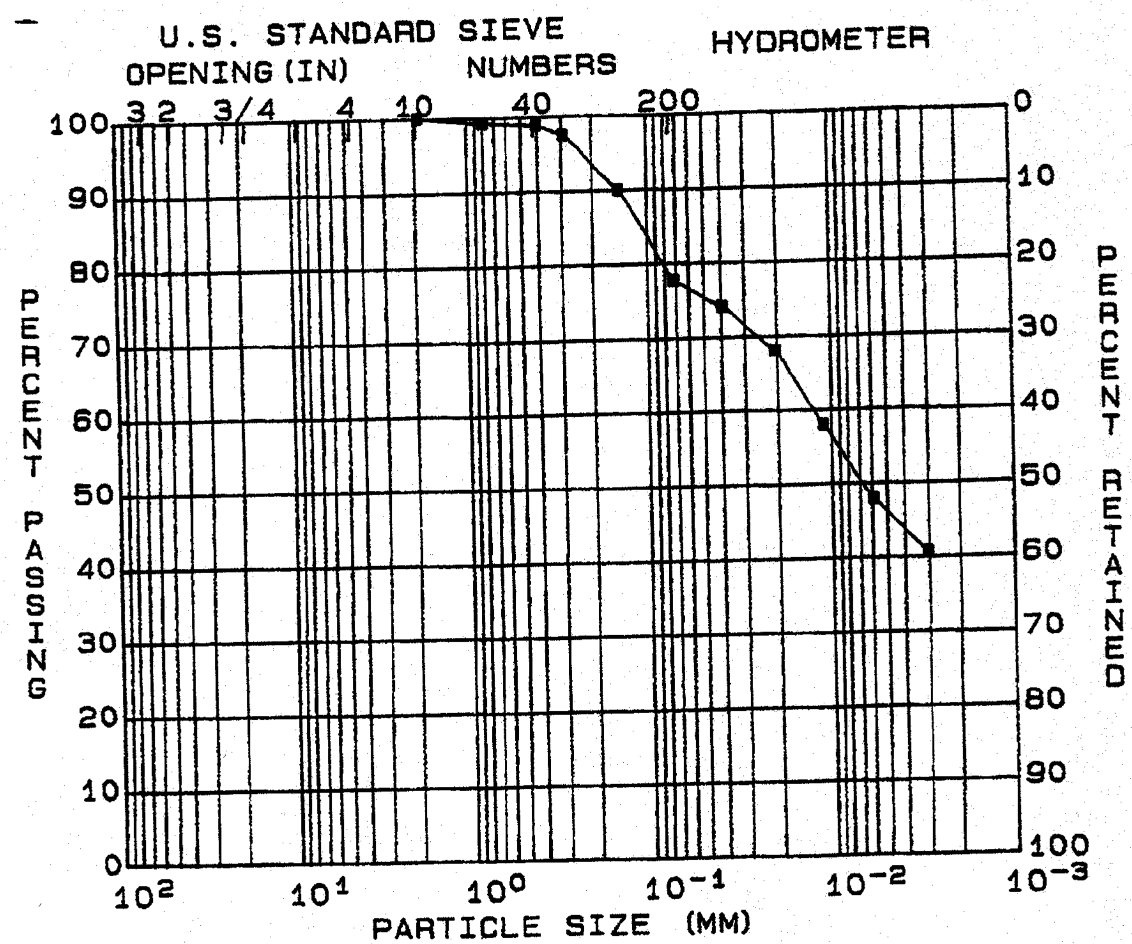
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 5
DATE : 09-29-94




GRAVEL (%) = 0
SAND (%) = 22
SILT (%) = 32
CLAY (%) = 46

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE (%) =
SP. GR. = 2.66

L.L. (%) = 31
P.I. (%) = 12

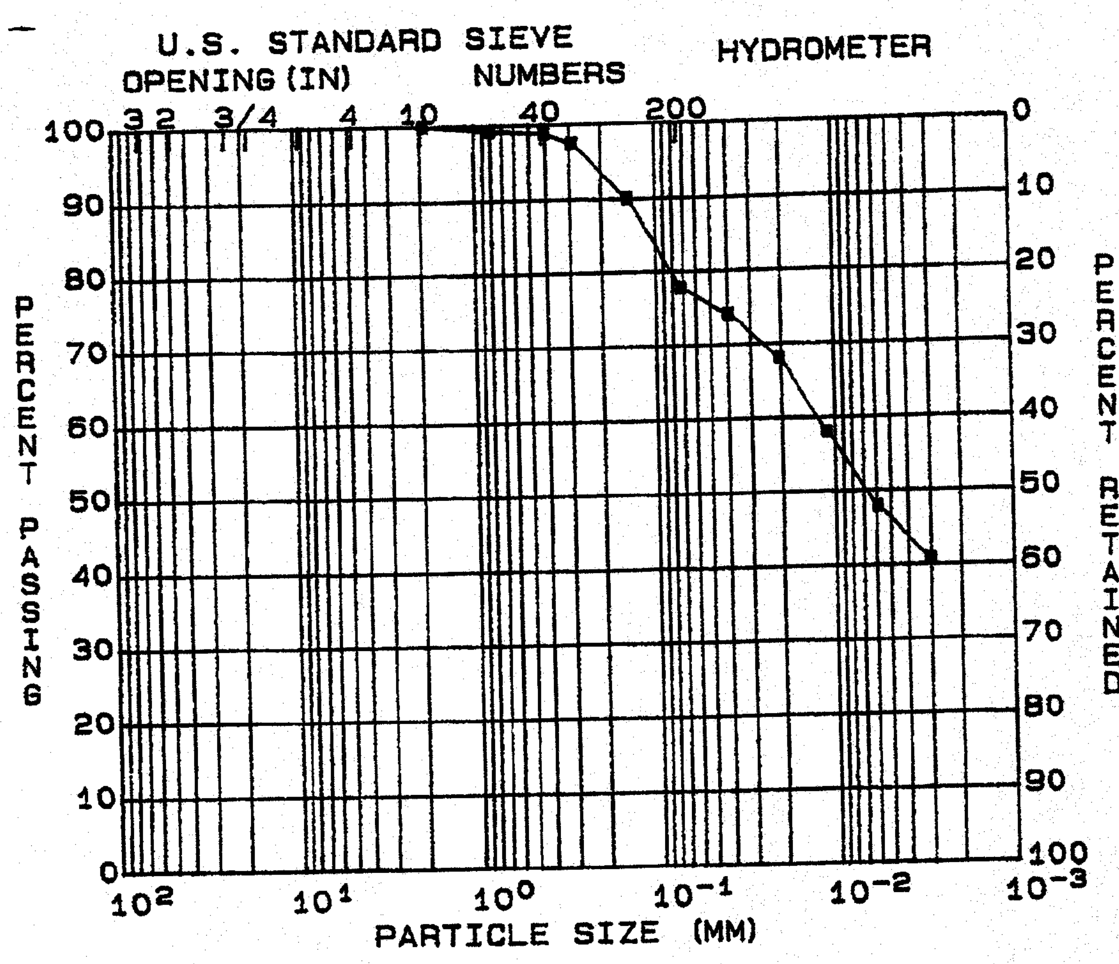
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
# PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 5
DATE : 09-29-94




GRAVEL (%) = 0
SAND (%) = 22
SILT (%) = 32
CLAY (%) = 46

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE (%) =
SP. GR. = 2.66

L.L. (%) = 30
P.I. (%) = 11

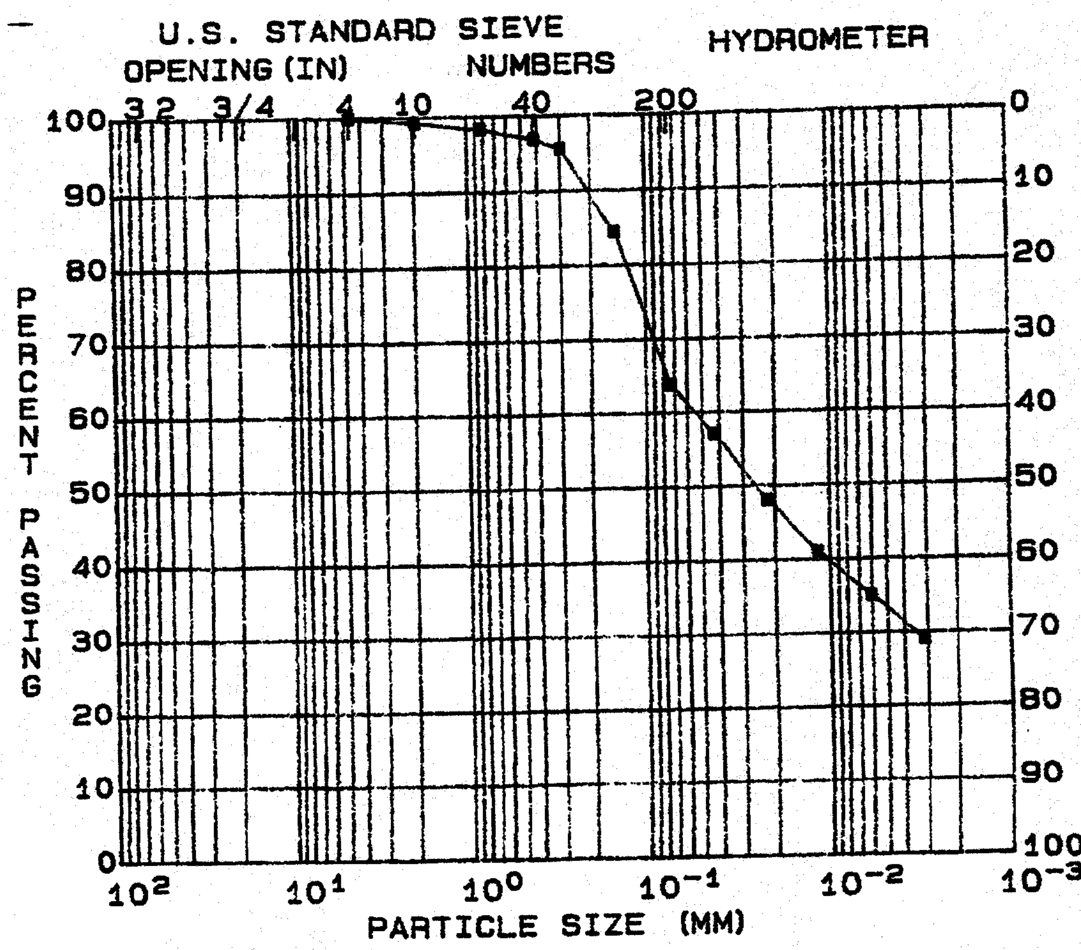
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 6
DATE : 09-29-94




GRAVEL (%) = 0
SAND (%) = 36
SILT (%) = 30
CLAY (%) = 34

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE (%) =
SP. GR. = 2.71

L.L. (%) = 26
P.I. (%) = 8

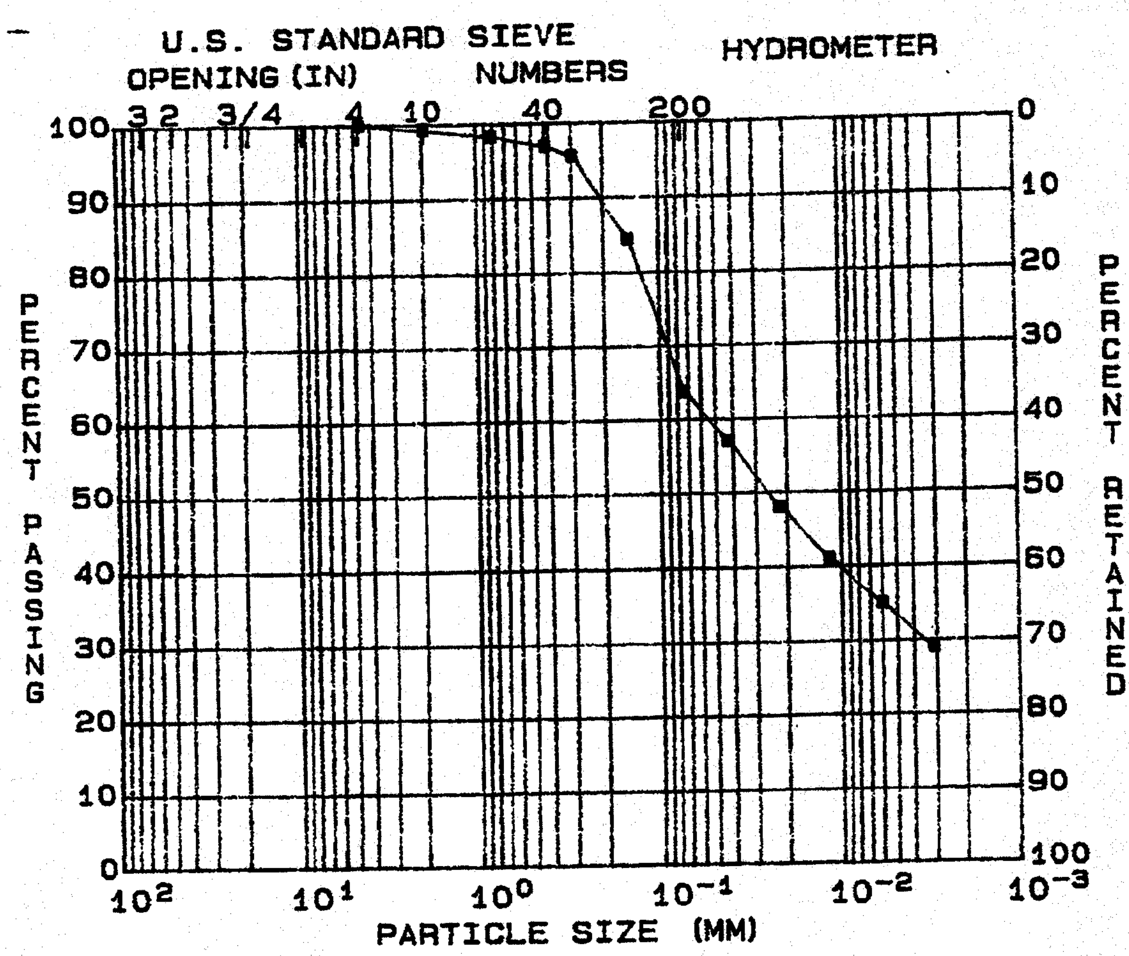
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 6
DATE : 09-29-94




GRAVEL (%) = 0
SAND (%) = 36
SILT (%) = 30
CLAY (%) = 34

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE (%) =
SP. GR. = 2.71

L.L. (%) = 26
P.I. (%) = 8

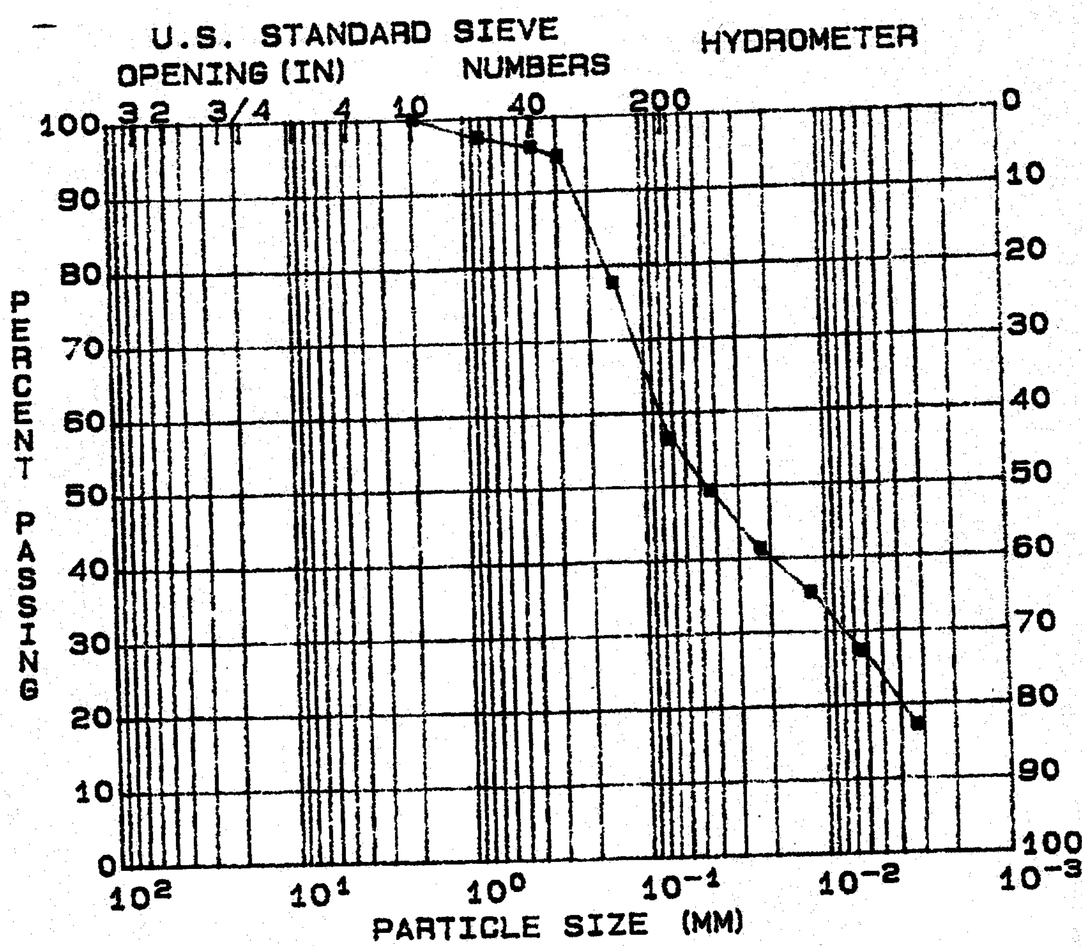
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 7
DATE : 09-29-94




GRAVEL (%) = 0
SAND (%) = 43
SILT (%) = 33
CLAY (%) = 24

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= ML
MOISTURE (%) =
SP. GR. = 2.65

L.L. (%) = NP
P.I. (%) = NP

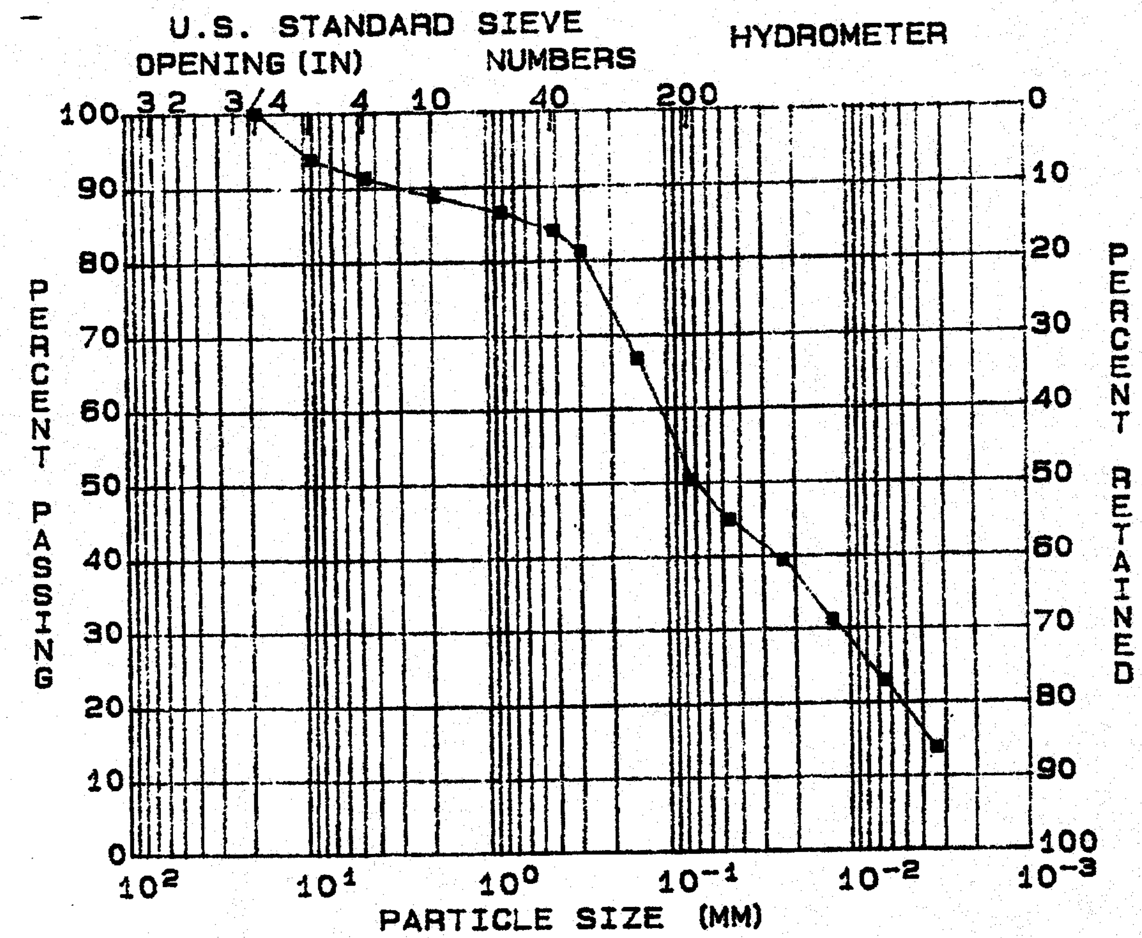
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 8
DATE : 09-29-94




GRAVEL (%) = 8
SAND (%) = 41
SILT (%) = 31
CLAY (%) = 20

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= ML
MOISTURE (%) =
SP. GR. = 2.56

L.L. (%) = NP
P.I. (%) = NP

DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

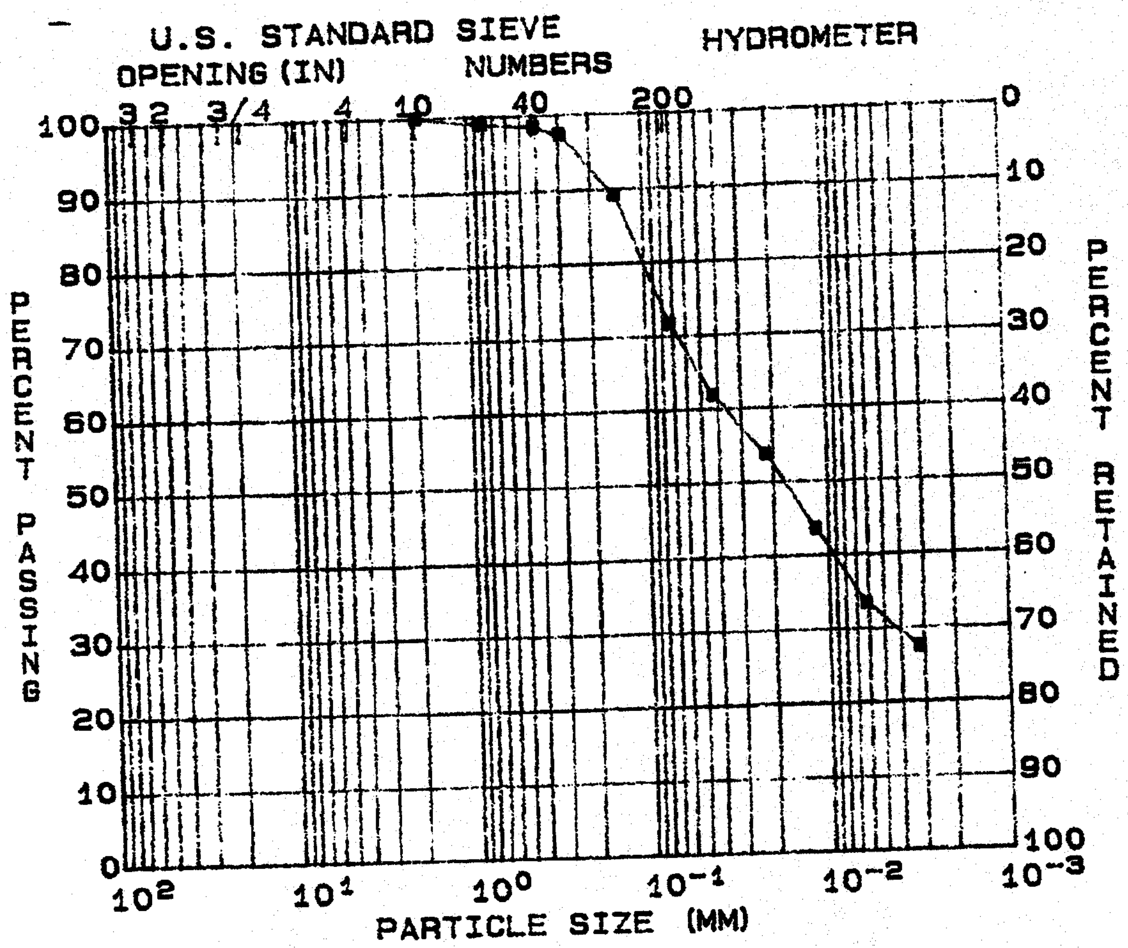
REMARKS:

TVA-00015925

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 9
DATE : 09-29-84




GRAVEL (%) = 0
SAND (%) = 28
SILT (%) = 40
CLAY (%) = 32

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE (%) =
SP. GR. = 2.64

L.L. (%) = 26
P.I. (%) = 8

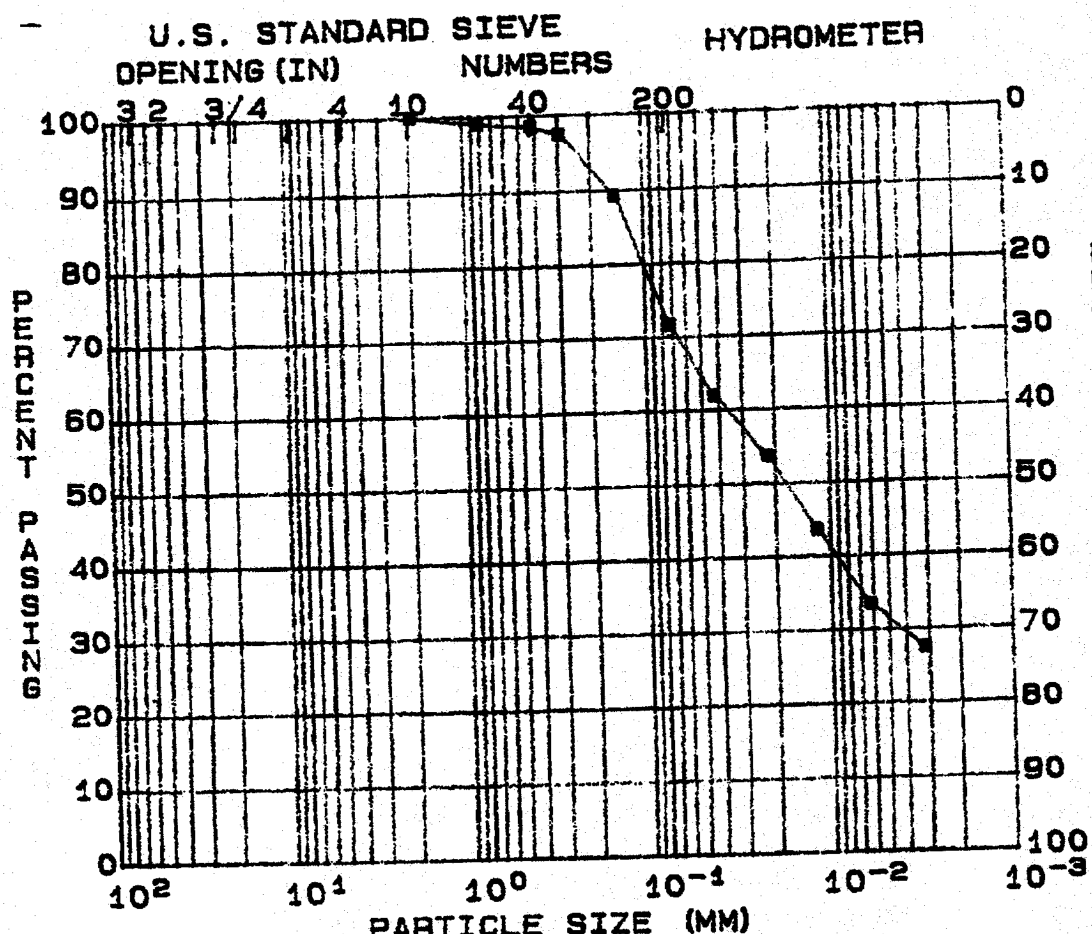
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 9
DATE : 09-29-94




GRAVEL (%) = 0
SAND (%) = 28
SILT (%) = 40
CLAY (%) = 32

D10 (MM) = --
D30 (MM) = --
D60 (MM) = --
COEF UNIF= --

SOIL SYMBOL= CL
MOISTURE (%) =
SP. GR. = 2.64

L.L. (%) = 26
P.I. (%) = 8

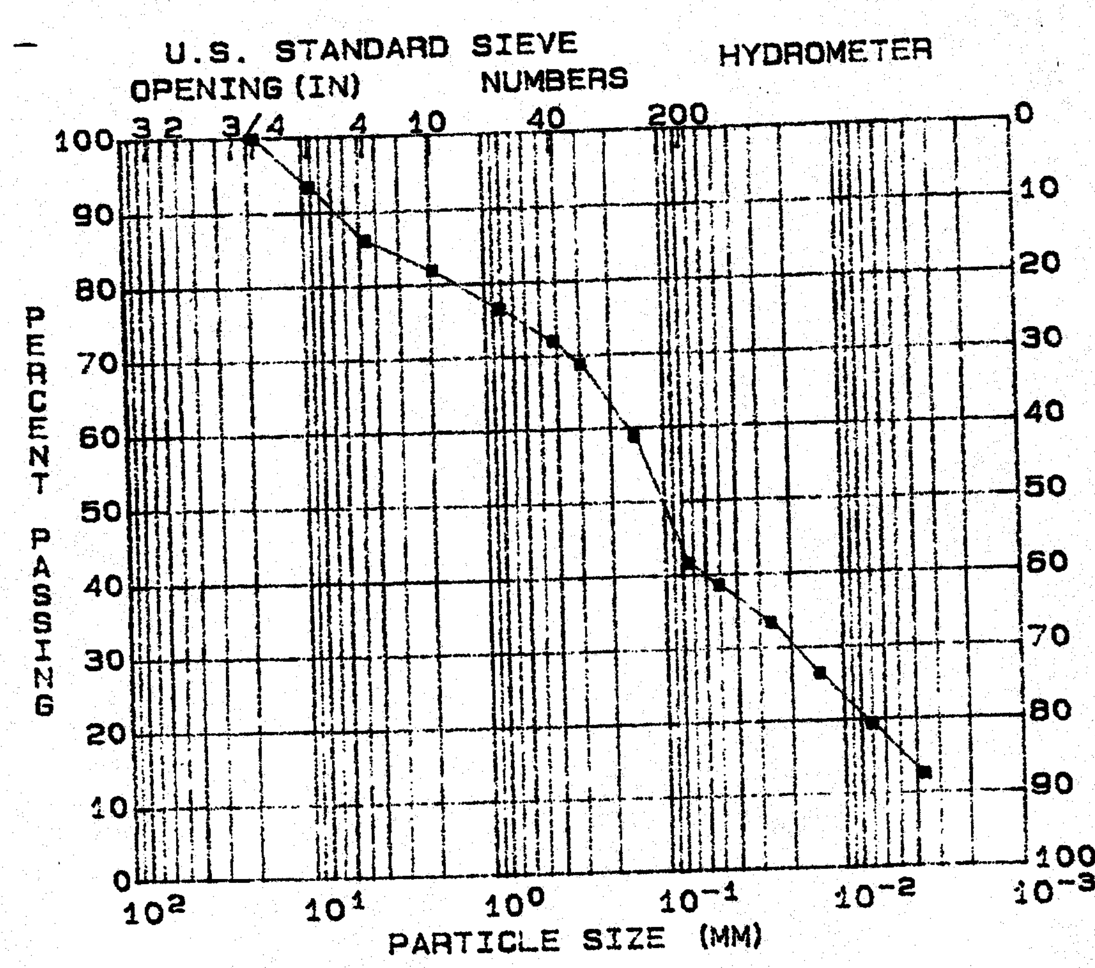
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 10
DATE : 09-29-94




GRAVEL (%) = 13
SAND (%) = 45
SILT (%) = 26
CLAY (%) = 16

D10 (MM) = 0.0029
D30 (MM) = 0.0185
D60 (MM) = 0.1552
COEF UNIF=54.2

SOIL SYMBOL= SM
MOISTURE (%) =
SP. GR. = 2.40

L.L. (%) = NP
P.I. (%) = NP

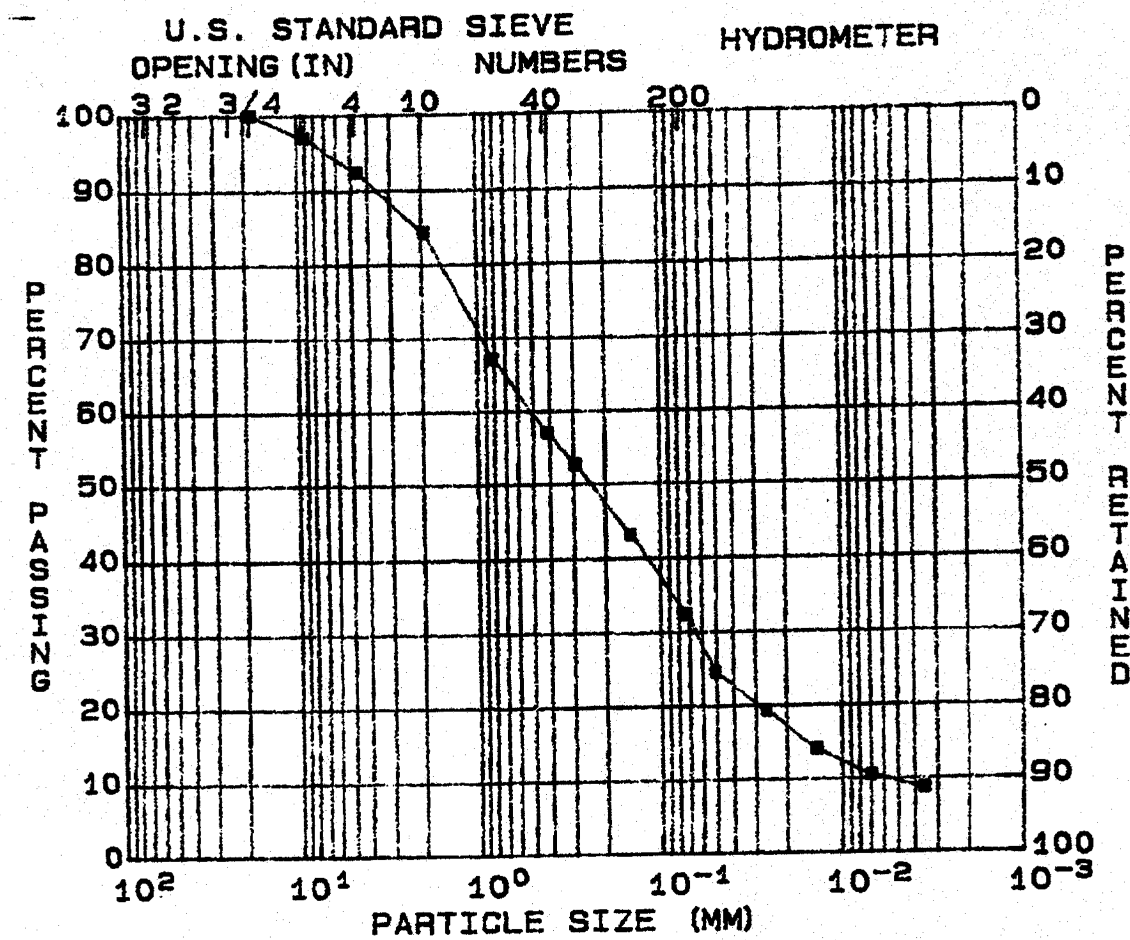
DENSITY (pcf) = ---
SATURATION (%) = ---
VOID RATIO = ---

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 11
DATE : 09-29-94




GRAVEL (%) = 7
SAND (%) = 61
SILT (%) = 23
CLAY (%) = 9

D10 (MM) = 0.0056
D30 (MM) = 0.0662
D60 (MM) = 0.5022
COEF UNIF=90.5

SOIL SYMBOL= SM
MOISTURE (%) =
SP. GR. = 2.51

L.L. (%) = NP
P.I. (%) = NP

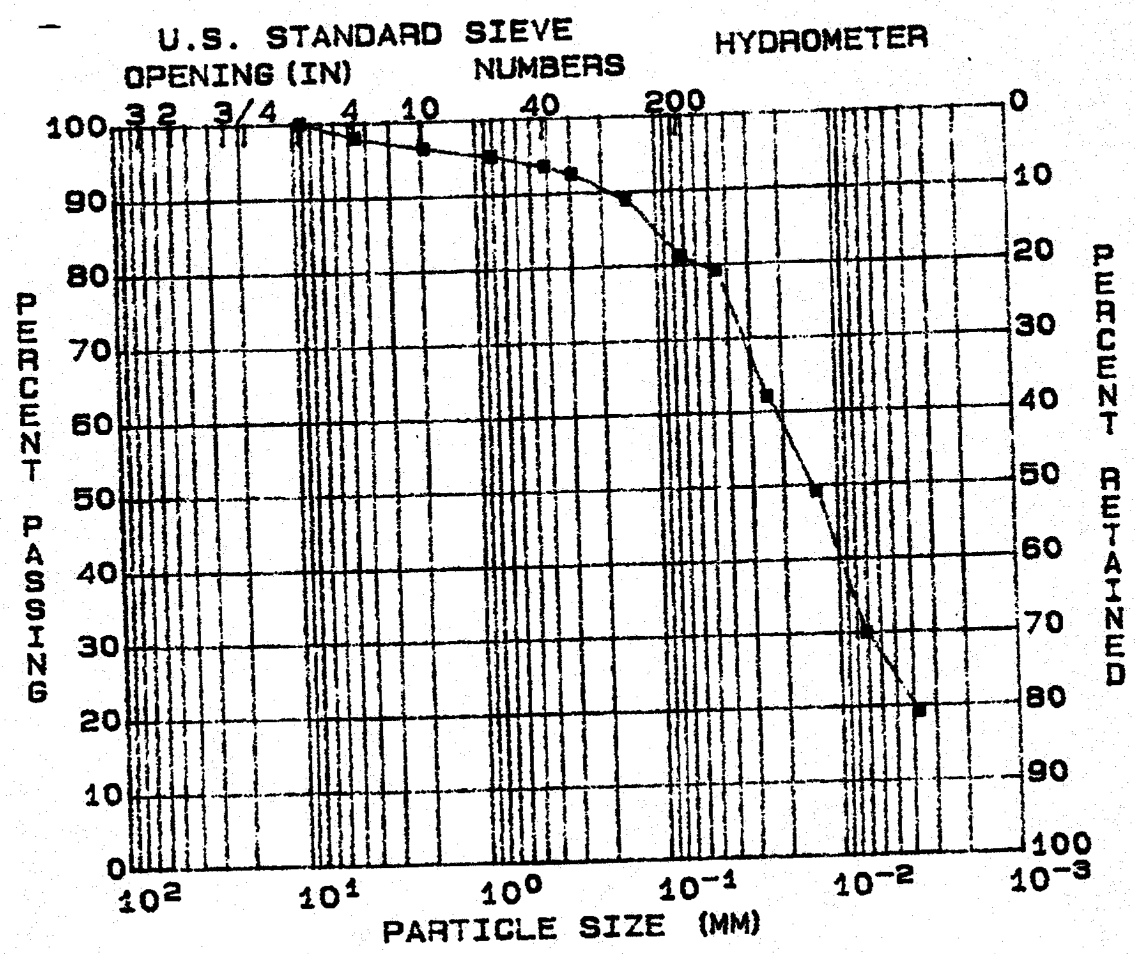
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

# SINGLETON LABORATORIES
## PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Sr 12
DATE : 09-29-94




GRAVEL (%) = 1
SAND (%) = 17
SILT (%) = 57
CLAY (%) = 25

D10 (MM) = ---
D30 (MM) = ---
D60 (MM) = ---
COEF UNIF= ---

SOIL SYMBOL= ML
MOISTURE (%) =
SP. GR. = 2.31

L.L. (%) = NP
P.I. (%) = NP

DENSITY (pcf) = ---
SATURATION (%) = ---
VOID RATIO = ---

REMARKS:

**This information taken from "Report of Soil Borings, Monitoring Well Installation and Soil Laboratory Testing – Tennessee Valley Authority – Watts Bar and Kingston Facilities," Law Engineering, November 30, 1988.**

## LABORATORY TESTING PROCEDURES

### ATTERBERG LIMITS

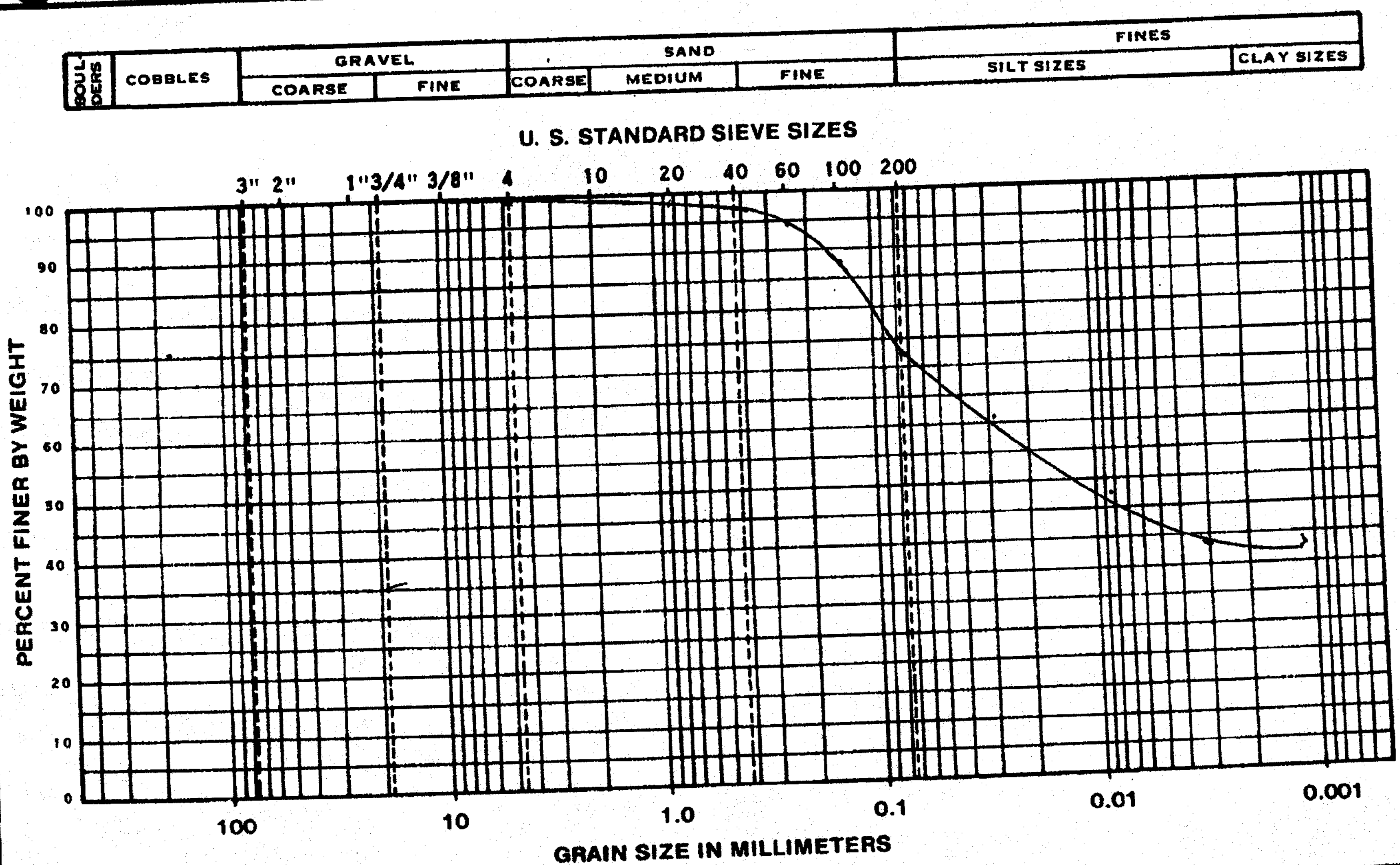
The Atterberg Limits consist of moisture contents of soils which produce specified consistencies. The Atterberg Limits consist of the Liquid Limit (LL), Plastic Limit (PL) and Shrinkage Limit (SL). The LL (between the liquid and plastic states) is the water content at which a trapazoidal groove of specified shape, cut in moist soil held in a special cup, is closed after 25 taps on a hard rubber plate. The PL (between the semi-solid and solid states) is the maximum water content at which a reduction in water content will not cause a decrease in the volume of the soil mass.

The LL has been found to be proportional to the compressibility of the normally consolidated soil. The Plasticity Index (PI) is the calculated difference in water contents between the LL and PL. Together the LL and PI are used to classify silts at clays according to the Unified System Classification of Soils (ASTM D-2487). The PI is used to predict the potential for volume changes in confined soils beneath foundations or grade slabs. Should the PI indicate the potential for soil volume change, Shrinkage Limit (SL) testing can be performed to estimate the amount of volume changes in confined soils beneath foundations or grade slabs.

The LL, (PL and PI) and SL are determined in accordance with ASTM's D-423, D-424 and D-427, respectively.

### GRAIN SIZE DISTRIBUTION

Grain Size Tests are performed to aid in determining the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D-421 (dry preparation) or ASTM D-2217 (wet preparation). If only the grain size distribution of soils coarser than a number 200 sieve (o.074 mm opening) is desired, the grain size distribution is determined by washing the sample over a #200 sieve and after drying passing the samples through a standard set of nested sieves. If the grain size distribution of the soils finer than the #200 sieve is also desired, the grain size distribution of the soils coarser than the #10 sieve is determined by passing the sample through a set of nested sieves. Materials passing the number 10 sieve are dispersed with a dispersing agent and suspended in water and the grain size distribution calculated from the measured settlement rate of the particles. These tests are conducted in accordance with ASTM D-422.

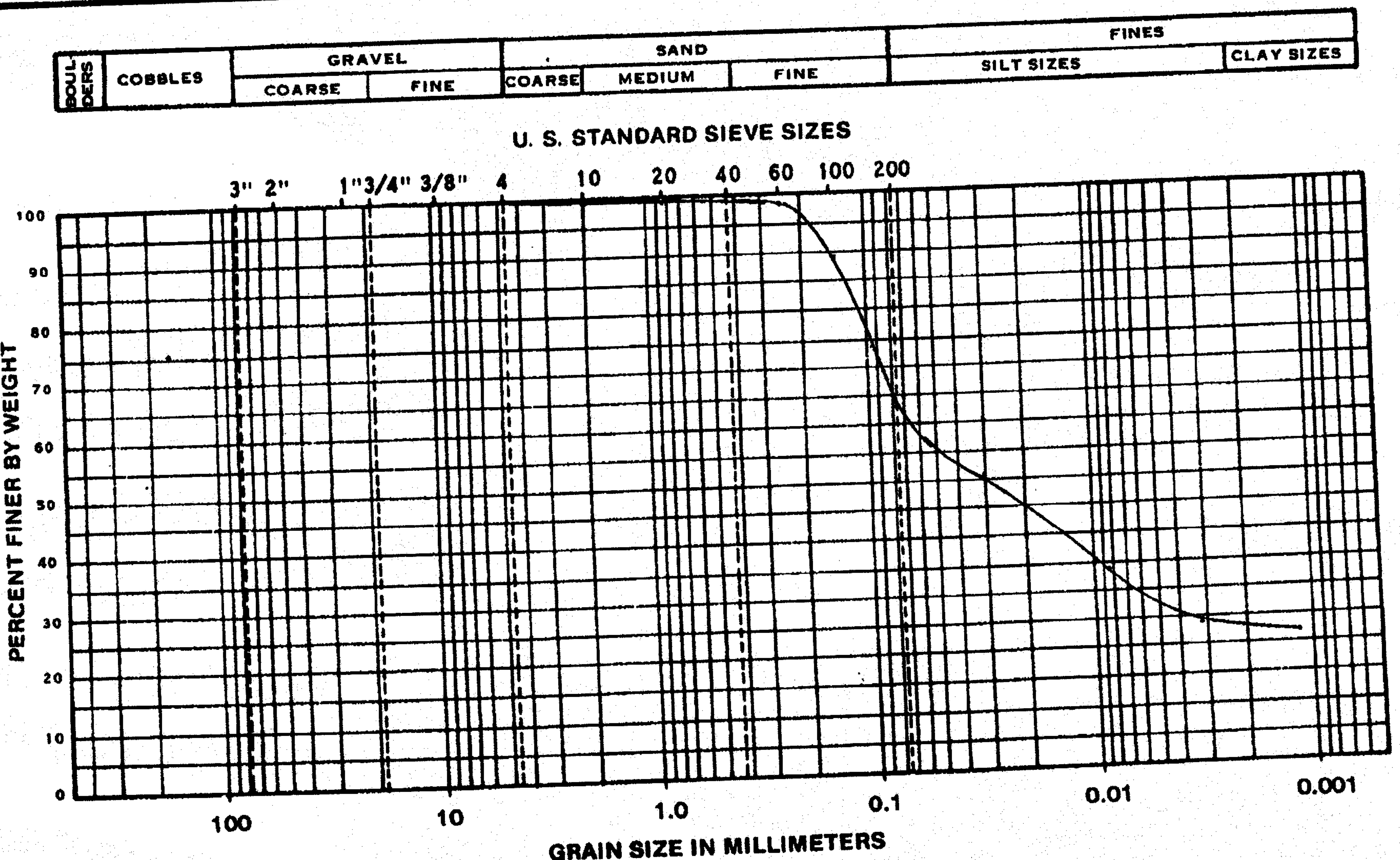



| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| WB-1 | 4 TO 5.5 FEET | 16.6% | 41 | 20 | 21 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

**Law Engineering Testing Company**

**Grain Size Distribution**

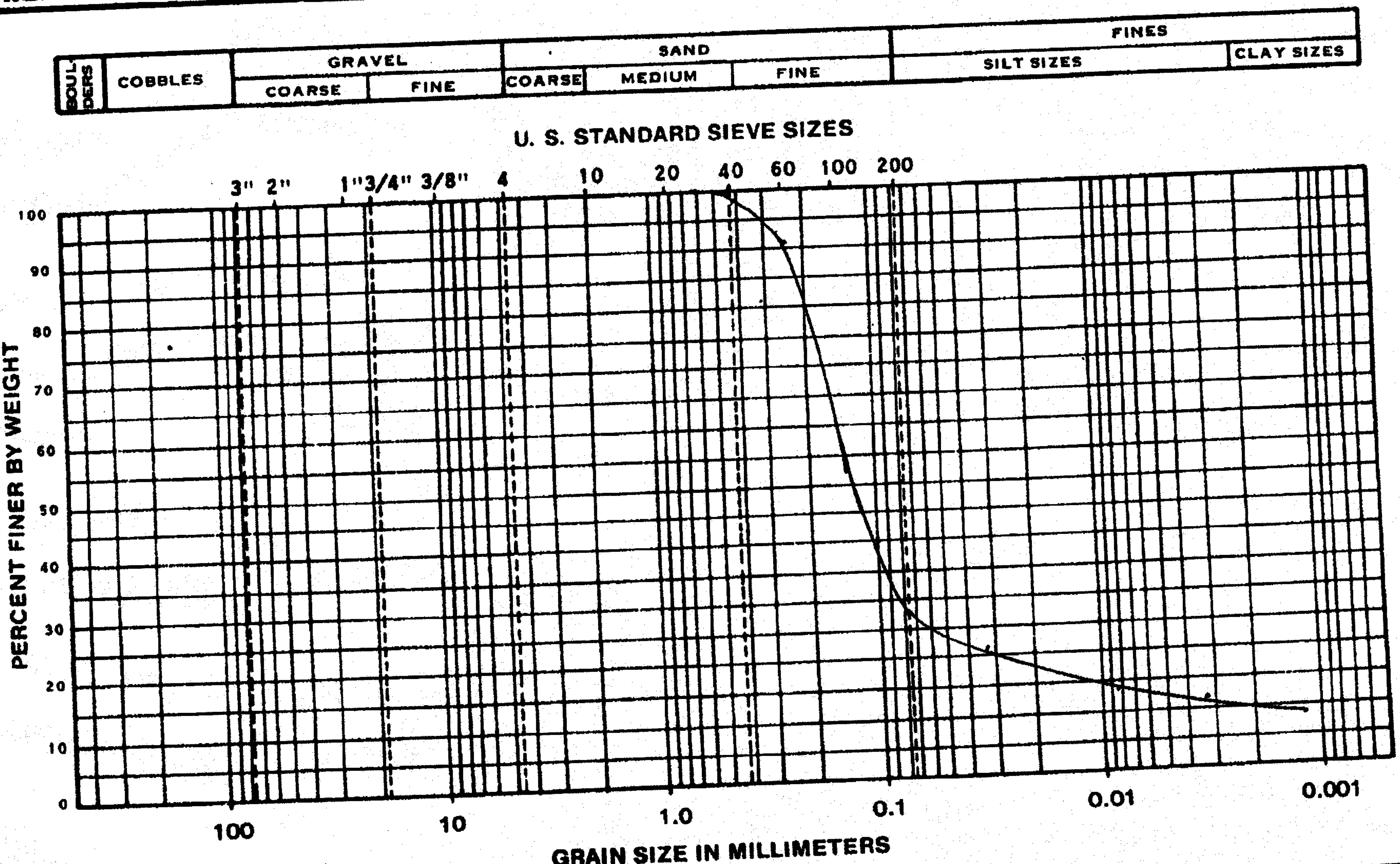
AF 3




**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| WB-1 | 19 TO 20.5 FEET | 19.1% | 27 | 17 | 10 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |



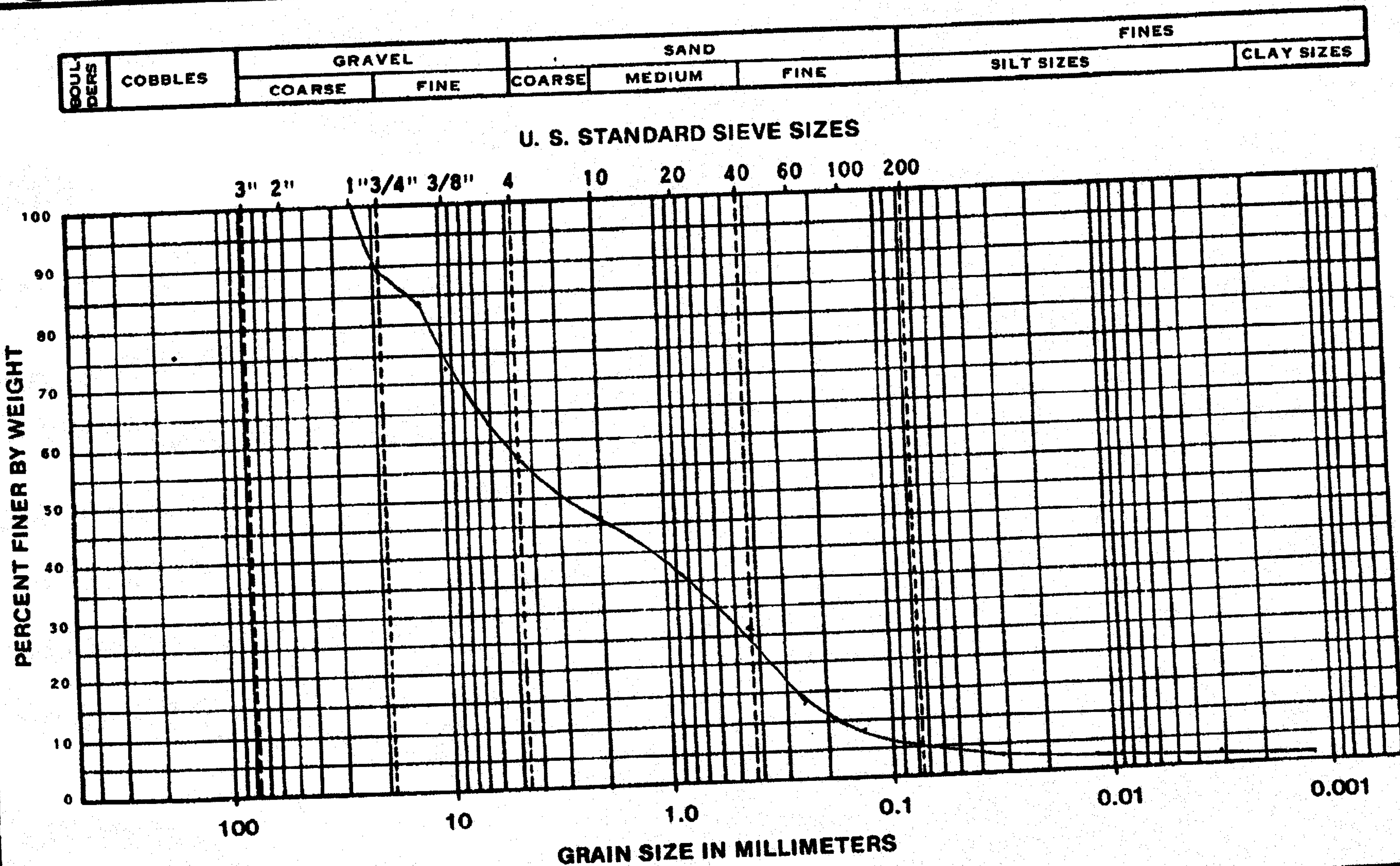

**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| WB-1 | 34 TO 35.5 FEET | 26.3% | 23 | 20 | 3 | SM - SILTY SANDS, SANDY-SILT MIXTURE |

| JOB NO. |
|---|
| K-88195 |

AF 30



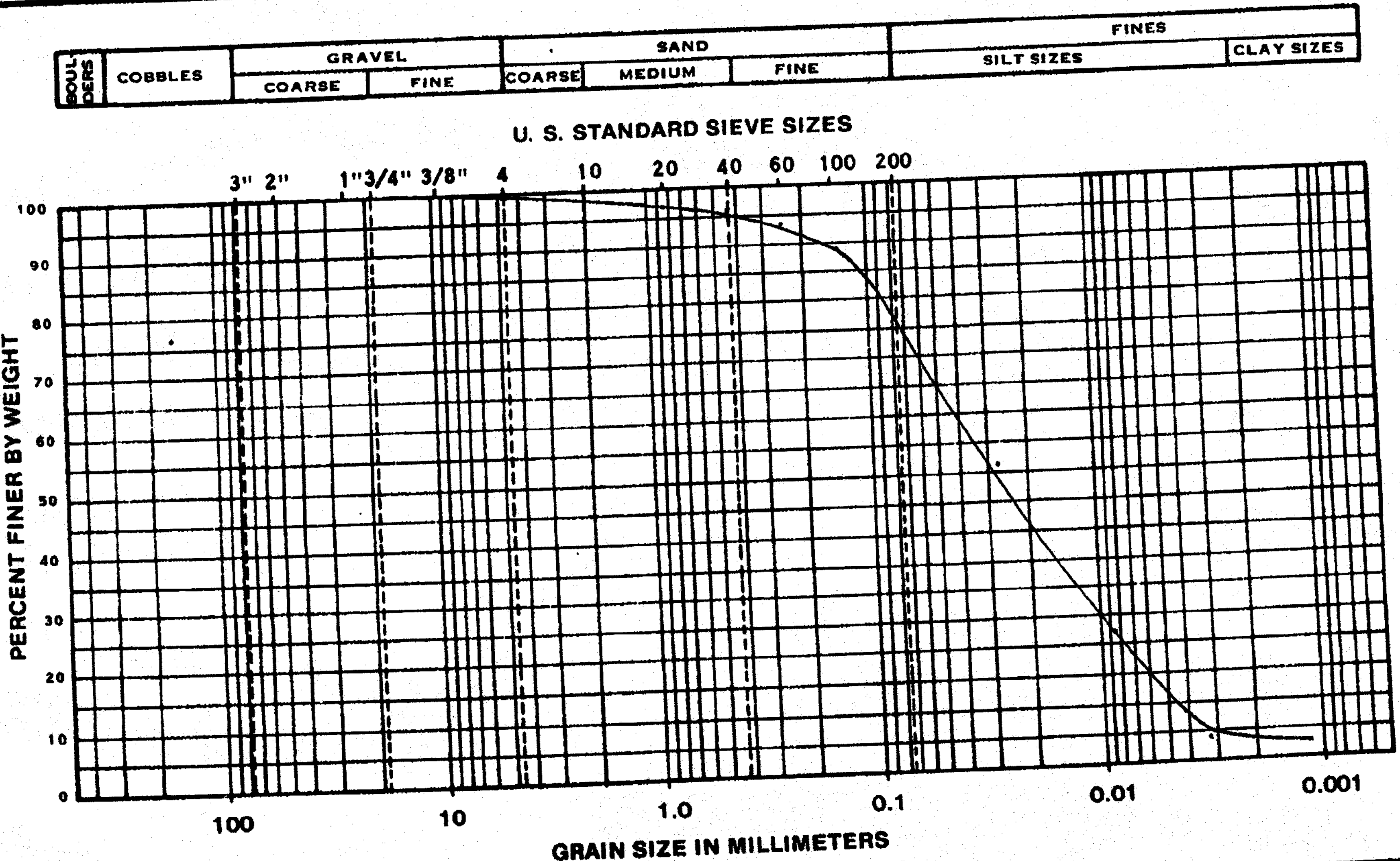

**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| WB-1 | 44 TO 45.5 FEET | 10.3% | NON-PLASTIC | | | SP-SM - POORLY GRADED SANDS TO SILTY SANDS |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF

AF 30



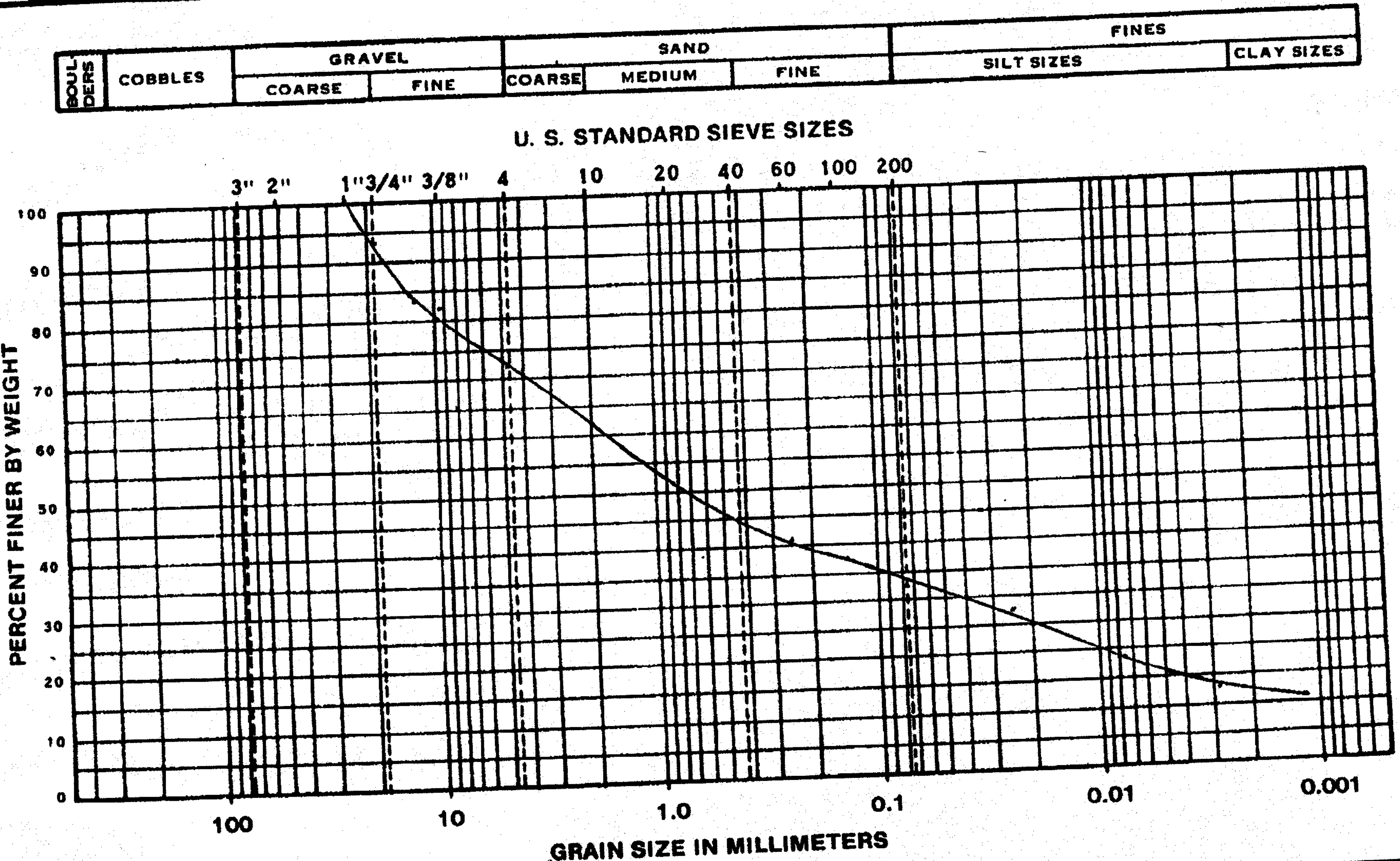

**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-9A | 9 TO 10.5 FEET | 23.5% | NON-PLASTIC SOIL | | | ML - INORGANIC SILTS AND FINE SANDS |
| JOB NO. K-88195 | | | | | | |

TVA-00015938

AF 3…

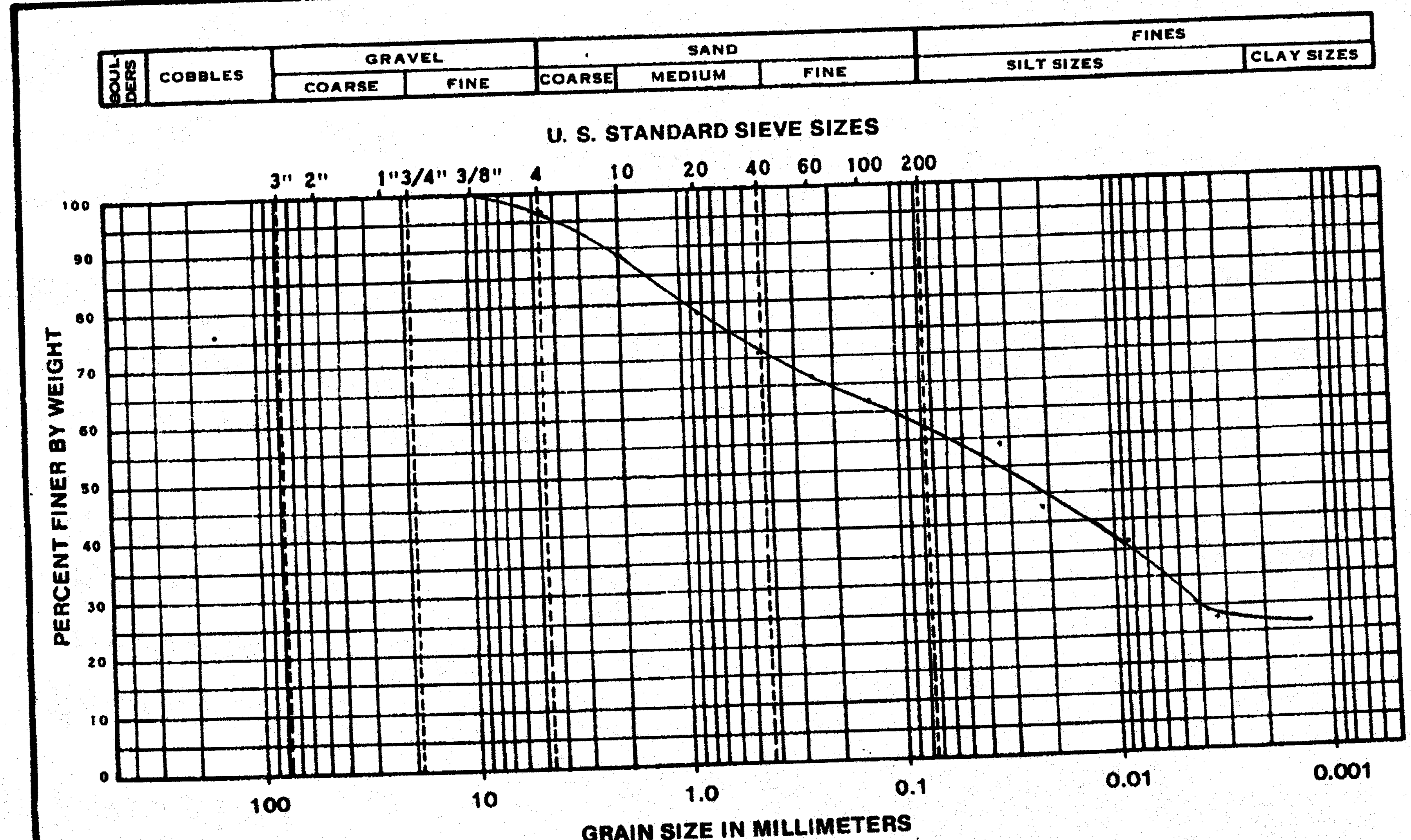



| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-10B | 4.0 TO 5.5 FEET | 11.4% | | | | SAMPLE NOT LARGE ENOUGH TO PERFORM PLASTICITY TESTS |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

**Law Engineering Testing Company**

## Grain Size Distribution

AF 96

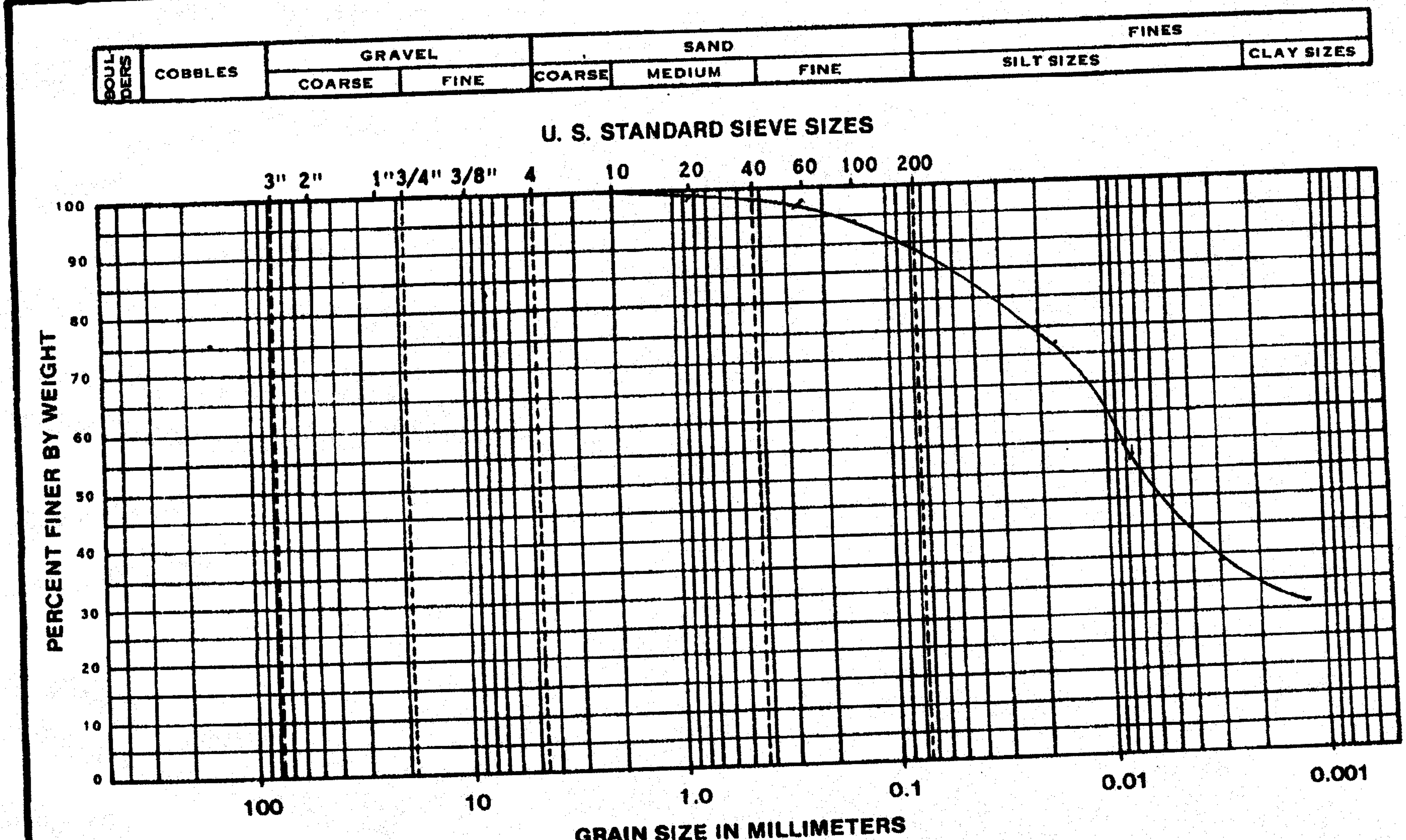



# Law Engineering Testing Company

## Grain Size Distribution

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-10B | 14 TO 15.5 FEET | 24.8% | 38 | 24 | 14 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |

| JOB NO. |
|---|
| K-88195 |

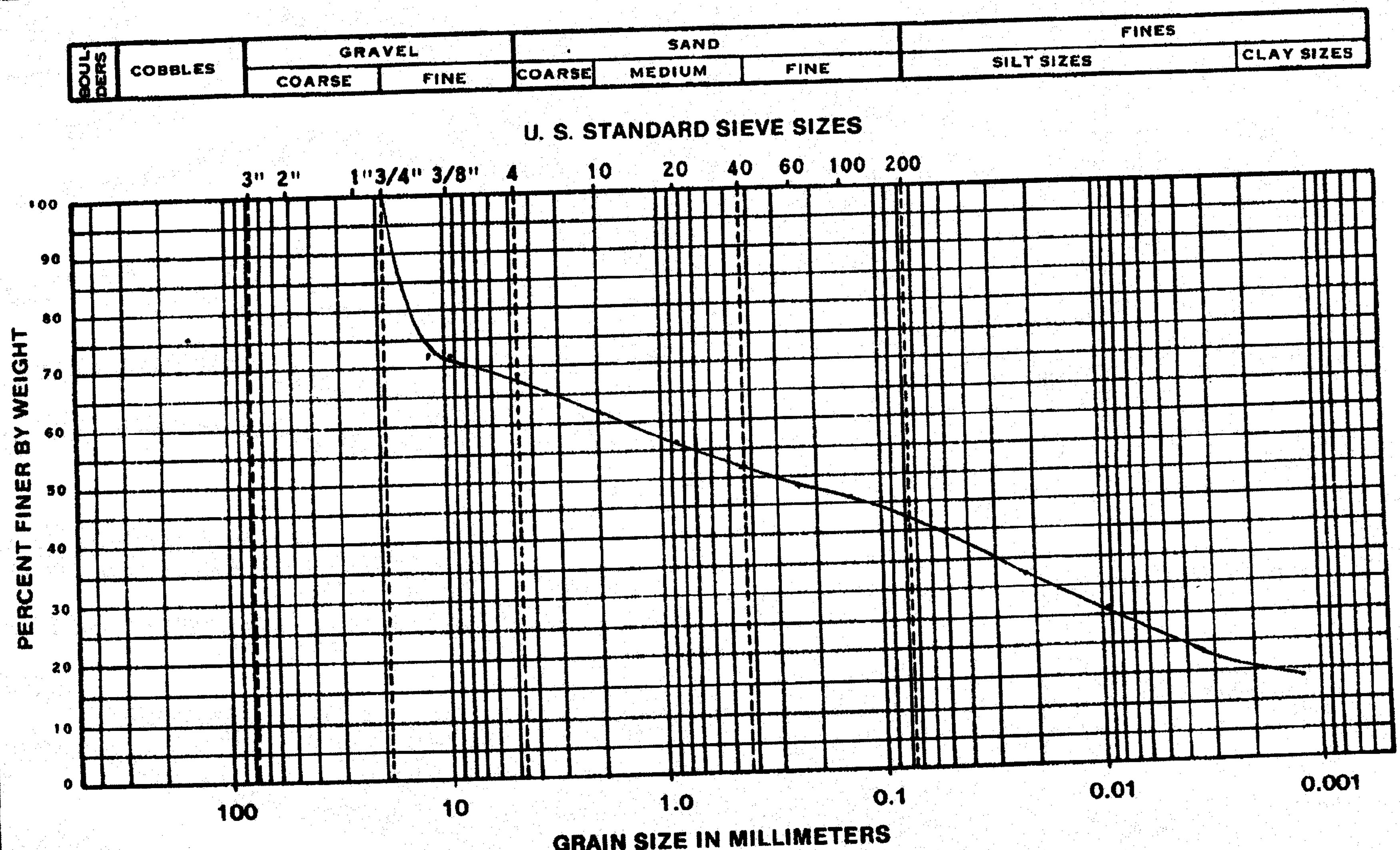



| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-11B | 4 TO 5.5 FEET | 12.5% | 37 | 23 | 14 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

Law Engineering Testing Company

**Grain Size Distribution**

AF 30

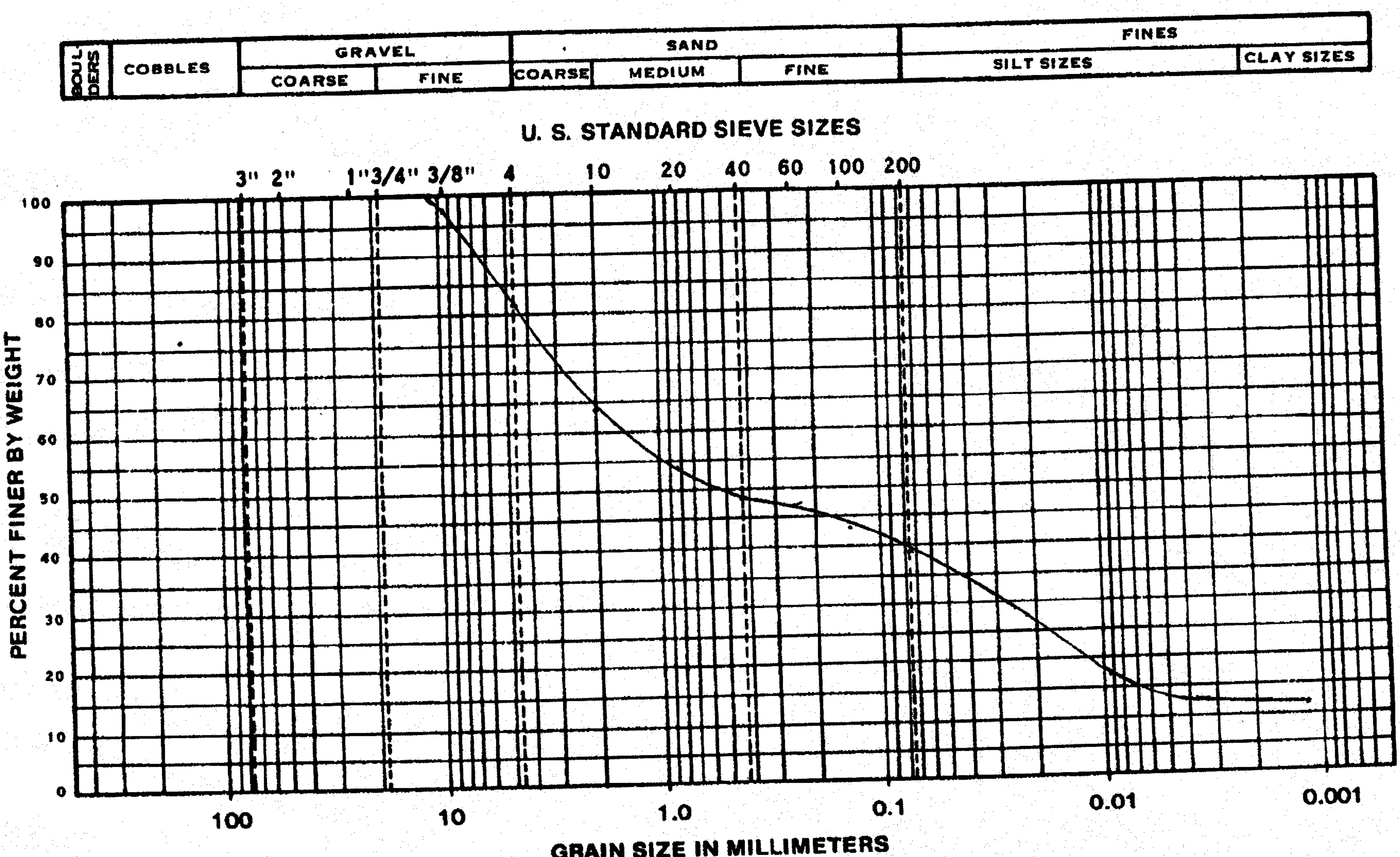



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | L.L. | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-12A | 14 TO 15.5 FEET | 21.3% | 36 | 21 | 15 | GC - CLAYEY GRAVELS, GRAVEL - SAND-CLAY MIXTURE |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 9…

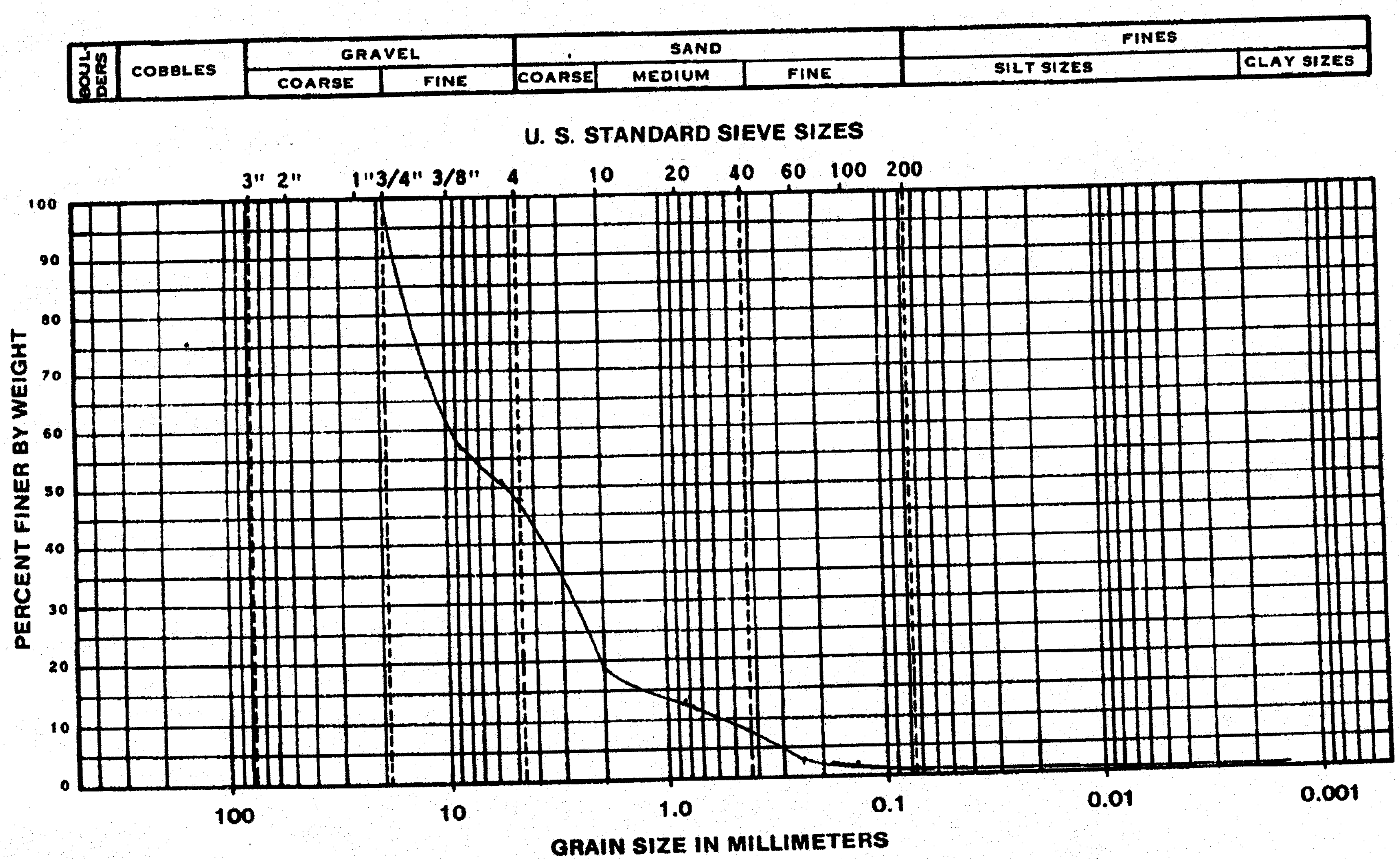



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-12A | 24 TO 25.5 FEET | 13.4% | 30 | 20 | 10 | SC - CLAYEY SANDS, SANDY-CLAY MIXTURE |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 30

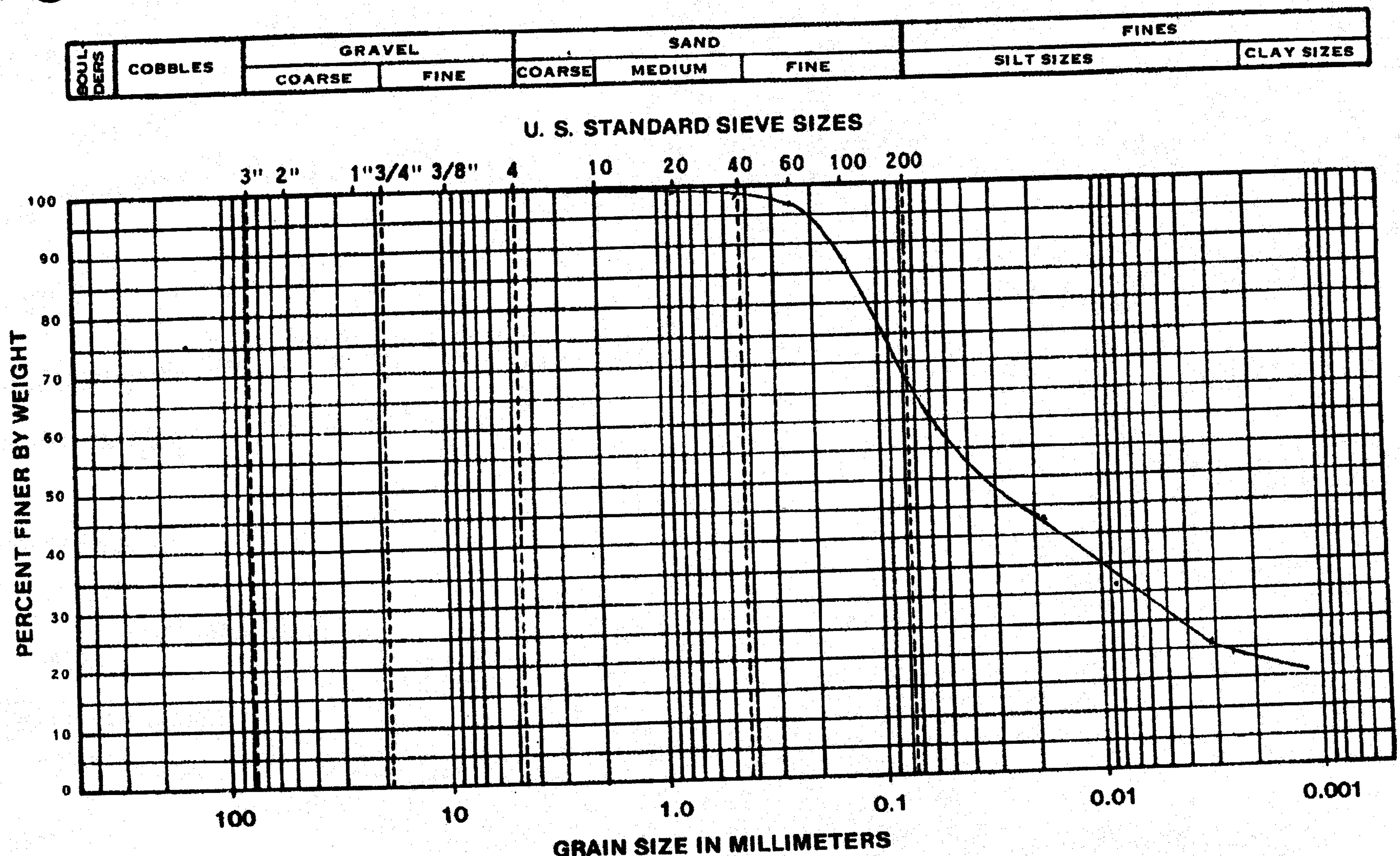



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-13 A | 49 TO 50.5 FEET | 17.2% | NON-PLASTIC | | | GW - WELL GRADED GRAVEL, GRAVEL SAND MIXTURES, LITTLE TO NO FINES |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 3

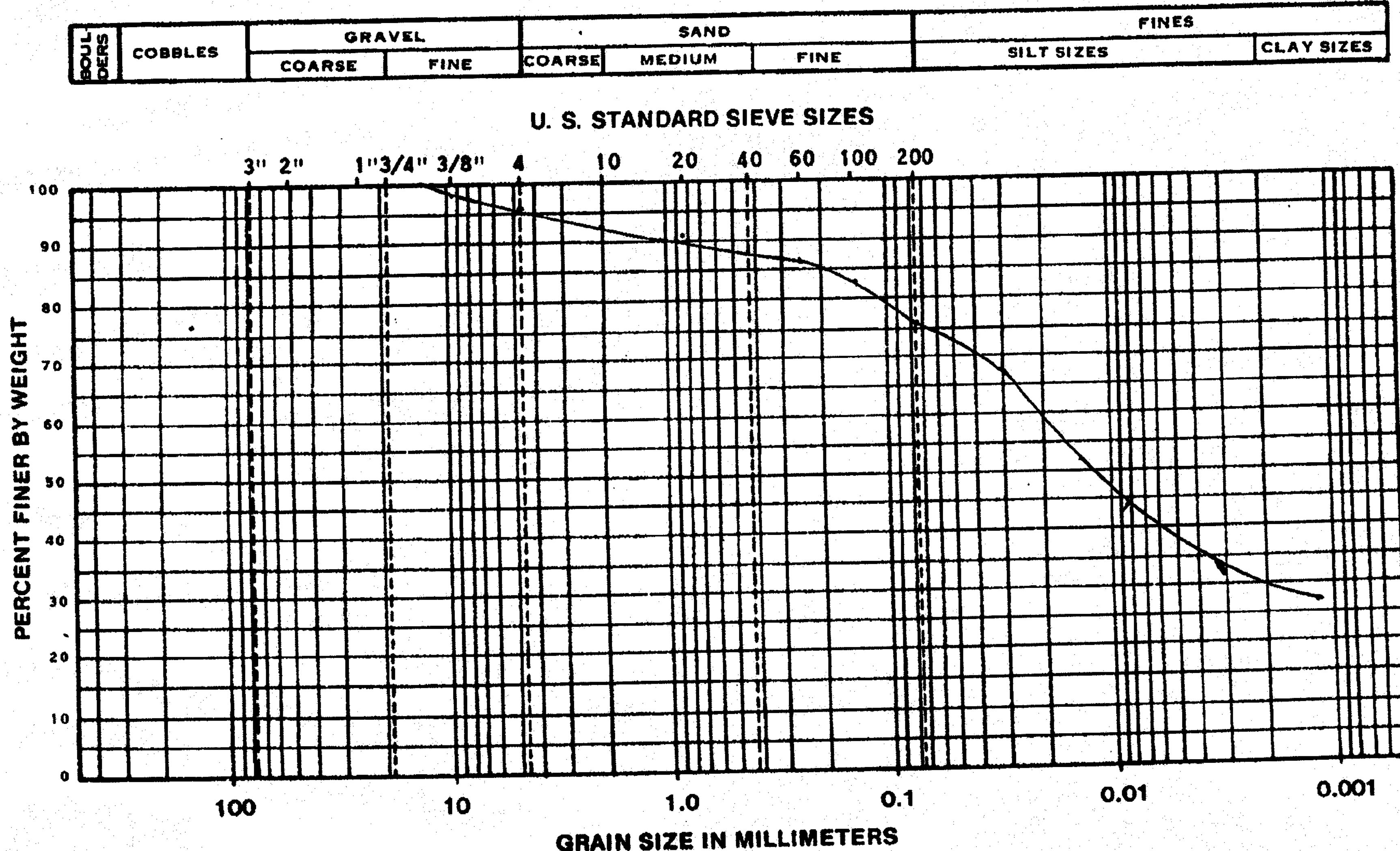



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-13 A | 54 TO 55.5 FEET | 29.3% | 27 | 17 | 10 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

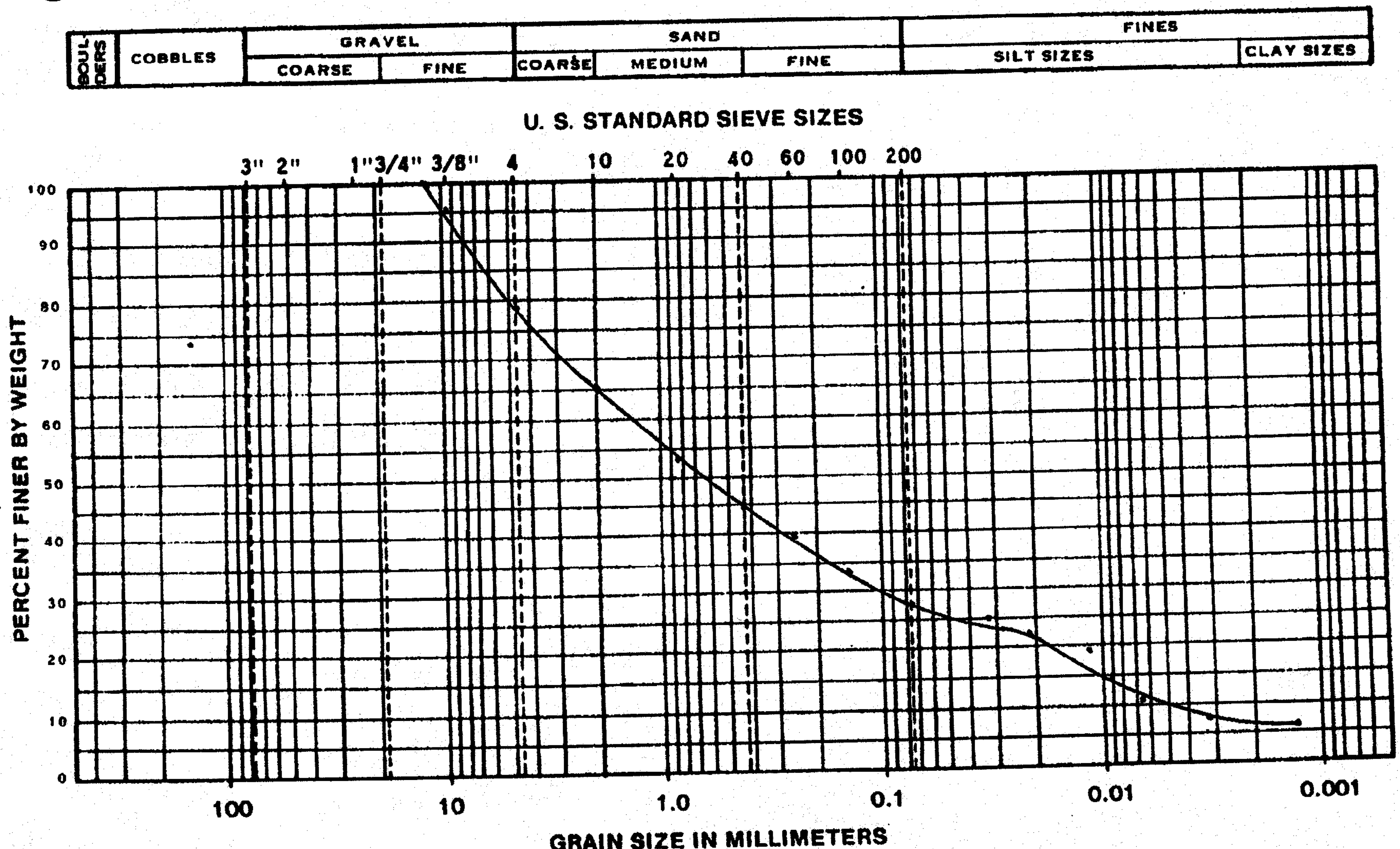
TVA-00015945




| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-14 | 9 TO 10.5 FEET | 17.8% | 28 | 14 | 14 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

**Law Engineering Testing Company**

## Grain Size Distribution



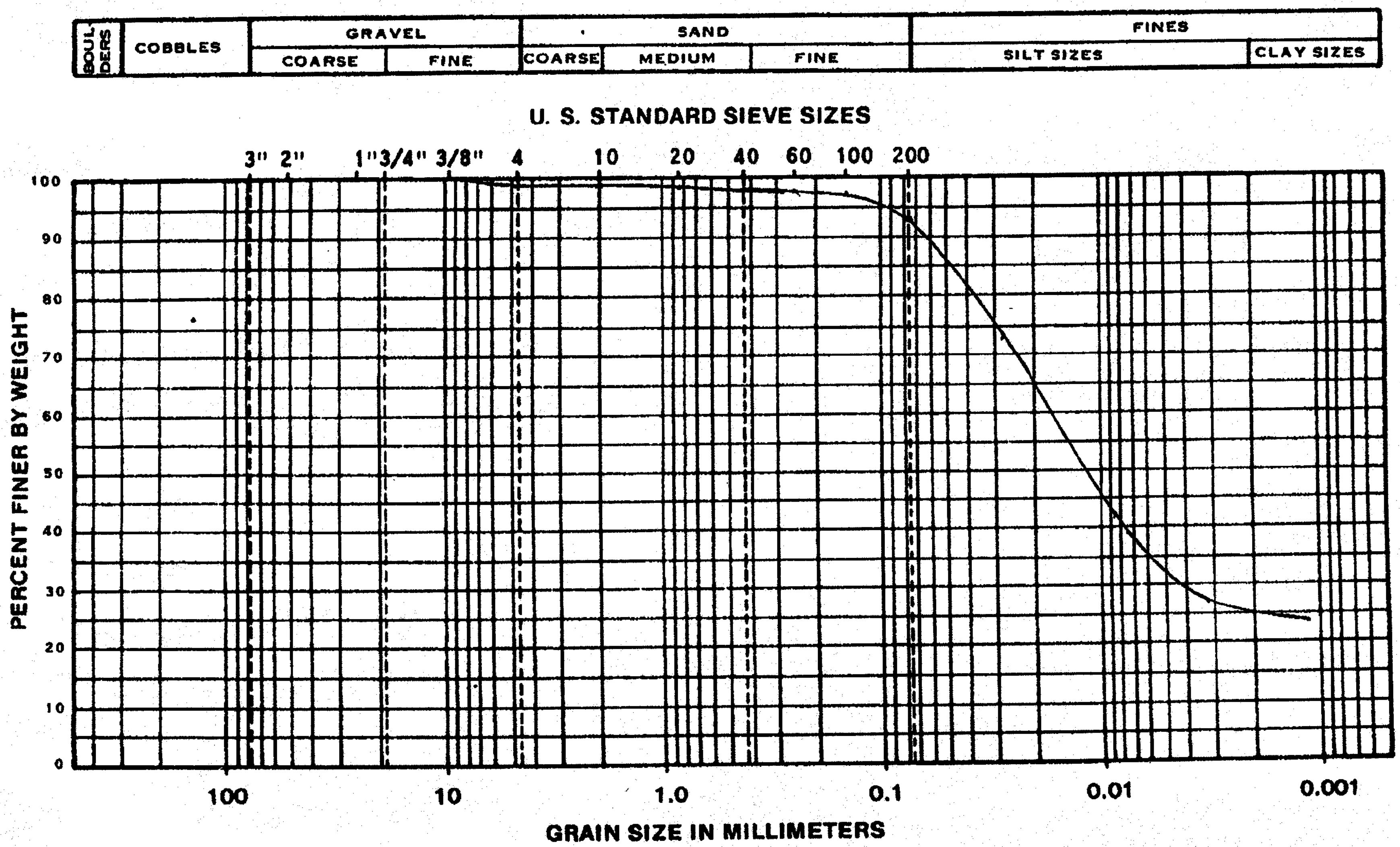

**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-14 | 11.5 TO 13.0 FEET | 25.1% | NON-PLASTIC | | | SM - SILTY SANDS, SAND-SILT MIXTURE |
| JOB NO. K-88195 | | | | | | |

AF 3

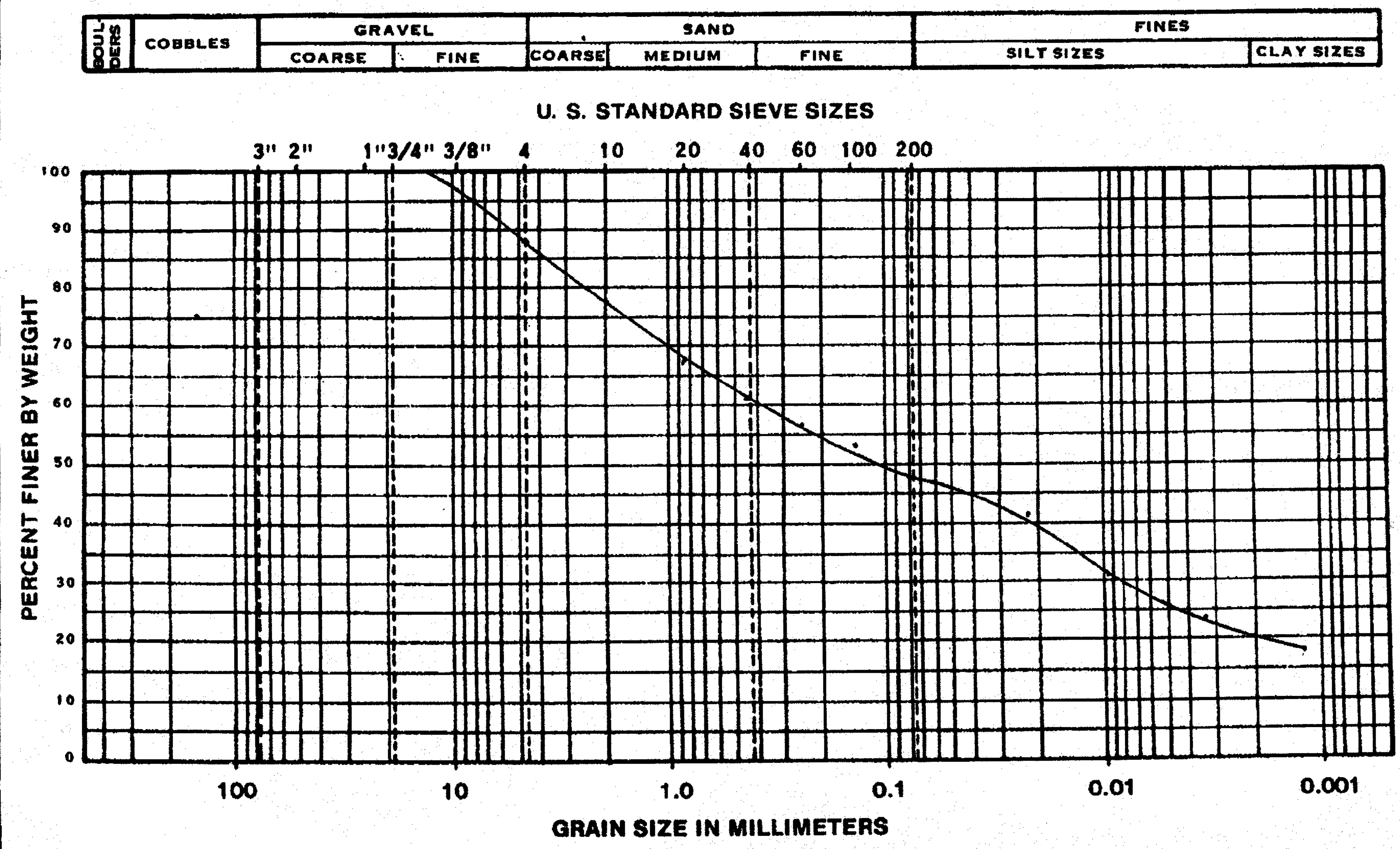
AF 36




| | BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|---|
| **Law Engineering Testing Company** | J-14 | 29 TO 30.5 FEET | 22.8% | 30 | 19 | 11 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| **Grain Size Distribution** | JOB NO. K-88195 | | | | | | |

TVA-00015948

AF 3

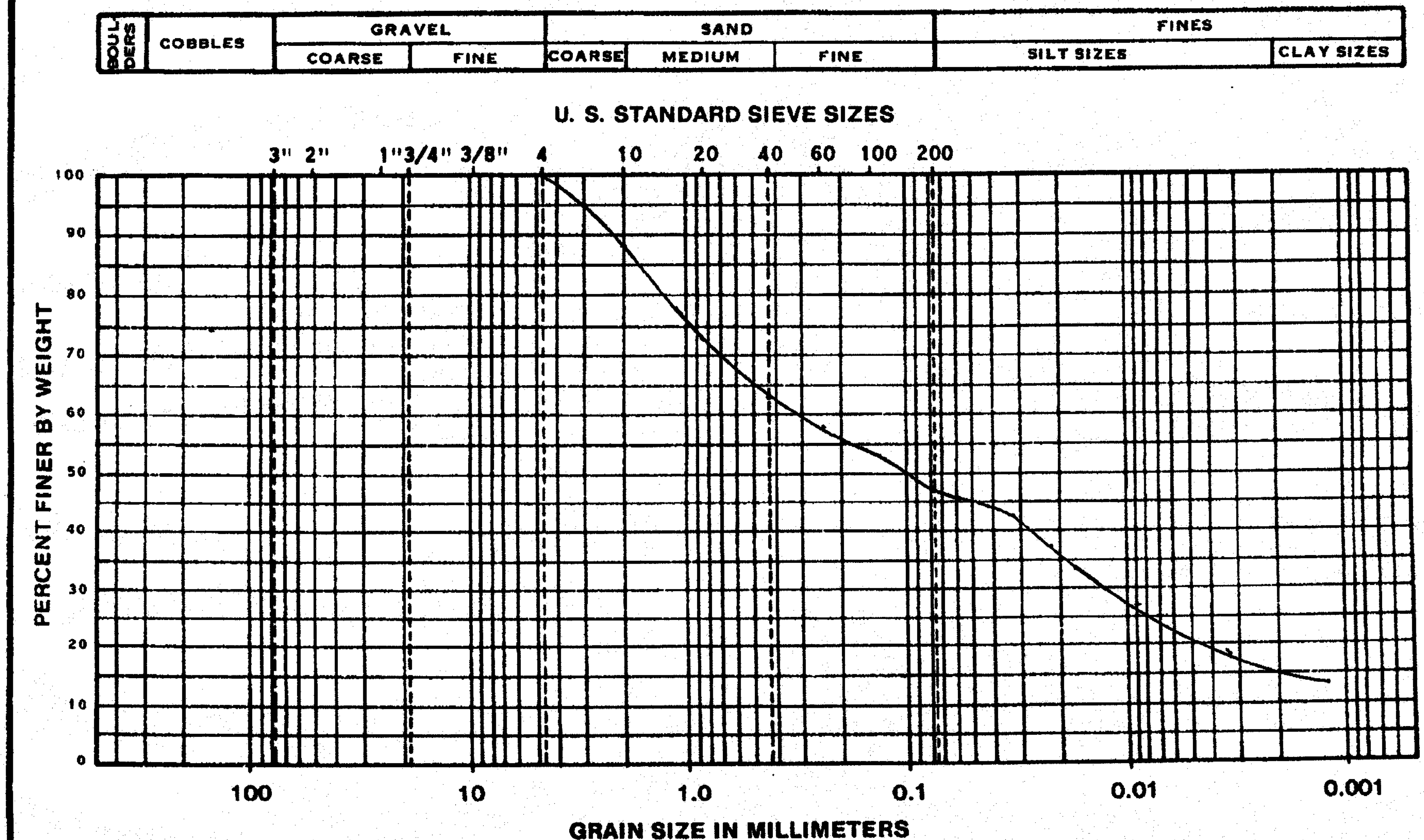



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-15 | 4.0 TO 5.5 FEET | 16.2% | 29 | 17 | 12 | SC - CLAYEY SANDS, SANDY-CLAY MIXTURE |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 3

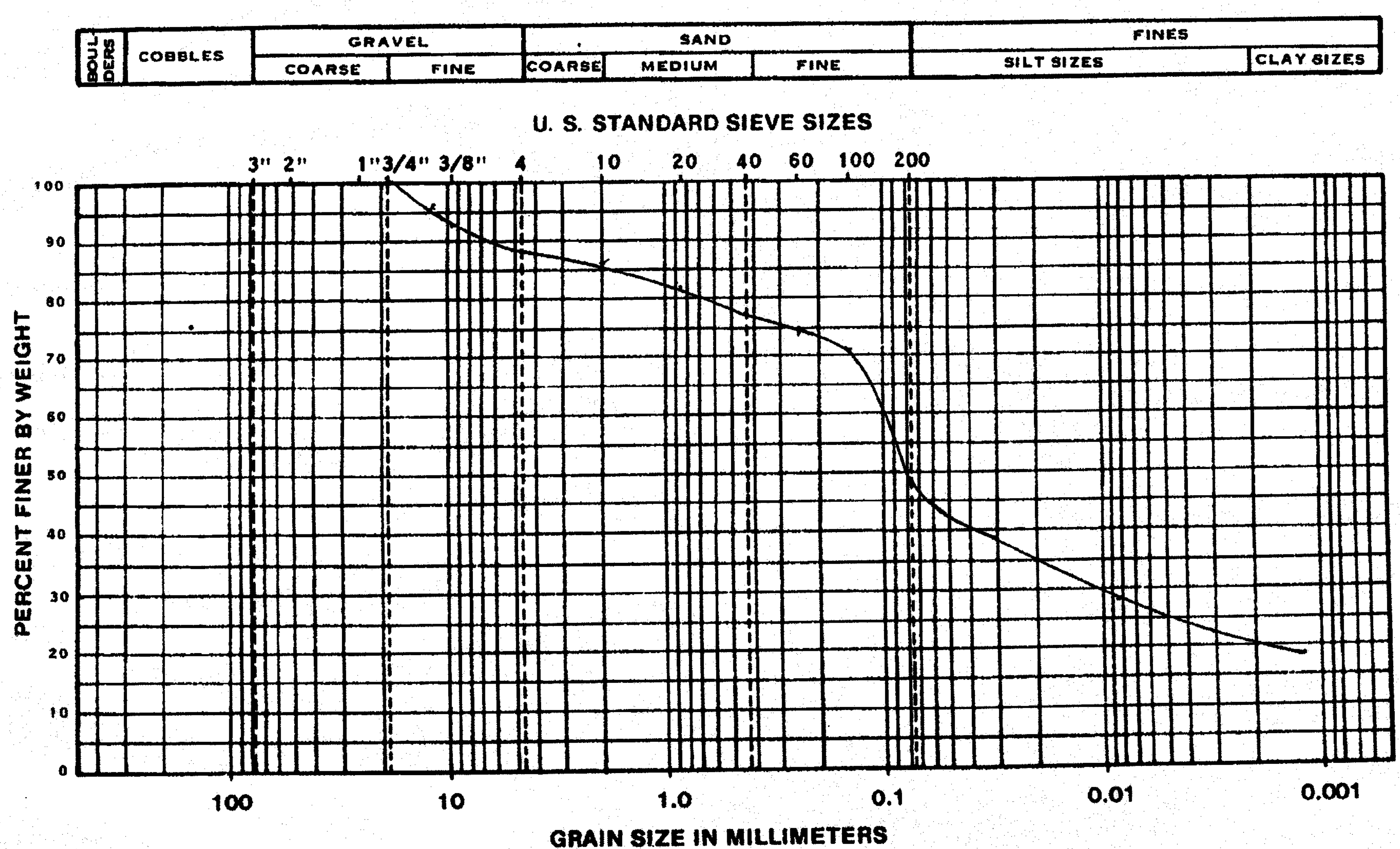



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-15 | 9 TO 10.5 FEET | 12.3% | 33 | 22 | 11 | SC - CLAYEY SANDS, SANDY-CLAY MIXTURE |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 36

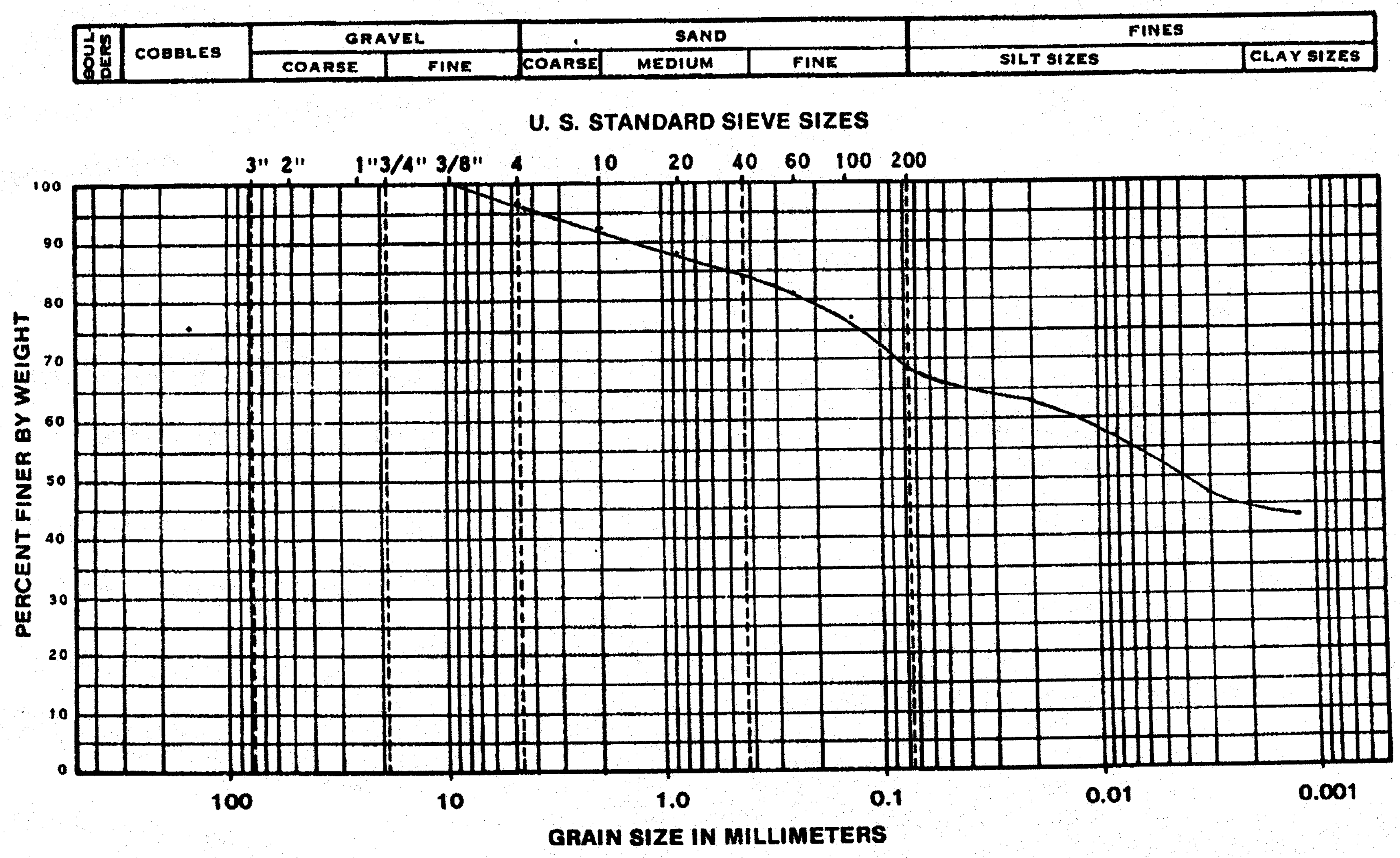



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-16A | 19 TO 20.5 FEET | 29.6% | 28 | 17 | 11 | SC - CLAYEY SAND, SANDY CLAY MIXTURE |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 36

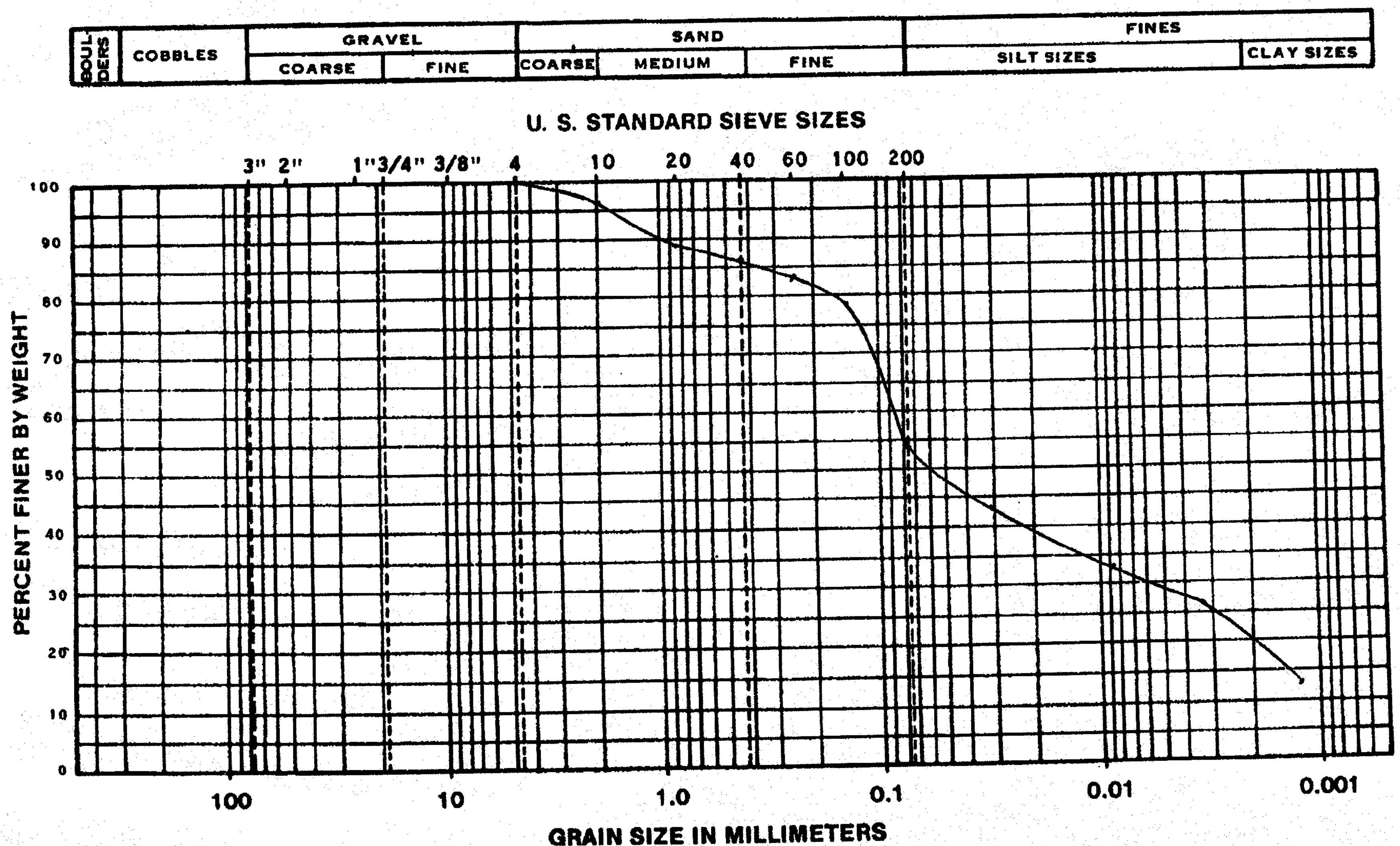



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-16A | 9 TO 10.5 FEET | 21.8% | 45 | 20 | 25 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 30

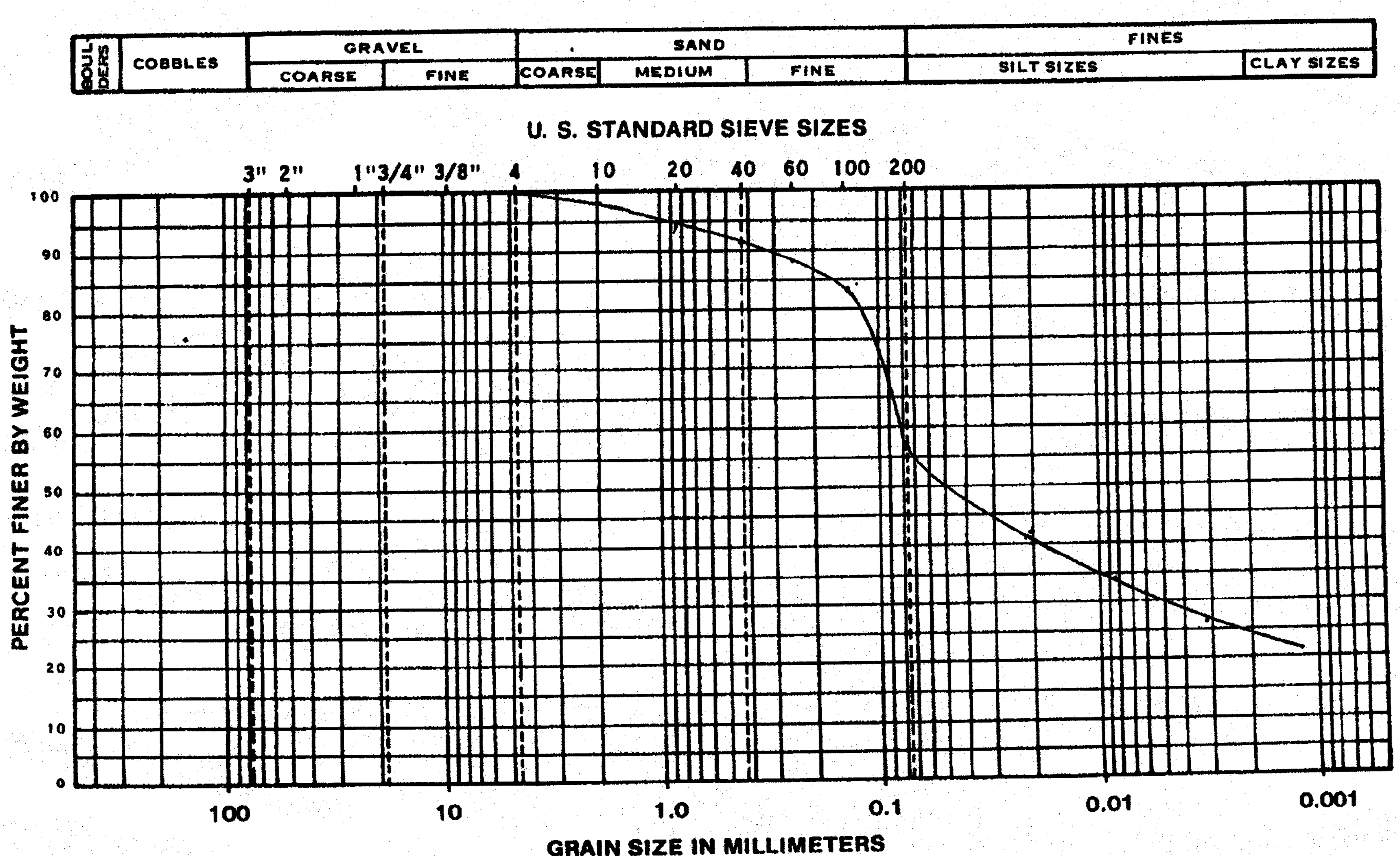



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-16A | 39 TO 40.5 FEET | 47.8% | 29 | 13 | 16 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 3

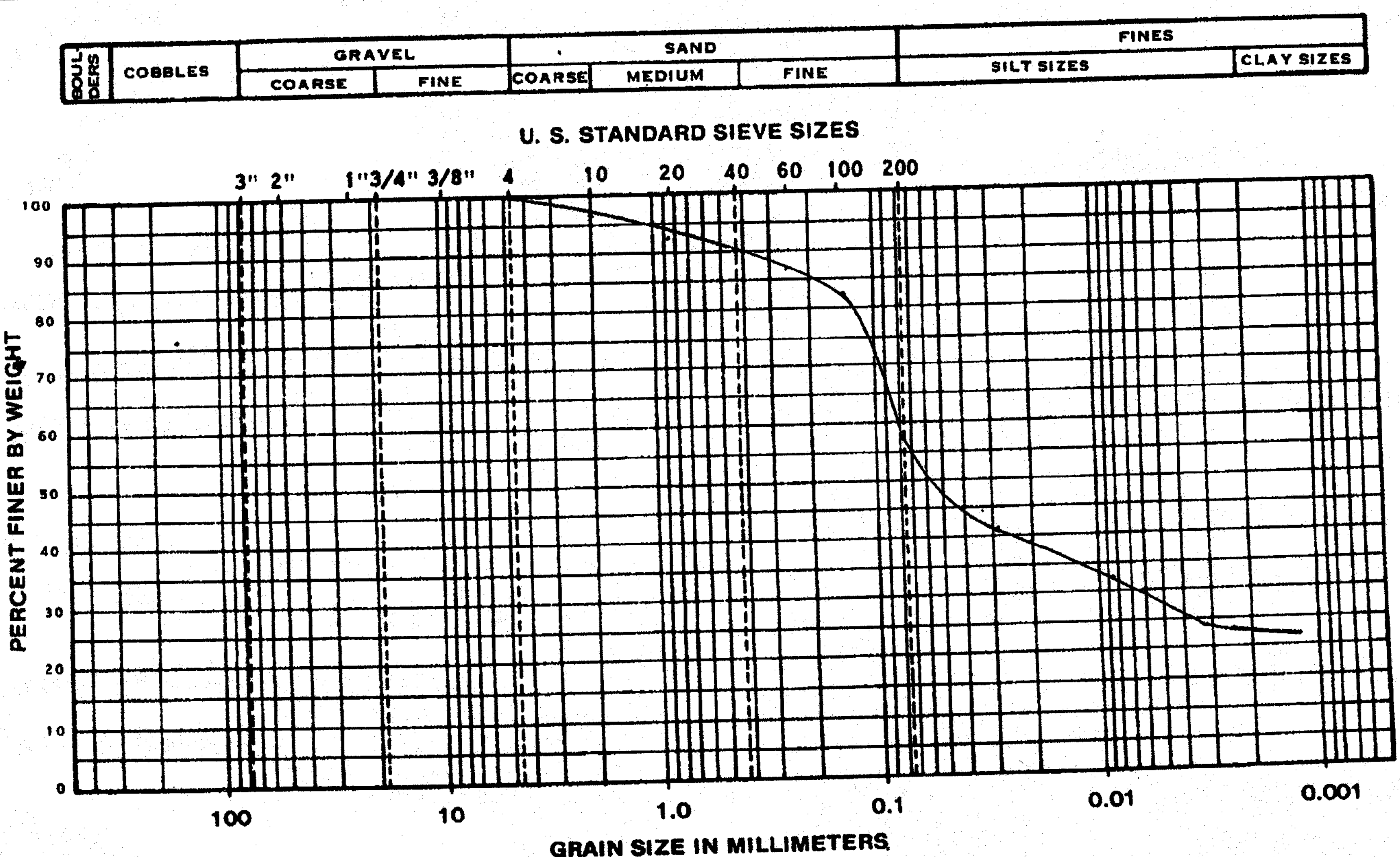



**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-16A | 44.0 TO 45.5 FEET | 60.0% | 26 | 16 | 10 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. | | | | | | |
| K-88195 | | | | | | |

AF 364...




**Law Engineering Testing Company**

**Grain Size Distribution**

| BORING NO. | DEPTH | NAT WC | LL | PL | PI | DESCRIPTION OR CLASSIFICATION |
|---|---|---|---|---|---|---|
| J-16A | 54.0 TO 55.5 FEET | 50.5% | 26 | 16 | 10 | CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| JOB NO. J-88195 | | | | | | |

# APPENDIX D

# TABULATED GROUNDWATER LEVEL DATA FOR SELECTED MONITORING WELLS

# Kingston Fossil Plant - Groundwater Level Data for Selected Monitoring Wells

| Date | KIF-10 | KIF-10A | KIF-10B | KIF-11B | KIF-12A | KIF-12B | KIF-13A | KIF-13B | KIF-16A | KIF-16B | KIF-2 | KIF-4A | KIF-4B | KIF-5 | KIF-5A | KIF-5B | KIF-6A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) |
| 01/04/1989 | 750.72 | 747.01 | 749.70 | 761.32 | 761.45 | 760.76 | | | 761.42 | 761.55 | | | | | | | |
| 01/05/1989 | | | | | | | | 757.45 | | | | | | | | | |
| 01/11/1989 | | | | | | | 757.91 | | | | 757.51 | 739.83 | 743.37 | 739.40 | | 741.01 | 740.88 |
| 03/28/1989 | 750.98 | 747.15 | 749.31 | 761.84 | | | | | | | | | | | 739.01 | | |
| 03/29/1989 | | | | | 762.11 | 760.79 | 758.27 | 757.84 | 762.99 | 762.53 | | 739.30 | 743.41 | 738.98 | | 740.62 | 740.45 |
| 03/30/1989 | | | | | | | | | | | 757.94 | | | | | | |
| 06/28/1989 | | | | 762.50 | 761.06 | 761.45 | | | | | | 743.21 | 735.20 | 742.36 | | 744.26 | 744.72 |
| 06/29/1989 | | | | | | | | 758.60 | | | 758.79 | | | | | | |
| 07/05/1989 | 751.21 | 748.92 | 751.90 | | | | 759.02 | | | | | | | | | | |
| 07/06/1989 | | | | | | | | | 759.06 | 762.63 | | | | | | | |
| 09/13/1989 | | | | | | | | | | | | 742.68 | 737.80 | 742.19 | | 743.70 | 743.86 |
| 09/14/1989 | 751.18 | 749.18 | 751.90 | 757.38 | | | | 757.68 | 758.76 | 760.53 | 757.61 | | | | | | |
| 11/29/1989 | | | | | | | | | | | 751.15 | 734.68 | 732.87 | 735.50 | | 733.83 | 733.01 |
| 11/30/1989 | 751.15 | 744.00 | 748.62 | 755.18 | | | | | | | | | | | | | |
| 12/04/1989 | | | | | | | | | 758.01 | 758.43 | | | | | | | |
| 12/05/1989 | | | | | | 755.12 | | 755.51 | | | | | | | | | |
| 12/06/1989 | | | | | | | 752.99 | | | | | | | | | | |
| 03/06/1990 | | | | | | | | | | | | 741.44 | 741.27 | 739.14 | | 740.72 | |
| 03/07/1990 | | | | 761.68 | | | | | | | 757.94 | | | | 724.84 | | 740.32 |
| 03/08/1990 | | | | | | | | | 758.76 | 762.57 | | | | | | | |
| 03/12/1990 | | | | | | 761.09 | | 758.20 | | | | | | | | | |
| 03/13/1990 | 751.21 | 747.38 | 749.93 | | | | | | | | | | | | | | |
| 03/14/1990 | | | | | 761.68 | | 758.53 | | | | | | | | | | |
| 06/05/1990 | | | | | | | | | | | 757.61 | 743.21 | 734.78 | 742.22 | | 744.72 | 743.64 |
| 06/06/1990 | 751.35 | 748.56 | 751.12 | 757.64 | | 760.17 | | 757.56 | | | | | | | | | |
| 06/07/1990 | | | | | | | | | 755.22 | 759.84 | | | | | 726.64 | | |
| 06/11/1990 | | | | | | | | | | | | | | | | | |
| 06/14/1990 | | | | | 760.93 | | 758.17 | | | | | | | | | | |
| 09/05/1990 | | | | | | | | | | | 757.09 | 747.74 | 735.01 | 741.77 | | 743.31 | 743.41 |
| 09/06/1990 | | | | | | | | | | | | | | | 726.25 | | |
| 09/10/1990 | | | | | 760.11 | 759.71 | 757.35 | 757.45 | | | | | | | | | |
| 09/11/1990 | 751.48 | 749.70 | 750.89 | 757.09 | | | | | 758.73 | 758.73 | | | | | | | |
| 12/04/1990 | | | | | | | | | | | 757.35 | 740.16 | 745.70 | 739.44 | | 741.08 | 741.17 |
| 12/05/1990 | | | | | | | | | 755.12 | 759.74 | | | | | 724.61 | | |

# Kingston Fossil Plant - Groundwater Level Data for Selected Monitoring Wells

| Date | KIF-10 | KIF-10A | KIF-10B | KIF-11B | KIF-12A | KIF-12B | KIF-13A | KIF-13B | KIF-16A | KIF-16B | KIF-2 | KIF-4A | KIF-4B | KIF-5 | KIF-5A | KIF-5B | KIF-6A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) |
| 12/06/1990 | | | | | 761.68 | 760.99 | 758.14 | 757.81 | | | | | | | | | |
| 12/10/1990 | 752.26 | 747.57 | 750.10 | 759.78 | | | | | | | | | | | | | |
| 03/15/1991 | | | | | | | | | 756.73 | 761.98 | | | | | | | |
| 03/20/1991 | 752.33 | 748.23 | 750.49 | 762.43 | | | | | | | 758.63 | 739.67 | 743.67 | 739.37 | | 740.98 | 740.45 |
| 03/21/1991 | | | | | 762.01 | 761.29 | 759.09 | 746.59 | | | | | | | 725.36 | | |
| 06/03/1991 | | | | | | | | | 755.41 | | | | | | | | |
| 06/04/1991 | 752.49 | 749.34 | | | | | | | | | 758.33 | | 742.75 | | | | |
| 06/06/1991 | | | | | | | 762.70 | | | | | | | | | | |
| 09/09/1991 | | | | | | | | | | | | | 744.13 | | | | |
| 09/10/1991 | 755.91 | 752.00 | | | | | | | | | 757.58 | | | | | | |
| 09/11/1991 | | | | | | | 758.66 | | 758.30 | | | | | | | | |
| 11/12/1991 | | | | | | | | | | | | | 734.42 | | | | |
| 12/17/1991 | | | | | | | | | | | 759.71 | 741.24 | 747.67 | 740.85 | 740.32 | 742.59 | 741.93 |
| 12/18/1991 | 756.59 | 751.80 | | | | | | | | | | | | | | | |
| 12/19/1991 | | | | | 762.11 | 761.35 | 759.55 | 759.25 | 761.06 | 762.80 | | | | | | | |
| 12/23/1991 | | | 751.28 | 760.99 | | | | | | | | | | | | | |
| 03/03/1992 | 756.33 | 750.98 | | | | | | | | | | 739.90 | 748.56 | 739.37 | | 741.27 | |
| 03/04/1992 | | | | | | | 759.74 | 759.35 | 763.48 | 763.39 | | | | | | | |
| 06/02/1992 | | | | | | | | | | | 759.42 | 742.39 | 743.44 | | | | 743.54 |
| 06/03/1992 | 756.43 | 752.30 | | | 761.15 | 760.43 | 759.51 | 759.12 | | | | | | 747.83 | | 742.42 | |
| 06/04/1992 | | | | | | | | | 762.86 | 762.83 | | | | | | | |
| 08/20/1992 | | | | | | | | | | | | | | | 742.13 | | |
| 09/01/1992 | 755.91 | 742.29 | | | | | 756.43 | 748.39 | | | | 737.47 | 720.90 | 740.09 | | 740.16 | |
| 09/02/1992 | | | | | | | | | 753.38 | 745.11 | | | | | | | |
| 12/07/1992 | | | | | | | | | | | 759.48 | 739.24 | 746.03 | | | | 740.98 |
| 12/08/1992 | 756.46 | 750.46 | 751.41 | 759.55 | | | 759.55 | 761.19 | | | | | | | | | |
| 12/10/1992 | | | | | | | | | 762.11 | 762.11 | | | | | | | |
| 06/07/1993 | | | | | 761.78 | 760.86 | | | | | | | | | | | |
| 06/08/1993 | 755.81 | 752.03 | | | | | 758.89 | | | | | 740.75 | 729.63 | | | | 742.36 |
| 06/09/1993 | | | | | | | | | 764.99 | 760.56 | | | | | | | |
| 12/06/1993 | 756.79 | 752.23 | 752.85 | 761.78 | 762.96 | 761.98 | 759.55 | 758.66 | 761.02 | 760.93 | 759.22 | 741.21 | 744.65 | 750.95 | 744.62 | 747.61 | 742.36 |
| 05/20/1994 | | | | | | | | | | | | | | | | | |
| 06/13/1994 | 756.43 | 752.30 | | | | | | | | | | 742.78 | 745.37 | | | | 743.77 |
| 06/14/1994 | | | | | | | 759.65 | | 763.75 | 764.17 | | | | | | | |

# Kingston Fossil Plant - Groundwater Level Data for Selected Monitoring Wells

| Date | KIF-10 | KIF-10A | KIF-10B | KIF-11B | KIF-12A | KIF-12B | KIF-13A | KIF-13B | KIF-16A | KIF-16B | KIF-2 | KIF-4A | KIF-4B | KIF-5 | KIF-5A | KIF-5B | KIF-6A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) | (ft-msl) |
| 11/29/1994 | | | | | | | | | | | | | | | | | |
| 12/05/1994 | 755.77 | 750.43 | 754.40 | 758.99 | 762.50 | 761.35 | 759.06 | 758.43 | 762.34 | 762.40 | 756.36 | 737.76 | 743.64 | 751.25 | 742.75 | 741.50 | 738.68 |
| 06/19/1995 | 755.64 | 751.38 | | 759.48 | 761.48 | 760.47 | 758.37 | 757.91 | 761.02 | 761.15 | 755.68 | 741.86 | 739.76 | 747.44 | 742.62 | 741.96 | 740.65 |
| 06/21/1995 | 755.71 | 751.64 | | | | | 758.43 | | | | | 741.86 | 739.80 | | | | 740.65 |
| 06/22/1995 | | | 752.17 | | | | | | 760.60 | 760.96 | | | | | | | |
| 12/11/1995 | | | | 761.02 | | | | | | | 756.07 | 738.19 | 741.57 | | | | 738.45 |
| 12/12/1995 | 755.97 | 749.65 | 751.08 | | | | | 758.53 | | | | | | | | | |
| 12/13/1995 | | | | | 762.53 | 761.19 | 759.12 | | | | | | | | | | |
| 12/14/1995 | | | | | | | | | 764.83 | 761.65 | | | | | | | |
| 07/08/1996 | 756.00 | 751.87 | 752.72 | 760.73 | 761.61 | 760.56 | 759.38 | 758.99 | 764.80 | 764.76 | 756.59 | 741.21 | 740.39 | 747.57 | 742.72 | 743.08 | 741.47 |
| 12/02/1996 | 756.86 | 753.08 | 753.54 | 764.60 | 763.68 | 762.24 | 759.74 | 758.92 | 764.04 | 764.37 | 760.07 | 747.11 | 752.20 | 750.98 | 744.98 | 745.18 | 744.78 |
| 05/06/1997 | 756.86 | 752.69 | 753.28 | 762.76 | 763.45 | 761.94 | 760.07 | 759.15 | 766.57 | 763.16 | 760.47 | 749.44 | 749.31 | 750.49 | 744.32 | 743.80 | 743.93 |
| 12/08/1997 | 756.86 | 754.69 | 754.92 | 761.88 | 763.22 | 761.65 | 759.19 | 758.23 | 761.52 | 761.84 | 759.45 | 742.06 | 743.67 | 750.52 | 741.93 | 740.55 | 741.27 |
| 06/29/1998 | 756.10 | 752.23 | 752.85 | 759.97 | 762.60 | 761.12 | 759.55 | 758.60 | 763.19 | 763.55 | 758.99 | 748.46 | 743.57 | 748.75 | 743.31 | 743.14 | 744.09 |
| 12/01/1998 | 756.33 | 751.28 | 751.67 | 758.27 | 761.32 | 760.37 | 759.55 | 758.37 | 760.93 | 761.32 | 758.89 | 741.40 | 740.78 | 742.22 | 740.09 | 740.03 | 741.73 |
| 12/06/1999 | | | | | | | | 759.22 | | | | | 741.37 | | | | 738.42 |
| 12/14/2000 | | | | | | | | 759.68 | 763.68 | | | | 742.91 | | | | 738.32 |
| 06/27/2001 | | | | | | | | 760.24 | 766.17 | | | | 742.88 | | | | 743.60 |
| 12/31/2001 | | | | | | | | 760.66 | 766.50 | | | | 744.98 | | | | 738.94 |
| 06/28/2002 | | | | | | | | 760.70 | 766.99 | | | | 742.81 | | | | 743.64 |
| 01/08/2003 | | | | | | | | 760.11 | 768.57 | | | | 742.88 | | | | 741.99 |
| 06/16/2003 | | | | | | | | 761.32 | 766.83 | | | | 744.36 | | | | 743.86 |
| 09/02/2003 | | | | | | | | 758.53 | 768.57 | | | | 744.06 | | | | 743.83 |
| 12/29/2003 | | | | | | | | 760.56 | 768.57 | | | | 741.86 | | | | 741.27 |
| 03/10/2004 | | | | | | | | 760.96 | 767.49 | | | | 743.21 | | | | 742.29 |
| 06/07/2004 | | | | | | | | 760.70 | 765.63 | | | | 743.76 | | | | 742.87 |
| Maximum = | 756.86 | 754.69 | 754.92 | 764.60 | 763.68 | 762.24 | 762.70 | 761.32 | 768.57 | 764.76 | 760.47 | 749.44 | 752.20 | 751.25 | 744.98 | 747.61 | 744.78 |

## Kingston Fossil Plant - Groundwater Level Data for Selected Monitoring Wells (Continued)

| | B-1 | | B-2 | | B-3 | | RAINFALL (IN.) |
|---|---|---|---|---|---|---|---|
| Well Elevations | | 782.1 | | 795.3 | | 811.4 | 24:00 - 24:00 |
| | Depth | Elevation | Depth | Elevation | Depth | Elevation | |
| 04/09/2004 | 7.75 | 774.35 | 15.80 | 779.50 | 29.00 | 782.40 | 0.00 |
| 04/10/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/11/2004 | | 782.10 | | 795.30 | | 811.40 | 0.70 |
| 04/12/2004 | | 782.10 | | 795.30 | | 811.40 | 0.80 |
| 04/13/2004 | 7.60 | 774.50 | 16.10 | 779.20 | 29.10 | 782.30 | 1.00 |
| 04/14/2004 | | 782.10 | | 795.30 | | 811.40 | 0.10 |
| 04/15/2004 | 7.35 | 774.75 | 16.20 | 779.10 | 29.35 | 782.05 | 0.00 |
| 04/16/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/17/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/18/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/19/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/20/2004 | 7.85 | 774.25 | 16.45 | 778.85 | 29.45 | 781.95 | 0.00 |
| 04/21/2004 | | 782.10 | | 795.30 | | 811.40 | 0.10 |
| 04/22/2004 | | 782.10 | | 795.30 | | 811.40 | 0.18 |
| 04/23/2004 | 8.30 | 773.80 | 16.60 | 778.70 | 29.75 | 781.65 | 0.18 |
| 04/24/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/25/2004 | | 782.10 | | 795.30 | | 811.40 | 0.01 |
| 04/26/2004 | 8.38 | 773.72 | 16.73 | 778.57 | 30.00 | 781.40 | 0.03 |
| 04/27/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/28/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/29/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 04/30/2004 | 8.60 | 773.50 | 17.00 | 778.30 | 30.30 | 781.10 | 0.00 |
| 05/01/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/02/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/03/2004 | 8.53 | 773.57 | 17.13 | 778.17 | 30.60 | 780.80 | 0.00 |
| 05/04/2004 | | 782.10 | | 795.30 | | 811:40 | 0.00 |
| 05/05/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/06/2004 | 8.66 | 773.44 | 17.30 | 778.00 | 30.64 | 780.76 | 0.00 |
| 05/07/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/08/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/09/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/10/2004 | | 782.10 | | 795.30 | | 811.40 | 0.10 |
| 05/11/2004 | 9.00 | 773.10 | 17.60 | 777.70 | 31.00 | 780.40 | 0.30 |
| 05/12/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/13/2004 | | 782.10 | | 795.30 | | 811.40 | 0.25 |
| 05/14/2004 | 9.35 | 772.75 | 17.75 | 777.55 | 31.10 | 780.30 | 0.00 |
| 05/15/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/16/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/17/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/18/2004 | 9.45 | 772.65 | 17.85 | 777.45 | 31.45 | 779.95 | 0.00 |
| 05/19/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/20/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/21/2004 | 9.75 | 772.35 | 18.17 | 777.13 | 31.65 | 779.75 | 0.00 |
| 05/22/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |

| | B-1 | | B-2 | | B-3 | | RAINFALL (IN.) |
|---|---|---|---|---|---|---|---|
| Well Elevations | | 782.1 | | 795.3 | | 811.4 | 24:00 - 24:00 |
| | Depth | Elevation | Depth | Elevation | Depth | Elevation | |
| 05/23/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/24/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/25/2004 | 9.95 | 772.15 | 18.35 | 776.95 | 31.83 | 779.57 | 0.00 |
| 05/26/2004 | | 782.10 | | 795.30 | | 811.40 | 0.90 |
| 05/27/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/28/2004 | 10.12 | 771.98 | 18.55 | 776.75 | 32.15 | 779.25 | 0.30 |
| 05/29/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 05/30/2004 | | 782.10 | | 795.30 | | 811.40 | 0.10 |
| 05/31/2004 | | 782.10 | | 795.30 | | 811.40 | 0.80 |
| 06/01/2004 | | 782.10 | | 795.30 | | 811.40 | 0.00 |
| 06/02/2004 | 9.98 | 772.12 | 18.87 | 776.43 | 32.42 | 778.98 | 0.2 |
| 06/03/2004 | | 782.10 | | 795.30 | | 811.40 | 0 |
| 06/04/2004 | | 782.10 | | 795.30 | | 811.40 | 0.35 |
| 06/05/2004 | | 782.10 | | 795.30 | | 811.40 | 0 |
| 06/06/2004 | | 782.10 | | 795.30 | | 811.40 | 0 |
| 06/07/2004 | . | 782.10 | | 795.30 | | 811.40 | 0 |
| 06/08/2004 | 10.34 | 771.76 | 19.24 | 776.06 | 32.71 | 778.69 | 0 |
| 06/09/2004 | | 782.10 | | 795.30 | | 811.40 | 0 |
| 06/10/2004 | | 782.10 | | 795.30 | | 811.40 | 0 |
| 06/11/2004 | | 782.10 | | 795.30 | | 811.40 | 0 |
| 06/12/2004 | | 782.10 | | 795.30 | | 811.40 | 0.5 |
| 06/13/2004 | | 782.10 | | 795.30 | | 811.40 | 0 |
| 06/14/2004 | 10.7 | 771.40 | 19.61 | 775.69 | 33.1 | 778.30 | 0 |

## APPENDIX E

## CHEMICAL ANALYSIS OF GYPSUM LEACHATE SAMPLES FROM CUMBERLAND FOSSIL PLANT

# Chemical Analysis of Gypsum Leachate Samples from Cumberland Fossil Plant

| Constituent | Units | MCL | Sample 1 | Sample 2 | Sample 3 | Sample 4 | Sample 5 |
|---|---|---|---|---|---|---|---|
| Aluminum, total | ug/L | 200 | 580 | | 140 | 350 | < 50 |
| Antimony, total | ug/L | 6 | 12 | | 13 | < 6 | < 6 |
| Arsenic, total | ug/L | 50 | < 1 | | < 1 | < 1 | < 1 |
| Barium, total | ug/L | 2000 | 130 | | 120 | 30 | 30 |
| Beryllium, total | ug/L | 4 | < 1 | | < 1 | | |
| Boron, total | ug/L | -- | 54000 | | 54000 | 25000 | 37000 |
| Cadmium, total | ug/L | 5 | 9.2 | | 3.5 | 22 | 13 |
| Calcium, total | mg/L | -- | 870 | | 880 | 760 | 790 |
| Chloride, total | mg/L | 250 | 1000 | 1200 | 1000 | 1400 | 1900 |
| Chromium, total | ug/L | 100 | 5 | | < 1 | | < 1 |
| Cobalt, total | ug/L | -- | 10 | | 9 | | |
| Copper, total | ug/L | 1300 | < 10 | | < 10 | < 1 | < 1 |
| Fluoride, total | mg/L | 4 | 18 | 1.2 | 20 | | |
| Iron, total | ug/L | 300 | 790 | | 10 | < 10 | < 10 |
| Lead, total | ug/L | 15 | < 1 | | < 1 | < 1 | < 1 |
| Magnesium, total | mg/L | -- | 350 | | 350 | 650 | 790 |
| Manganese, total | ug/L | 50 | 2600 | | 2500 | 110 | 750 |
| Mercury, total | ug/L | 2 | < 0.2 | | < 0.2 | 13 | 0.2 |
| Nickel, total | ug/L | 100 | 97 | | 85 | 167 | 77 |
| pH (field) | pH | 6.5-8.5 | 6.99 | 7.19 | 7.48 | | |
| Selenium, total | ug/L | 50 | 25 | | 28 | 396 | 99 |
| Silver, total | ug/L | 100 | < 10 | | < 10 | 0.4 | 0.3 |
| Sodium, total | mg/L | -- | 18 | | 21 | | |
| TDS (180) | mg/L | 500 | 6300 | 8100 | 6000 | | |
| Strontium, total | ug/L | -- | 4500 | | 4500 | | |
| Sulfate, total | mg/L | 250 | 3700 | 2100 | 3800 | 2700 | 2800 |
| Thallium, total | ug/L | 2 | < 2 | | < 2 | | |
| Vanadium, total | ug/L | -- | < 10 | | < 10 | | |
| Zinc, total | ug/L | 5000 | 880 | | 1000 | 840 | 140 |

1. *Sample collected on 2/25/99 before effluent entered gypsum pond overflow weir.*
2. *Sample collected on 7/21/99 before effluent entered gypsum pond overflow weir.*
3. *Sample collected on 2/25/99 at RP-4.*
4. *Filtered sample collected on 9/23/03 at RP-3.*
5. *Filtered sample collected on 9/23/03 from end of gypsum effluent pipe.*

# APPENDIX F

# OPTION A – FACILITY SUBREGIONS AND PROFILES FOR SEEPAGE MODEL SIMULATIONS

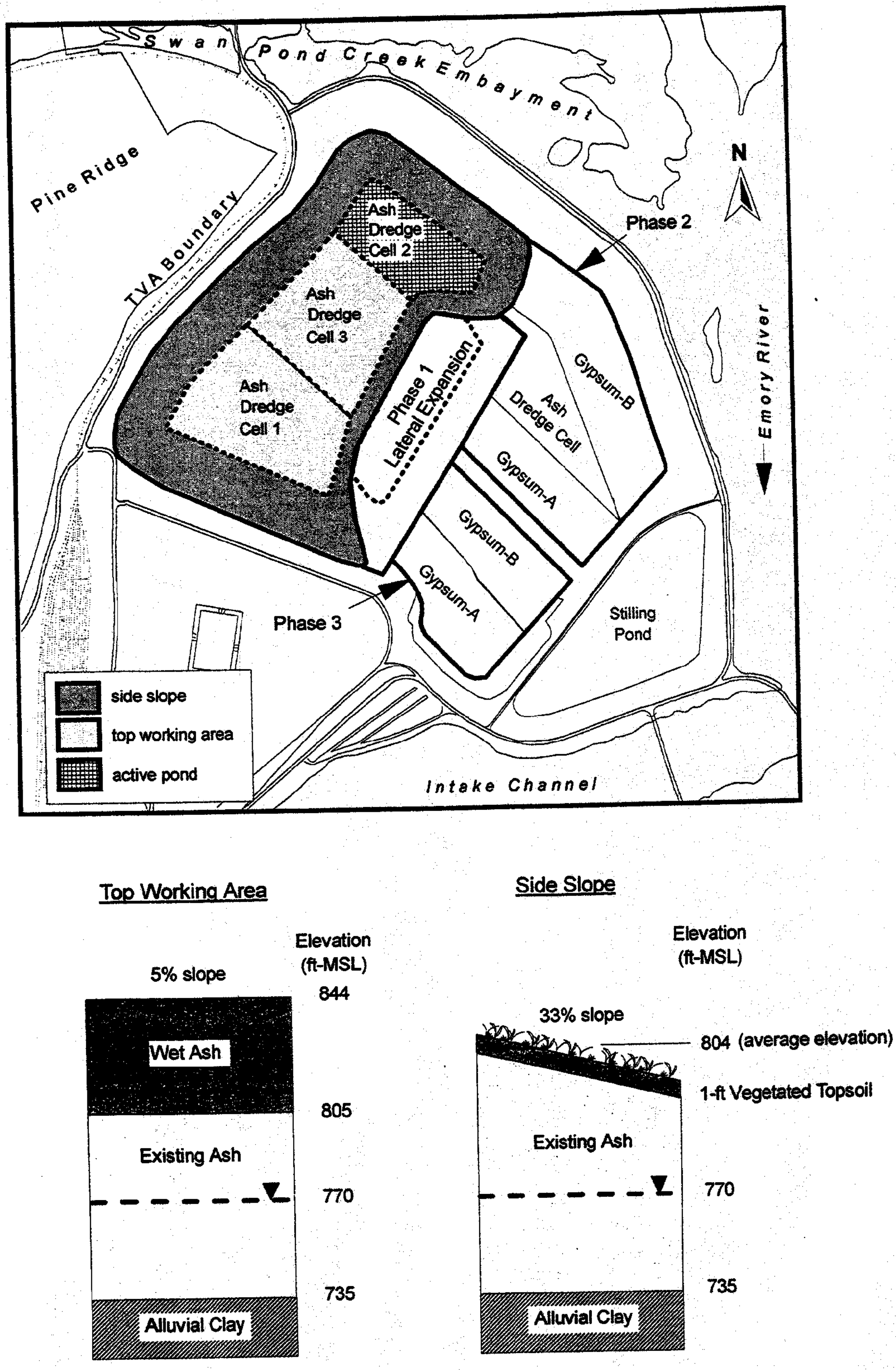
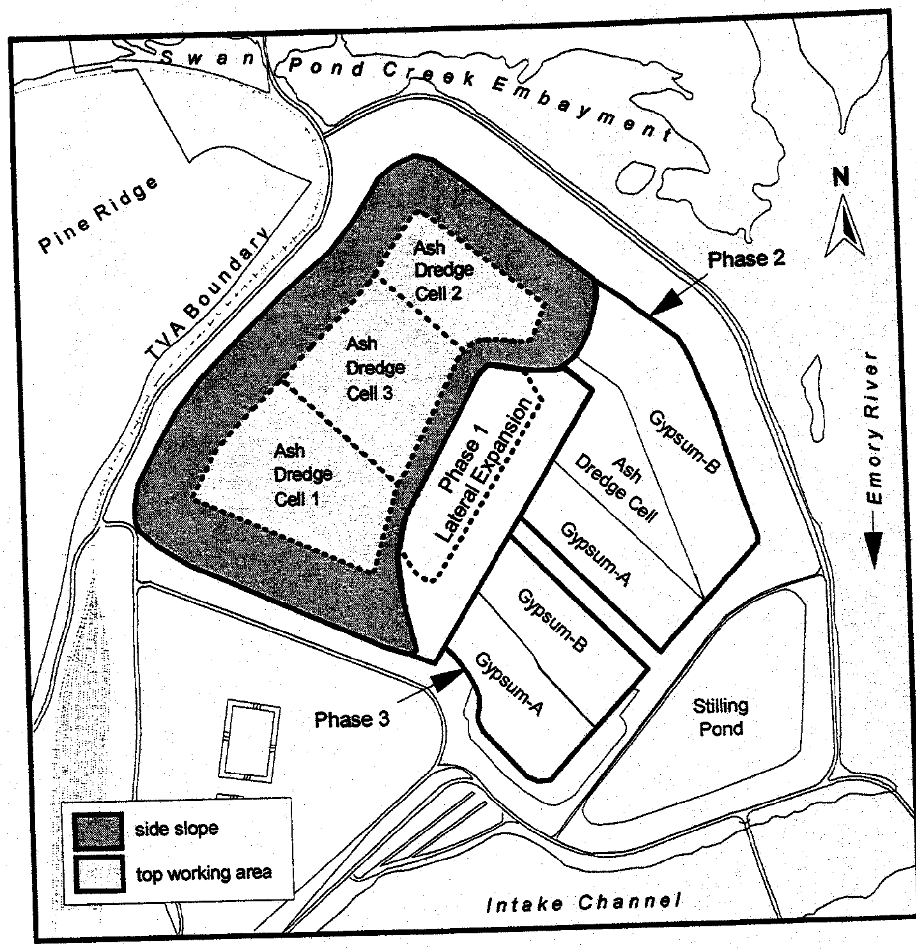

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
side slope
top working area
active pond
Intake Channel
Top Working Area
5% slope
Elevation (ft-MSL)
844
Wet Ash
805
Existing Ash
770
735
Alluvial Clay
Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
Existing Ash
770
735
Alluvial Clay

Figure F-1


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
side slope
top working area
Intake Channel

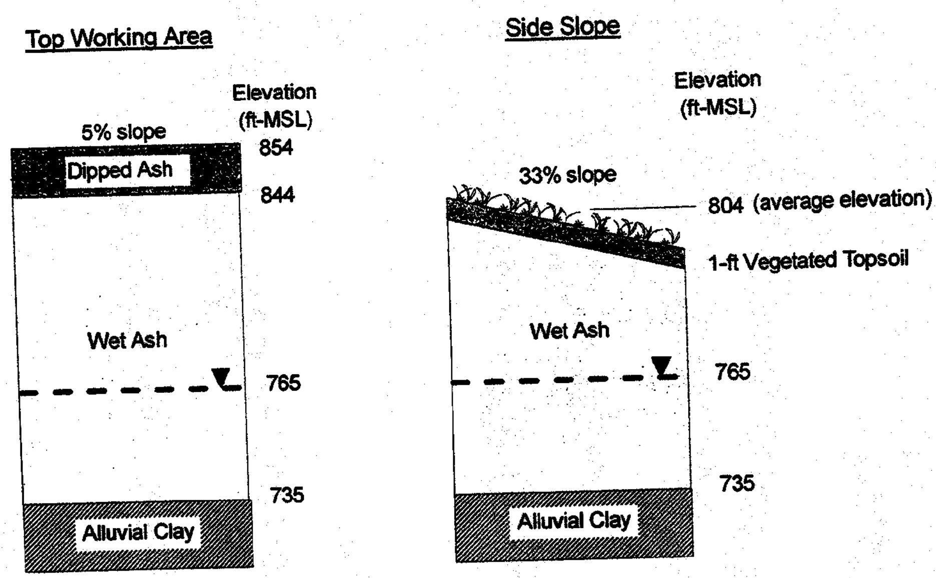

Top Working Area
Elevation (ft-MSL)
5% slope
854
Dipped Ash
844
Wet Ash
765
735
Alluvial Clay
Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
Wet Ash
765
735
Alluvial Clay

Figure F-2

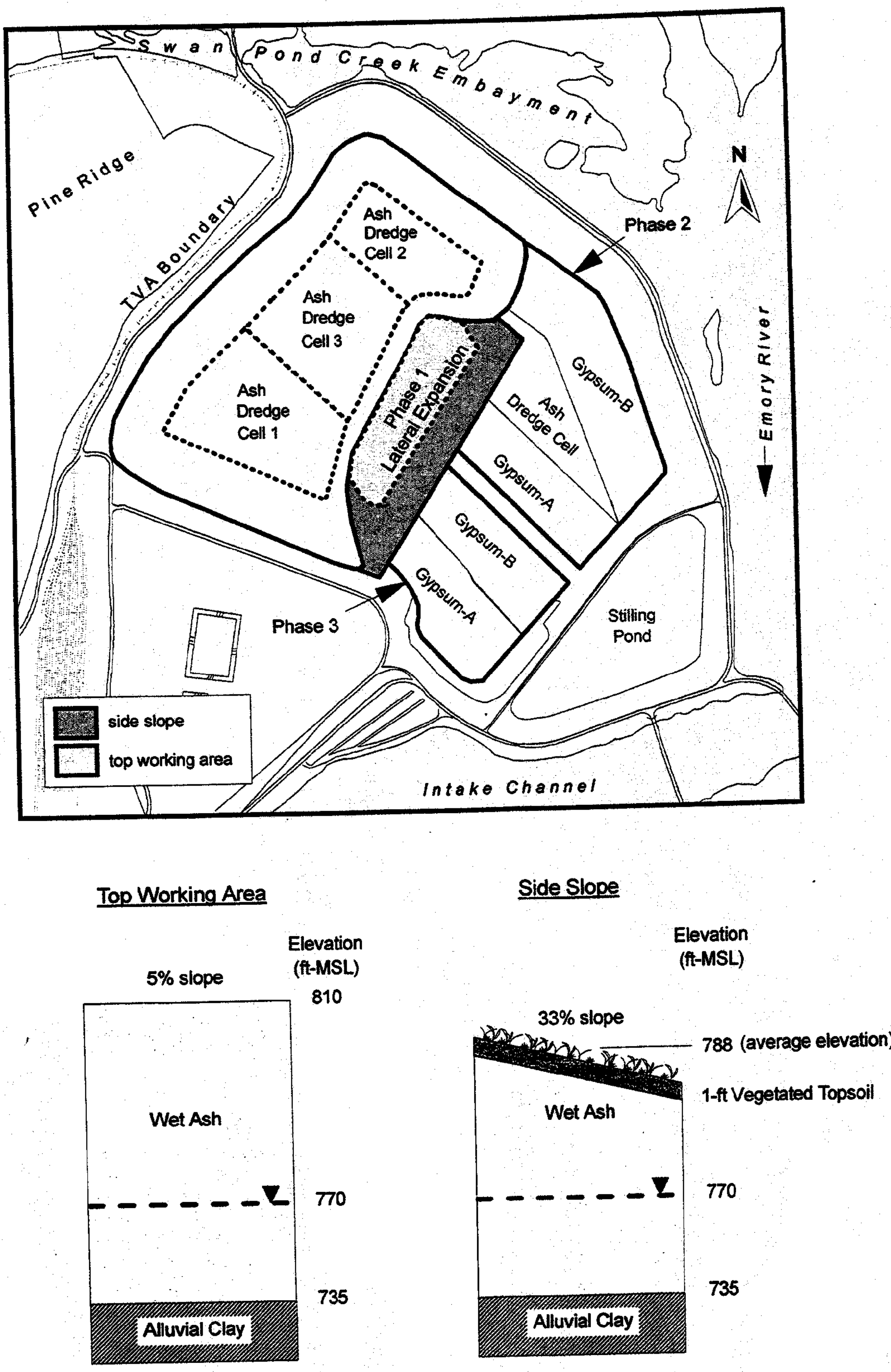

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
side slope
top working area
Intake Channel
Top Working Area
Elevation (ft-MSL)
5% slope
810
Wet Ash
770
735
Alluvial Clay
Side Slope
Elevation (ft-MSL)
33% slope
788 (average elevation)
1-ft Vegetated Topsoil
Wet Ash
770
735
Alluvial Clay

Figure F-3

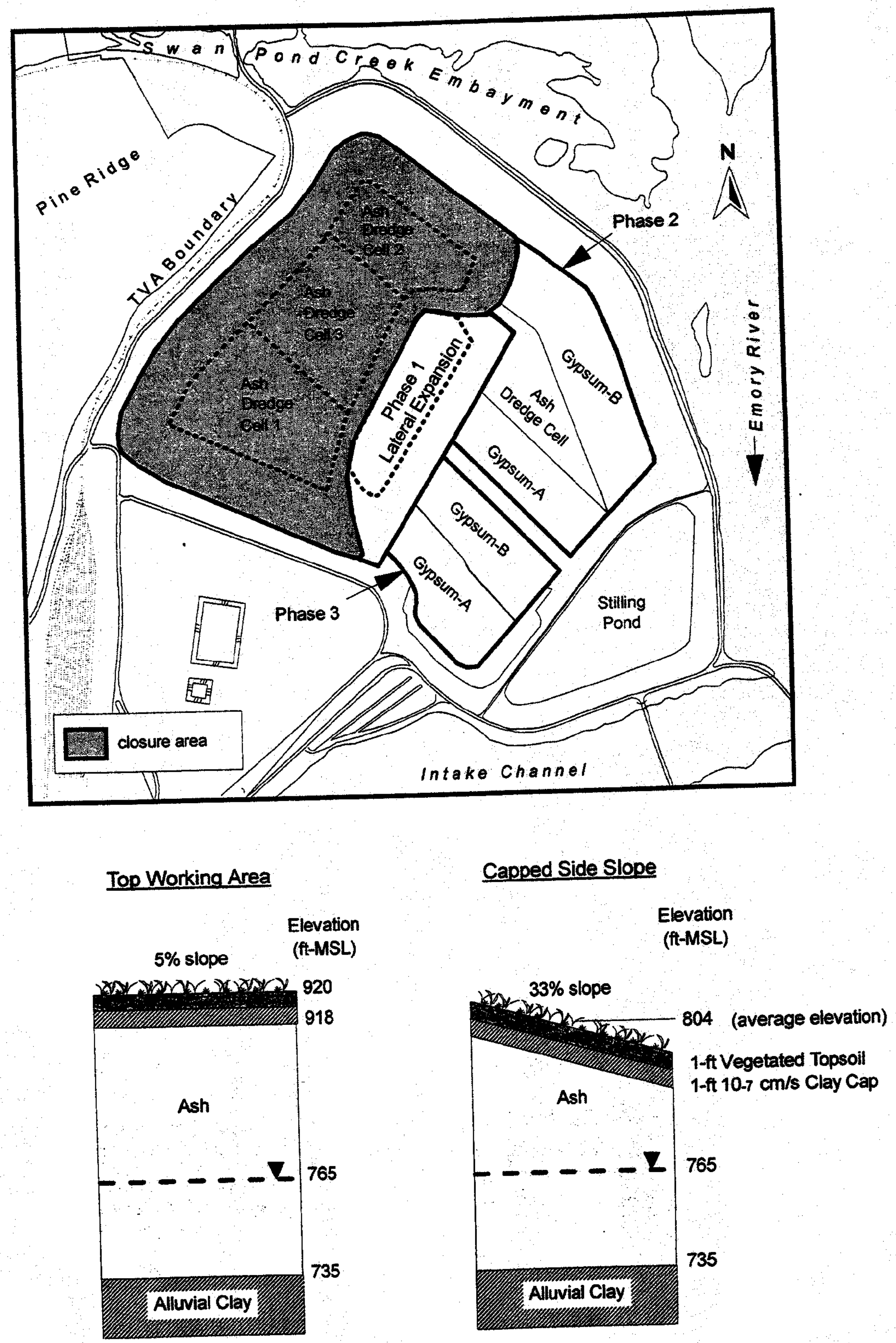

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Emory River
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Phase 3
Stilling Pond
closure area
Intake Channel
Top Working Area
Elevation (ft-MSL)
5% slope
920
918
Ash
765
735
Alluvial Clay
Capped Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
1-ft 10-7 cm/s Clay Cap
Ash
765
735
Alluvial Clay

Figure F-4

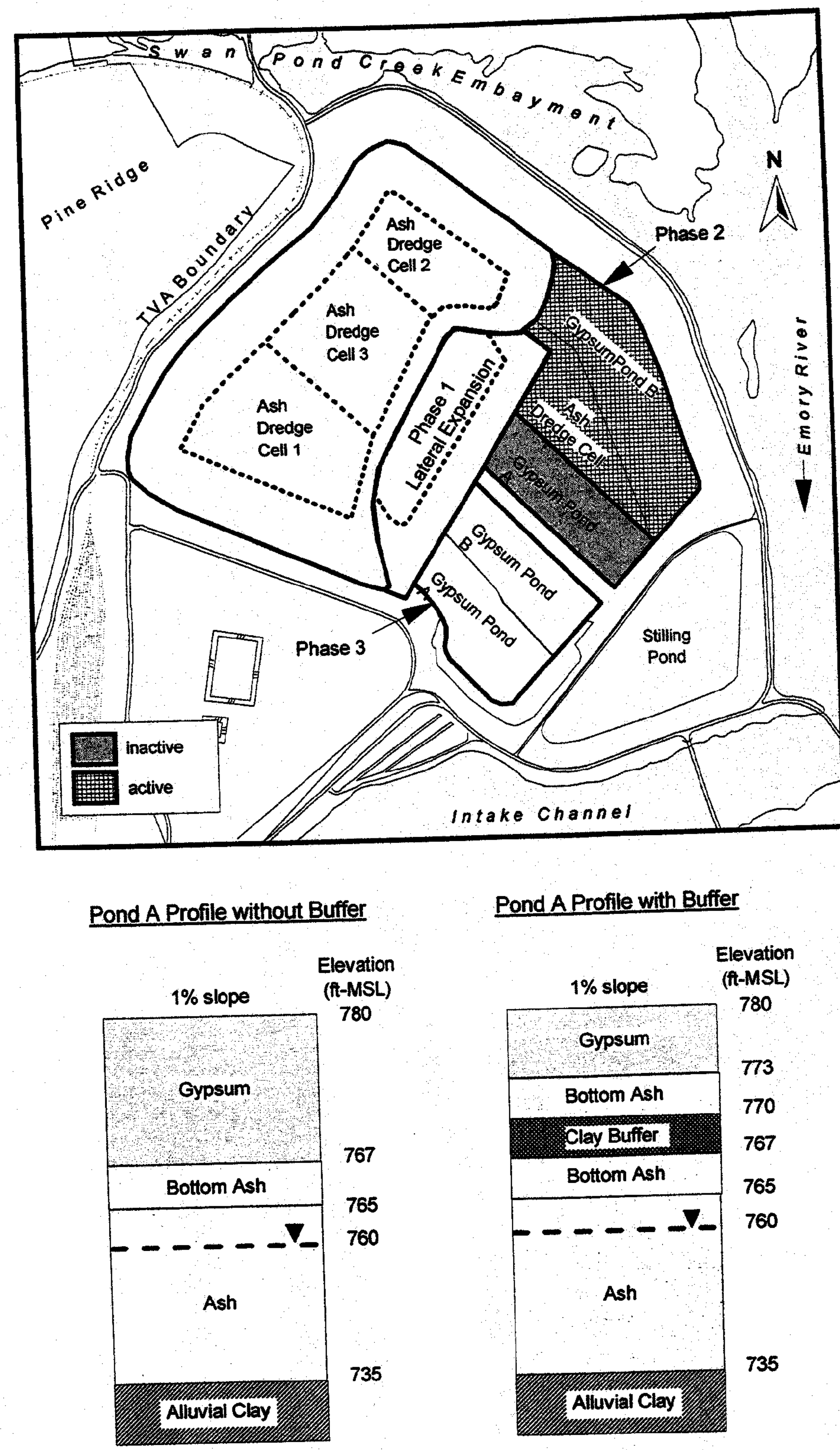
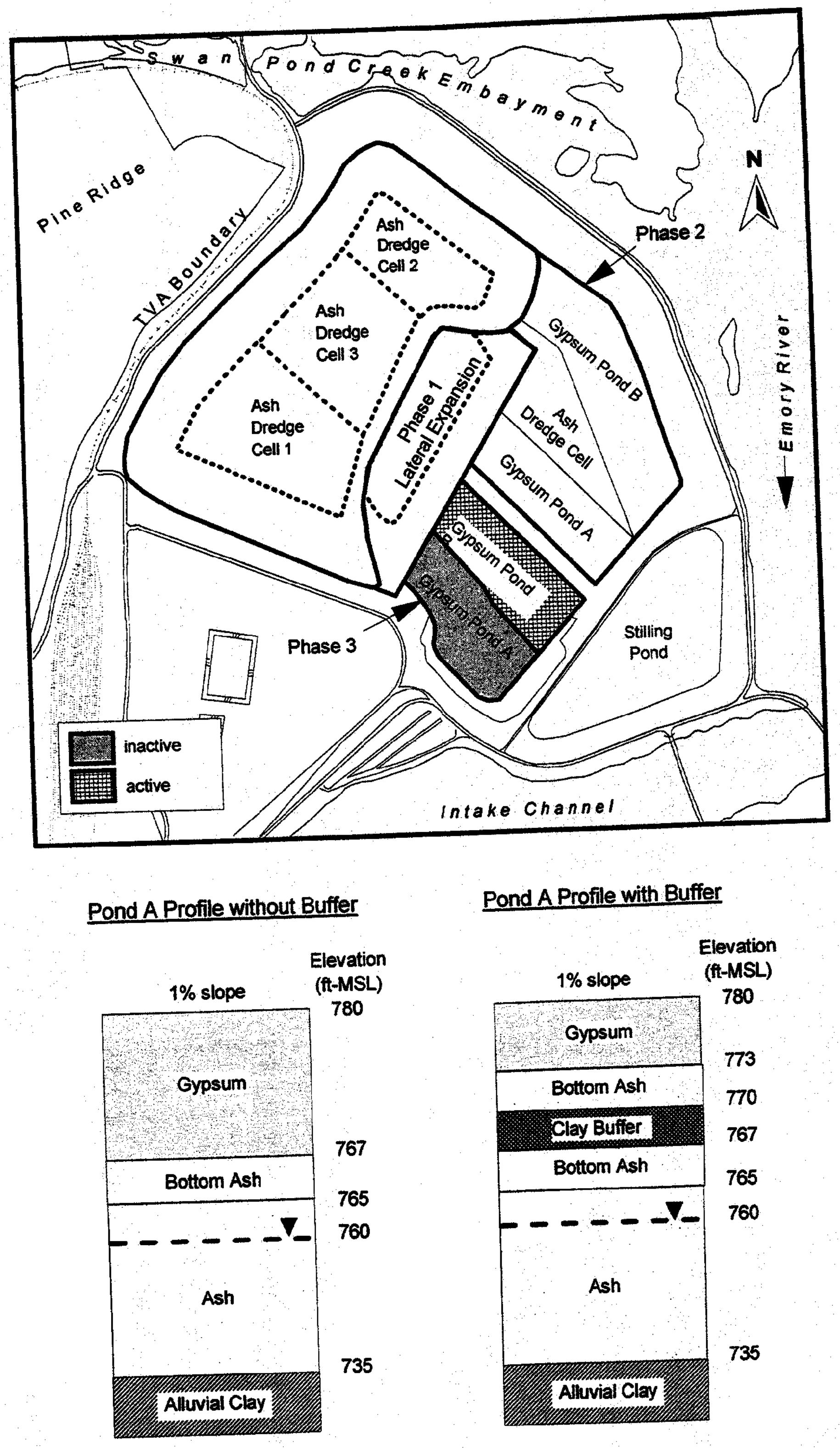

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Emory River
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum Pond B
Ash Dredge Cell
Gypsum Pond A
Gypsum Pond B
Gypsum Pond A
Phase 3
Stilling Pond
inactive
active
Intake Channel
Pond A Profile without Buffer
1% slope
Elevation (ft-MSL)
780
Gypsum
767
Bottom Ash
765
760
Ash
735
Alluvial Clay
Pond A Profile with Buffer
1% slope
Elevation (ft-MSL)
780
Gypsum
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure F-5



Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum Pond B
Ash Dredge Cell
Gypsum Pond A
Emory River
Gypsum Pond B
Gypsum Pond A
Phase 3
Stilling Pond
inactive
active
Intake Channel
Pond A Profile without Buffer
1% slope
Elevation (ft-MSL)
780
Gypsum
767
Bottom Ash
765
760
Ash
735
Alluvial Clay
Pond A Profile with Buffer
1% slope
Elevation (ft-MSL)
780
Gypsum
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay


Figure F-6

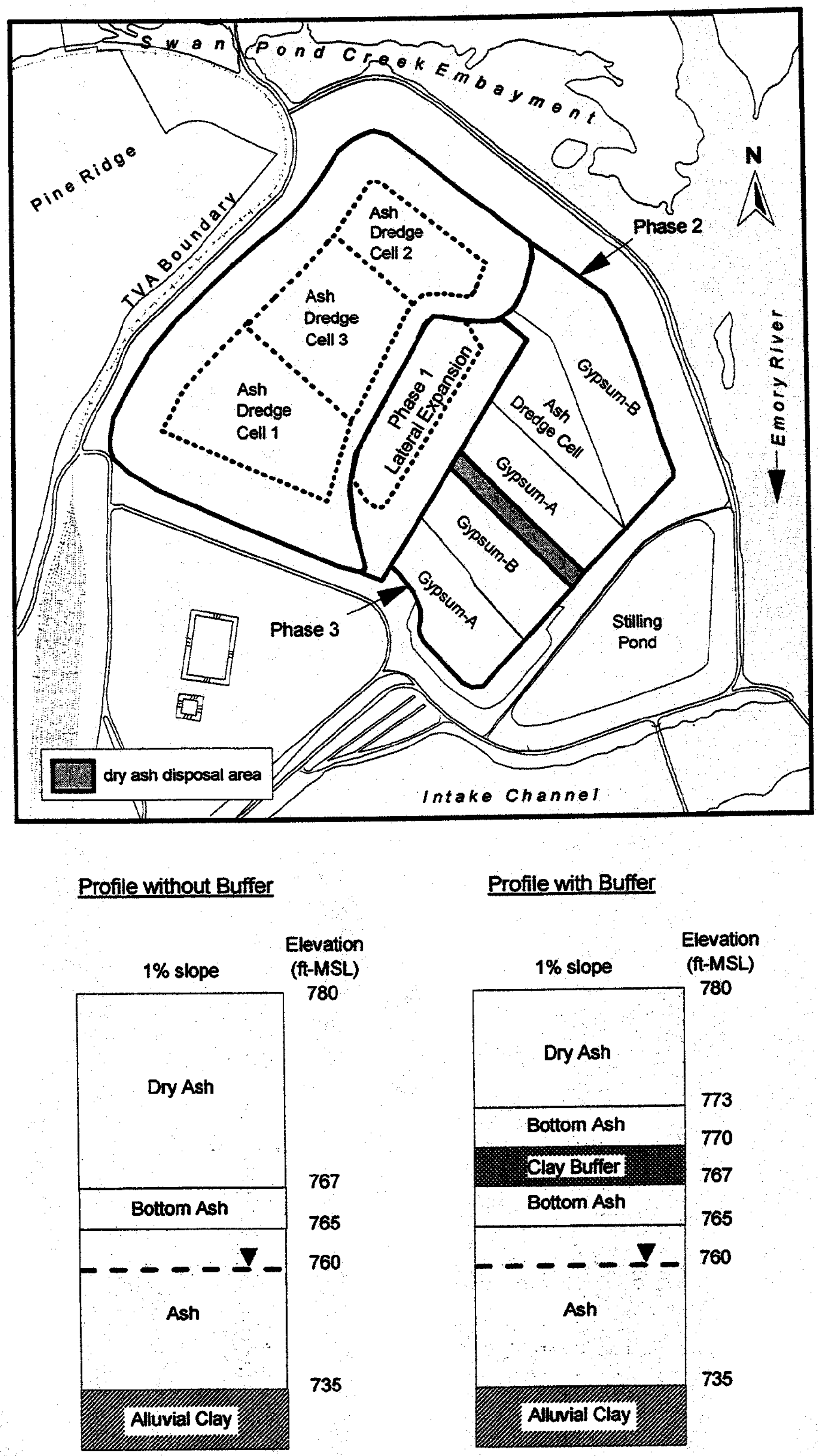
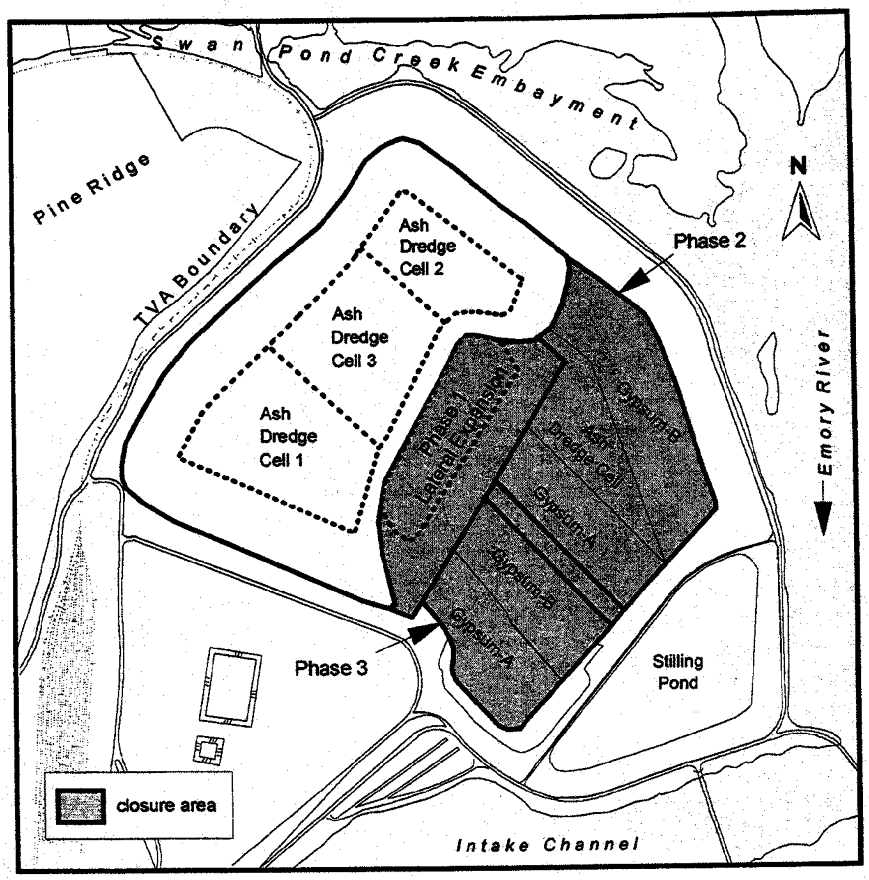
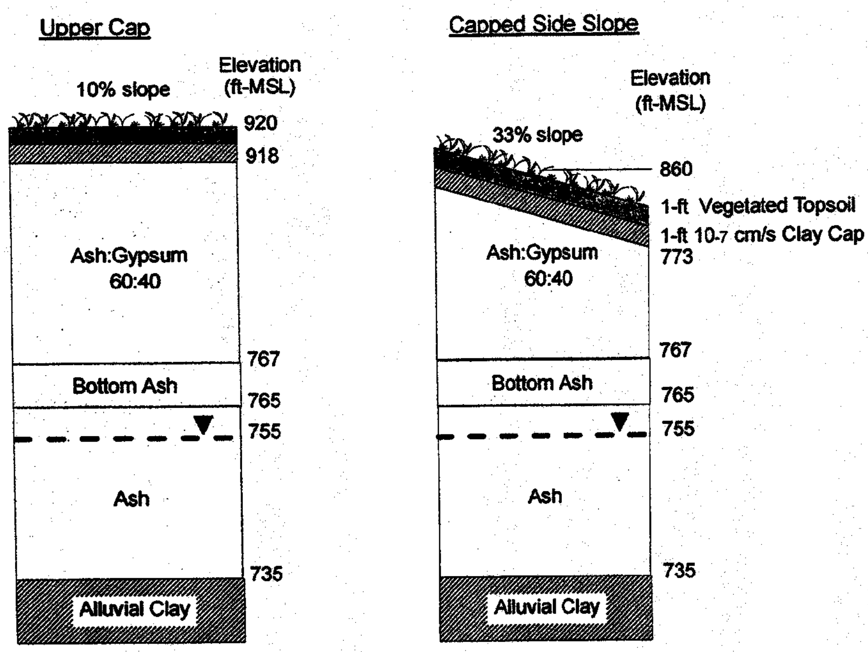

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Emory River
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Phase 3
Stilling Pond
dry ash disposal area
Intake Channel
Profile without Buffer
1% slope
Elevation (ft-MSL)
780
Dry Ash
767
Bottom Ash
765
760
Ash
735
Alluvial Clay
Profile with Buffer
1% slope
Elevation (ft-MSL)
780
Dry Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure F-7



Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Phase 2
Phase 3
Gypsum-B
Ash Dredge Cell
Gypsum-A
Stilling Pond
N
Emory River
closure area
Intake Channel

Upper Cap
10% slope
Elevation (ft-MSL)
920
918
Ash:Gypsum 60:40
767
Bottom Ash
765
755
Ash
735
Alluvial Clay
Capped Side Slope
Elevation (ft-MSL)
33% slope
860
1-ft Vegetated Topsoil
1-ft 10-7 cm/s Clay Cap
773
Ash:Gypsum 60:40
767
Bottom Ash
765
755
Ash
735
Alluvial Clay


Figure F-8

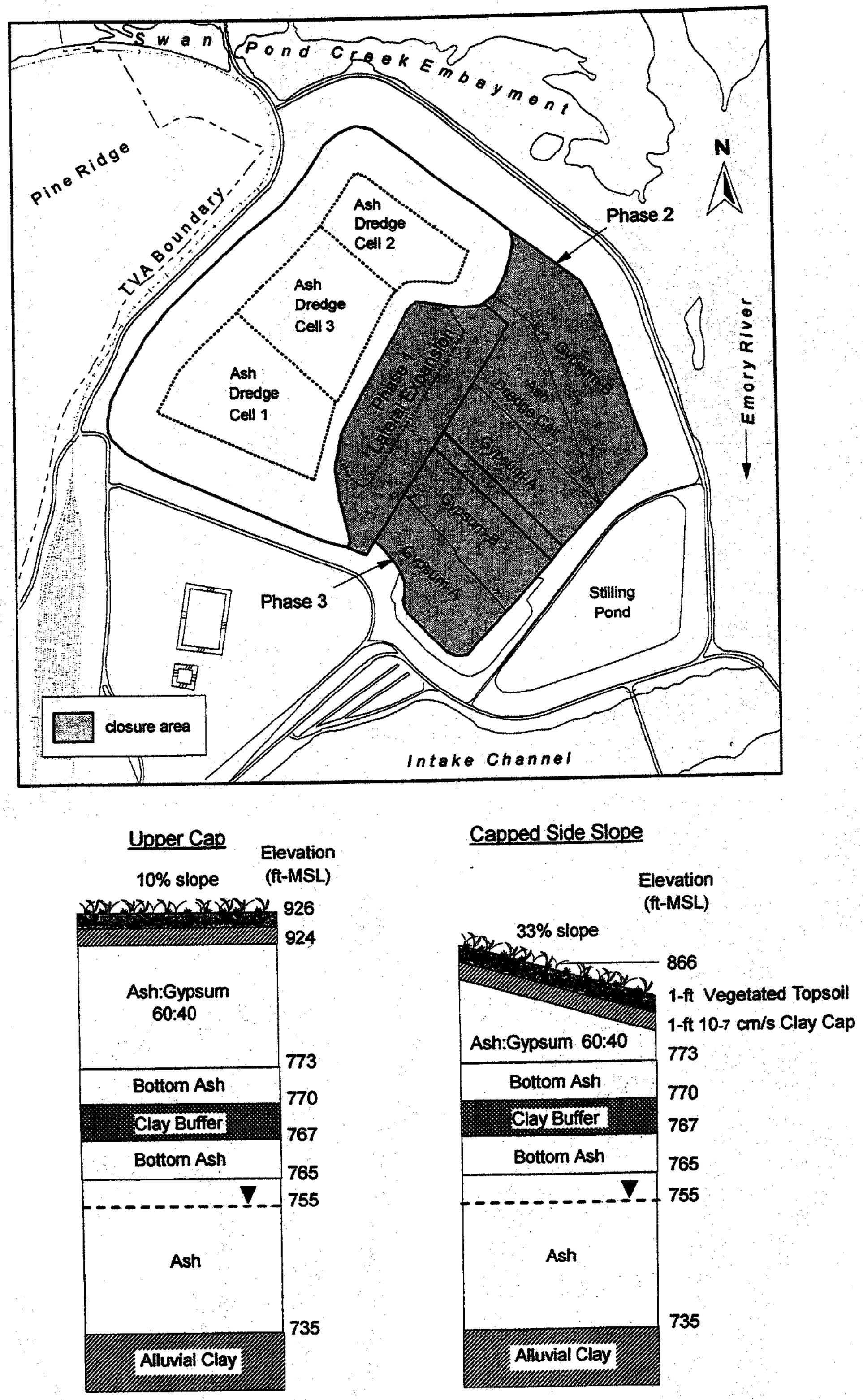
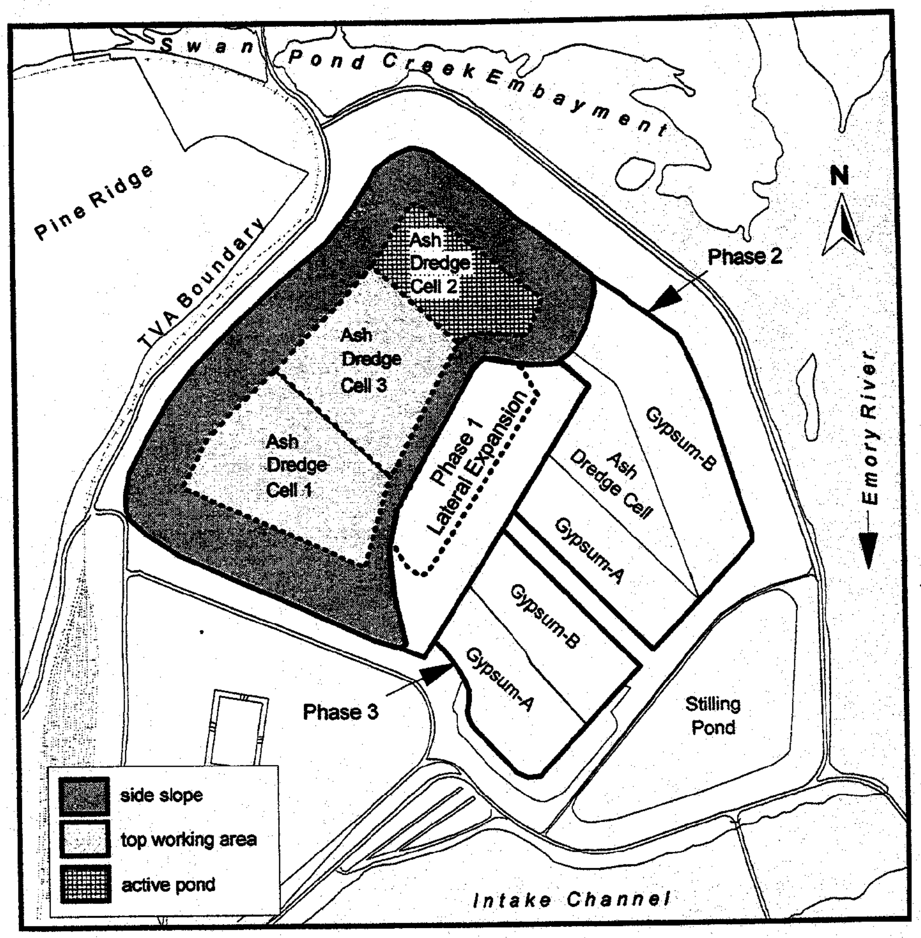

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
closure area
Intake Channel
Upper Cap
Elevation (ft-MSL)
10% slope
926
924
Ash:Gypsum 60:40
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
755
Ash
735
Alluvial Clay
Capped Side Slope
Elevation (ft-MSL)
33% slope
866
1-ft Vegetated Topsoil
1-ft 10-7 cm/s Clay Cap
Ash:Gypsum 60:40
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
755
Ash
735
Alluvial Clay

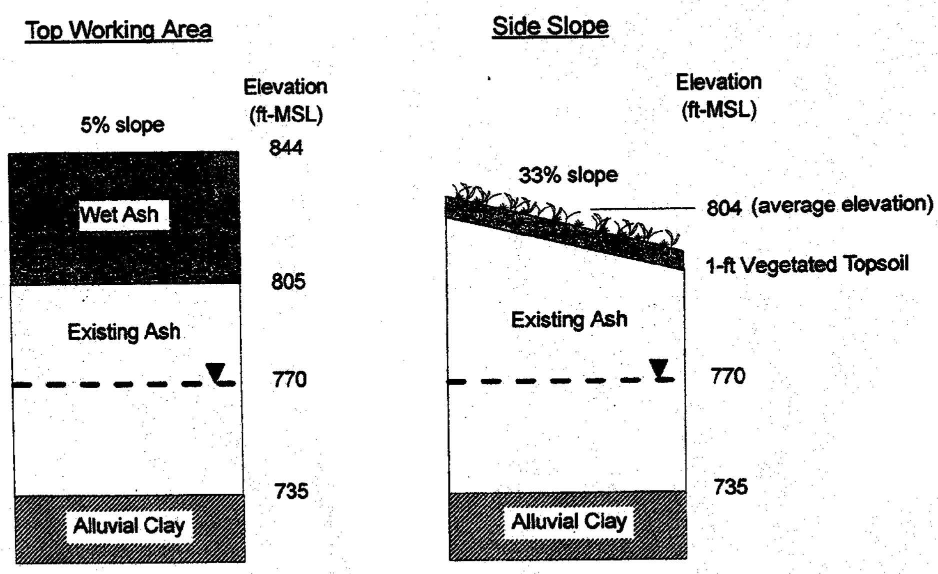
Figure F-9

## APPENDIX G

## OPTION B – FACILITY SUBREGIONS AND PROFILES FOR SEEPAGE MODEL SIMULATIONS



Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Phase 2
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
side slope
top working area
active pond
Intake Channel

Top Working Area
Elevation (ft-MSL)
5% slope
844
Wet Ash
805
Existing Ash
770
735
Alluvial Clay
Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
Existing Ash
770
735
Alluvial Clay


Figure G-1

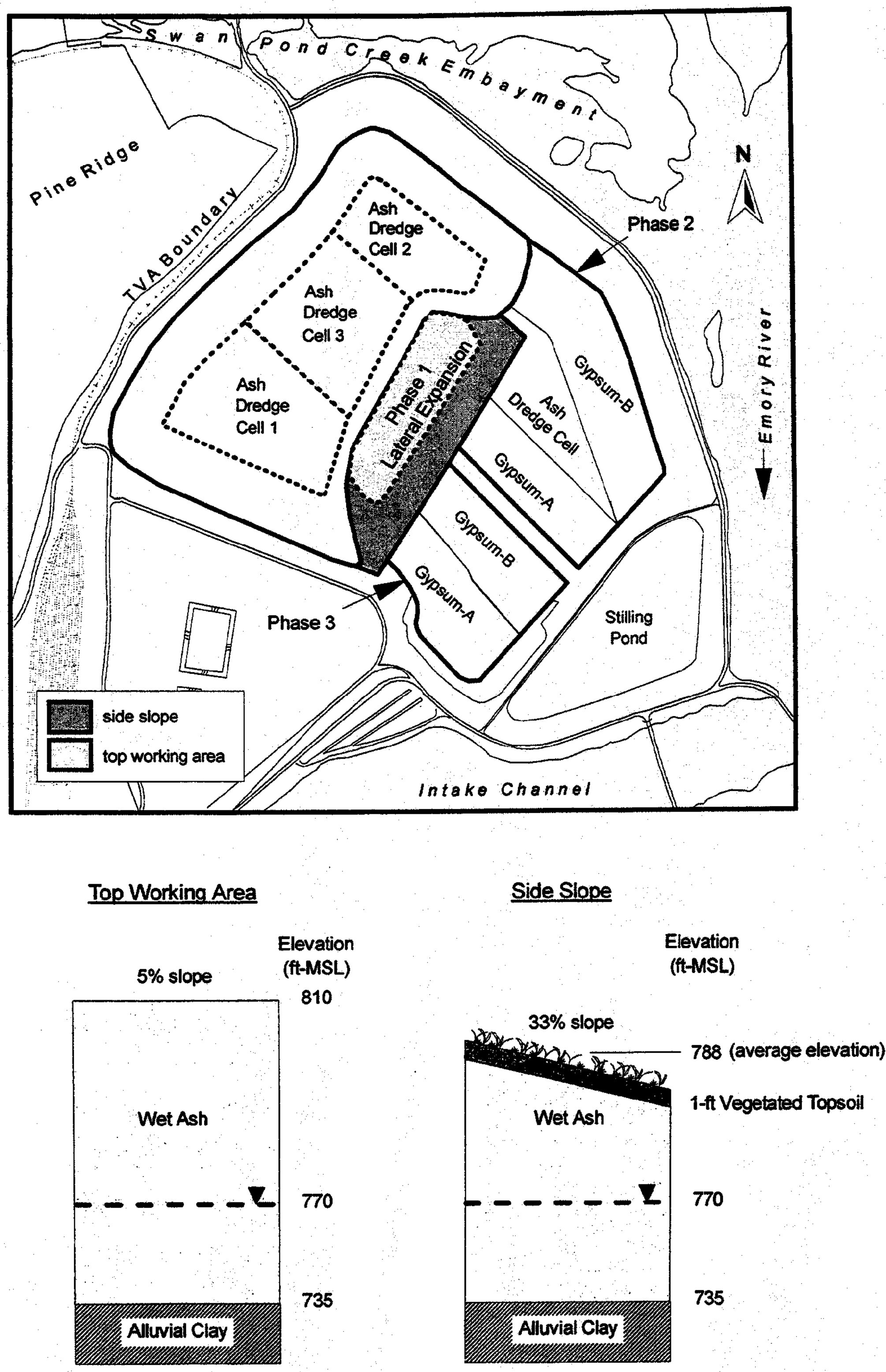

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
side slope
top working area
Intake Channel
Top Working Area
Elevation (ft-MSL)
5% slope
810
Wet Ash
770
735
Alluvial Clay
Side Slope
Elevation (ft-MSL)
33% slope
788 (average elevation)
1-ft Vegetated Topsoil
Wet Ash
770
735
Alluvial Clay

Figure G-2

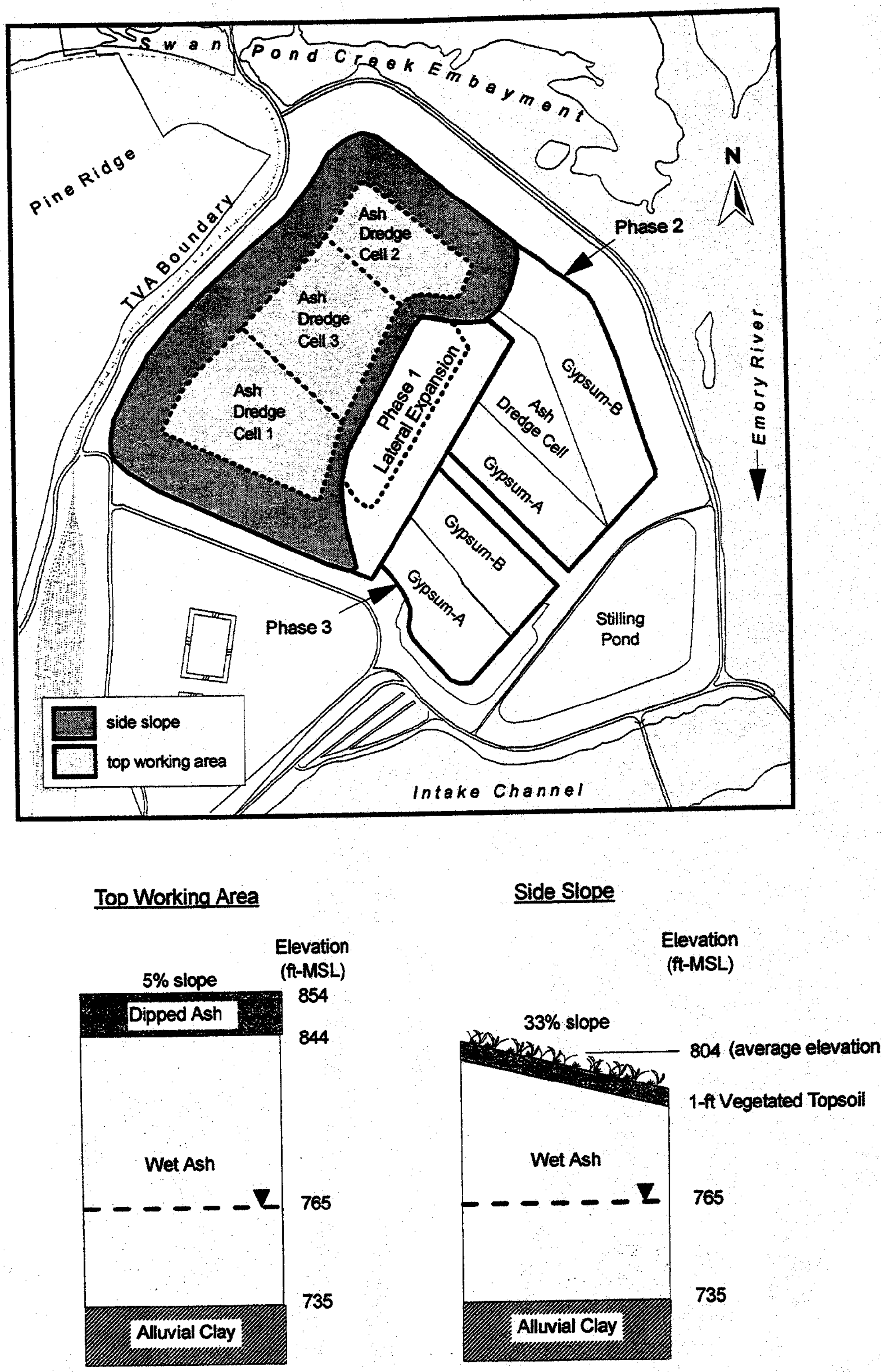

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Gypsum-B
Gypsum-A
Emory River
Phase 3
Stilling Pond
side slope
top working area
Intake Channel
Top Working Area
Elevation (ft-MSL)
5% slope
854
Dipped Ash
844
Wet Ash
765
735
Alluvial Clay
Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
Wet Ash
765
735
Alluvial Clay

Figure G-3

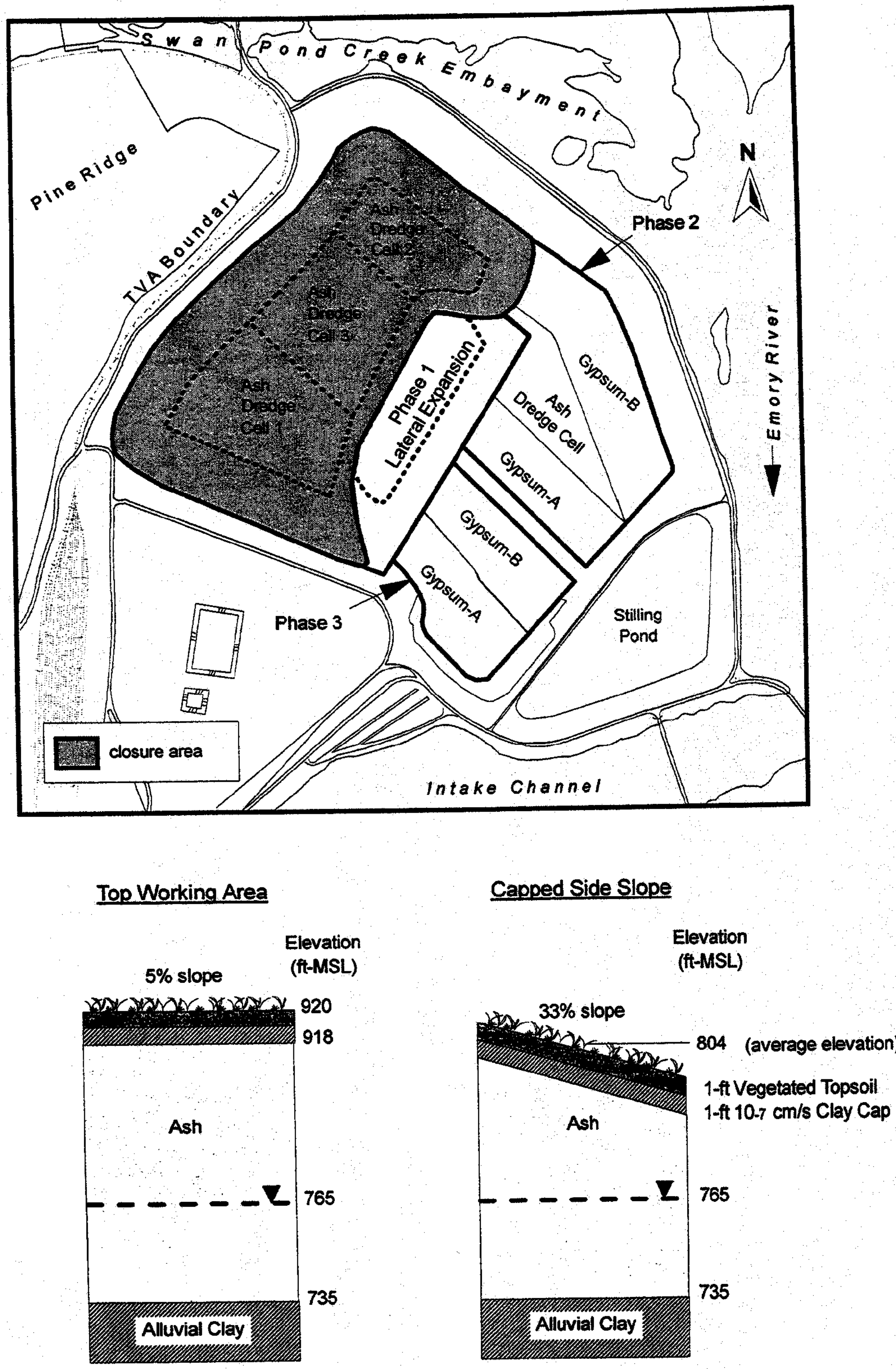
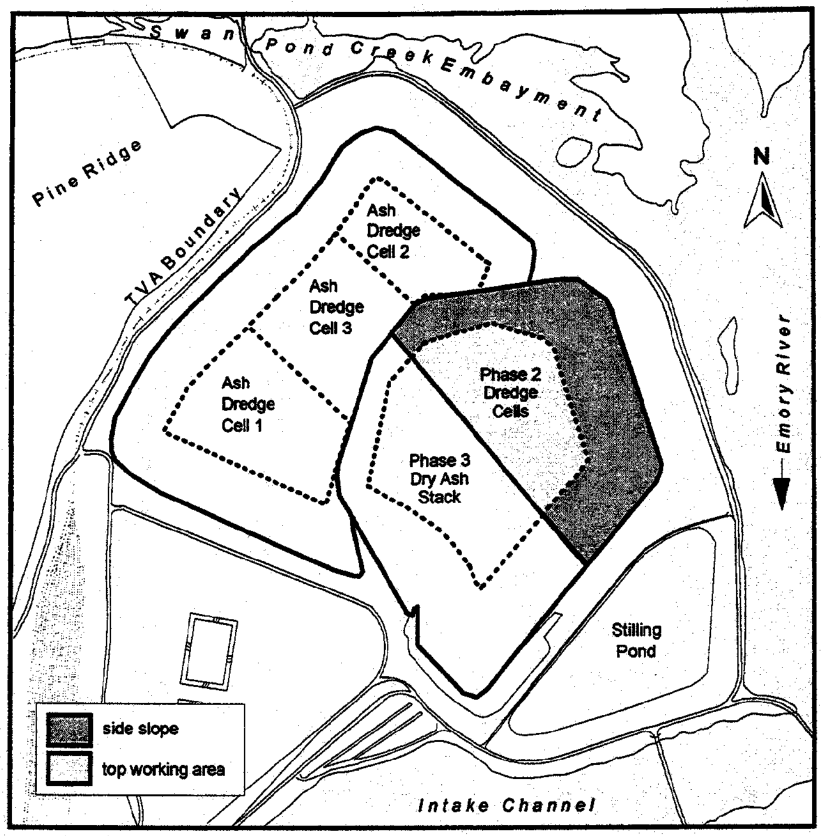

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Phase 2
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 1 Lateral Expansion
Gypsum-B
Ash Dredge Cell
Gypsum-A
Emory River
Gypsum-B
Gypsum-A
Phase 3
Stilling Pond
closure area
Intake Channel
Top Working Area
Elevation (ft-MSL)
5% slope
920
918
Ash
765
735
Alluvial Clay
Capped Side Slope
Elevation (ft-MSL)
33% slope
804 (average elevation)
1-ft Vegetated Topsoil
1-ft 10-7 cm/s Clay Cap
Ash
765
735
Alluvial Clay

Figure G-4


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 2 Dredge Cells
Phase 3 Dry Ash Stack
Emory River
Stilling Pond
side slope
top working area
Intake Channel

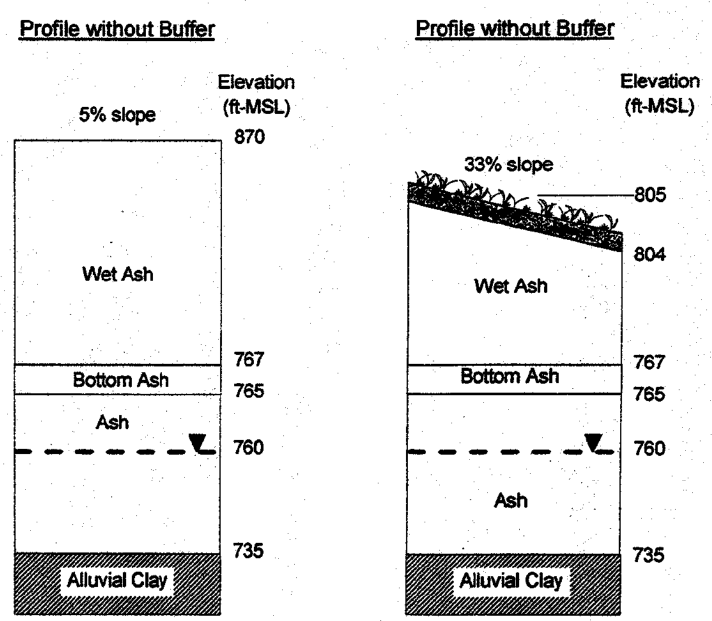
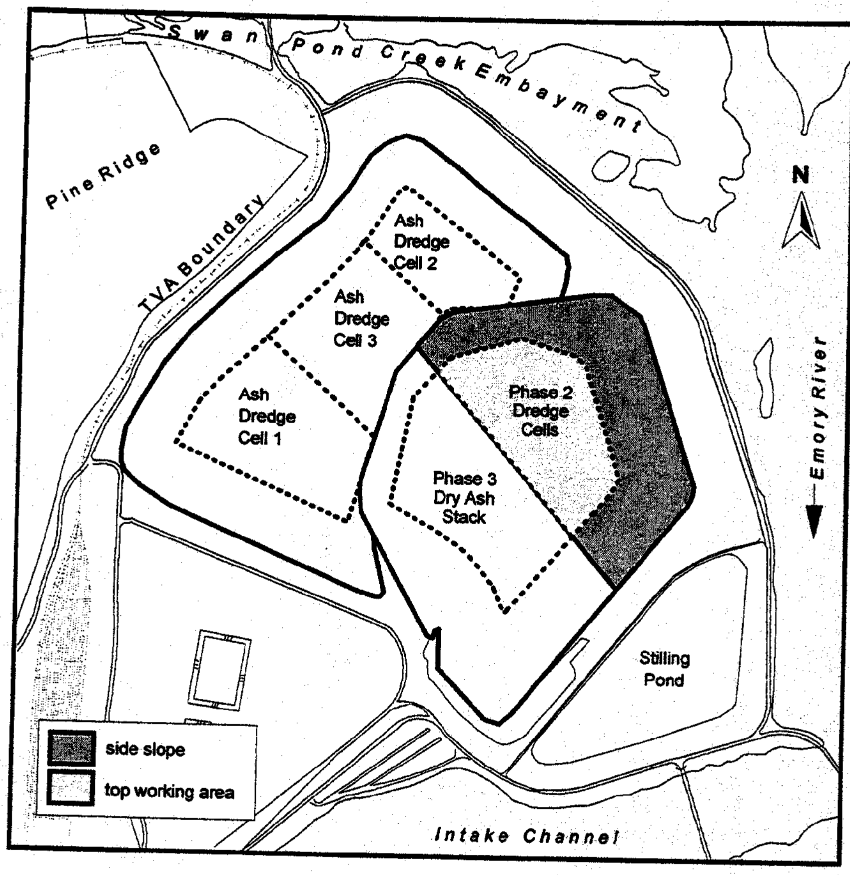

Profile without Buffer
Elevation (ft-MSL)
5% slope
870
Wet Ash
767
Bottom Ash
765
Ash
760
735
Alluvial Clay
Profile without Buffer
Elevation (ft-MSL)
33% slope
805
804
Wet Ash
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-5


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Emory River
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 2 Dredge Cells
Phase 3 Dry Ash Stack
Stilling Pond
side slope
top working area
Intake Channel

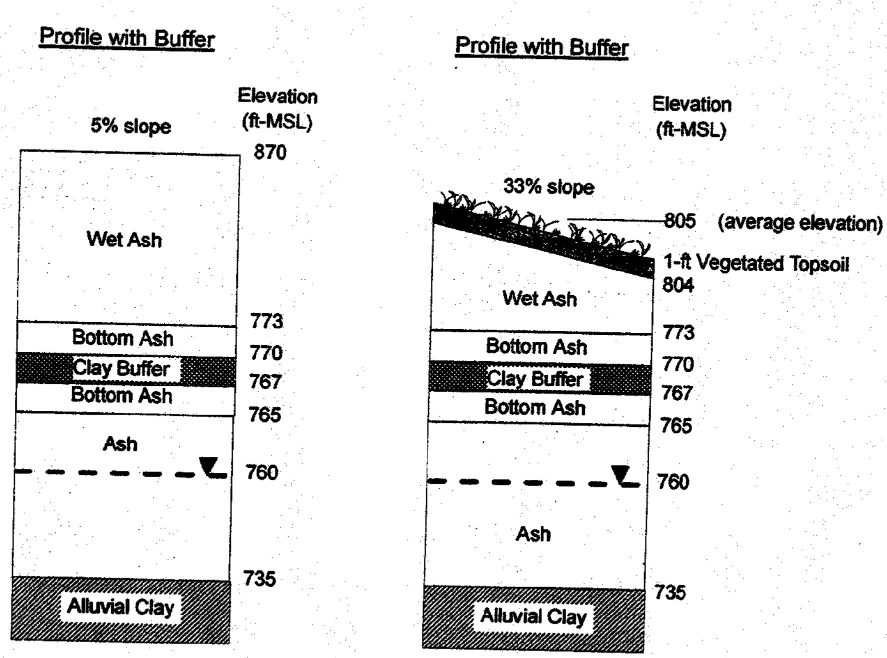
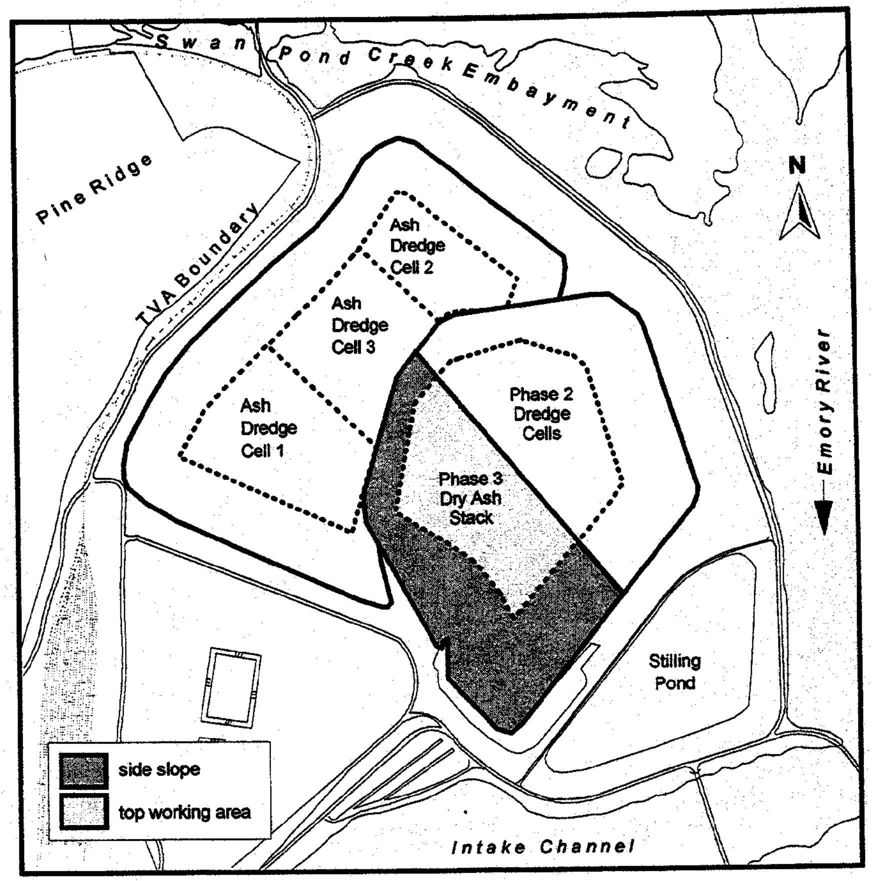

Profile with Buffer
Elevation (ft-MSL)
5% slope
870
Wet Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
Ash
760
735
Alluvial Clay
Profile with Buffer
Elevation (ft-MSL)
33% slope
805 (average elevation)
1-ft Vegetated Topsoil
804
Wet Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-6


Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Emory River
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 2 Dredge Cells
Phase 3 Dry Ash Stack
Stilling Pond
side slope
top working area
Intake Channel

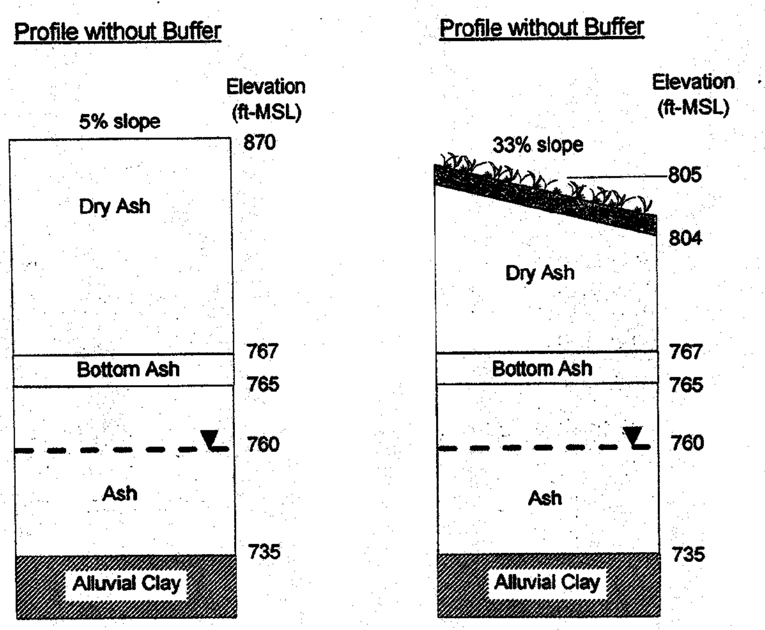

Profile without Buffer
Elevation (ft-MSL)
5% slope
870
Dry Ash
767
Bottom Ash
765
760
Ash
735
Alluvial Clay
Profile without Buffer
Elevation (ft-MSL)
33% slope
805
804
Dry Ash
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-7

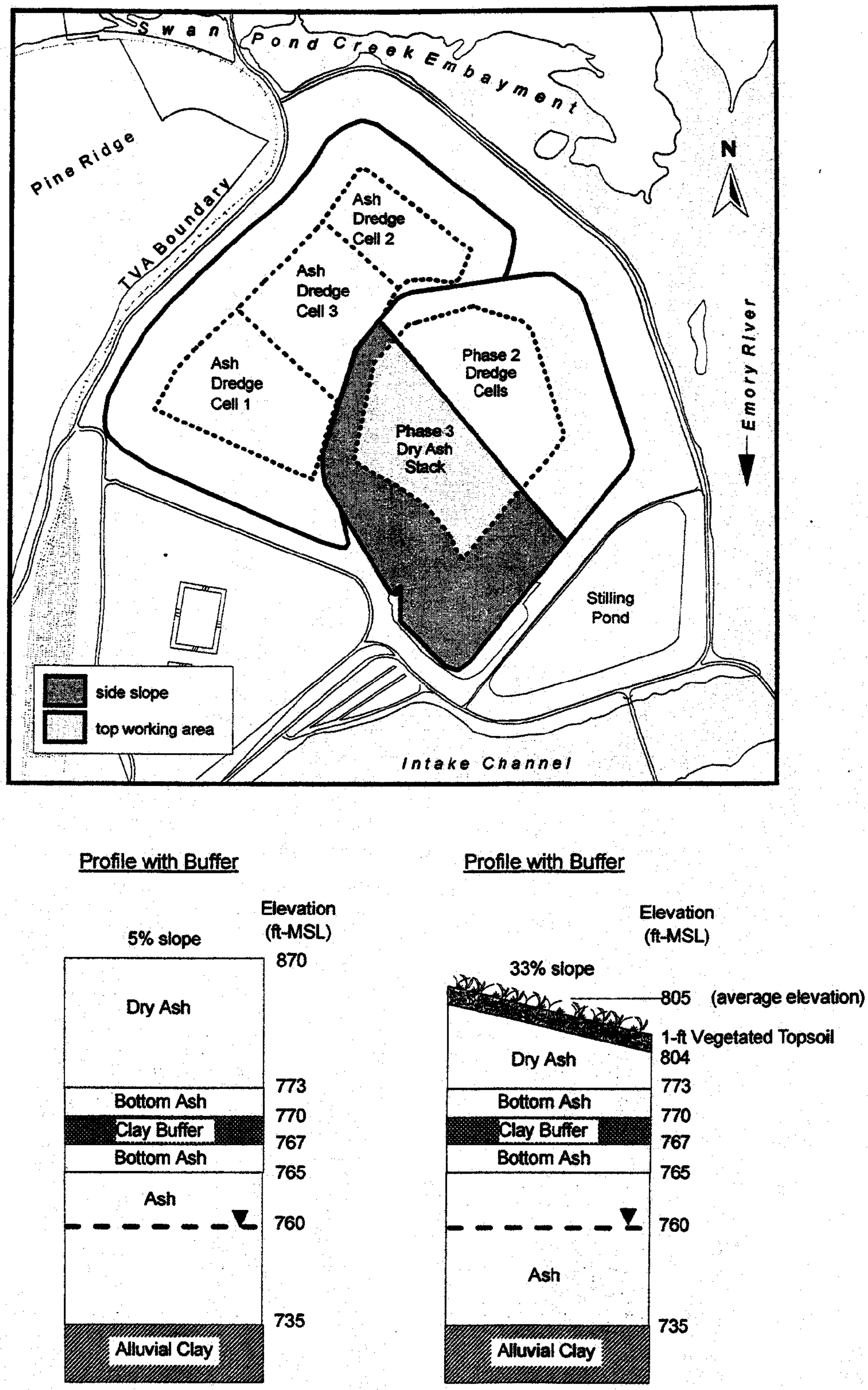

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 2 Dredge Cells
Phase 3 Dry Ash Stack
Emory River
Stilling Pond
side slope
top working area
Intake Channel
Profile with Buffer
5% slope
Elevation (ft-MSL)
870
Dry Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
Ash
760
735
Alluvial Clay
Profile with Buffer
Elevation (ft-MSL)
33% slope
805 (average elevation)
1-ft Vegetated Topsoil
804
Dry Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-8

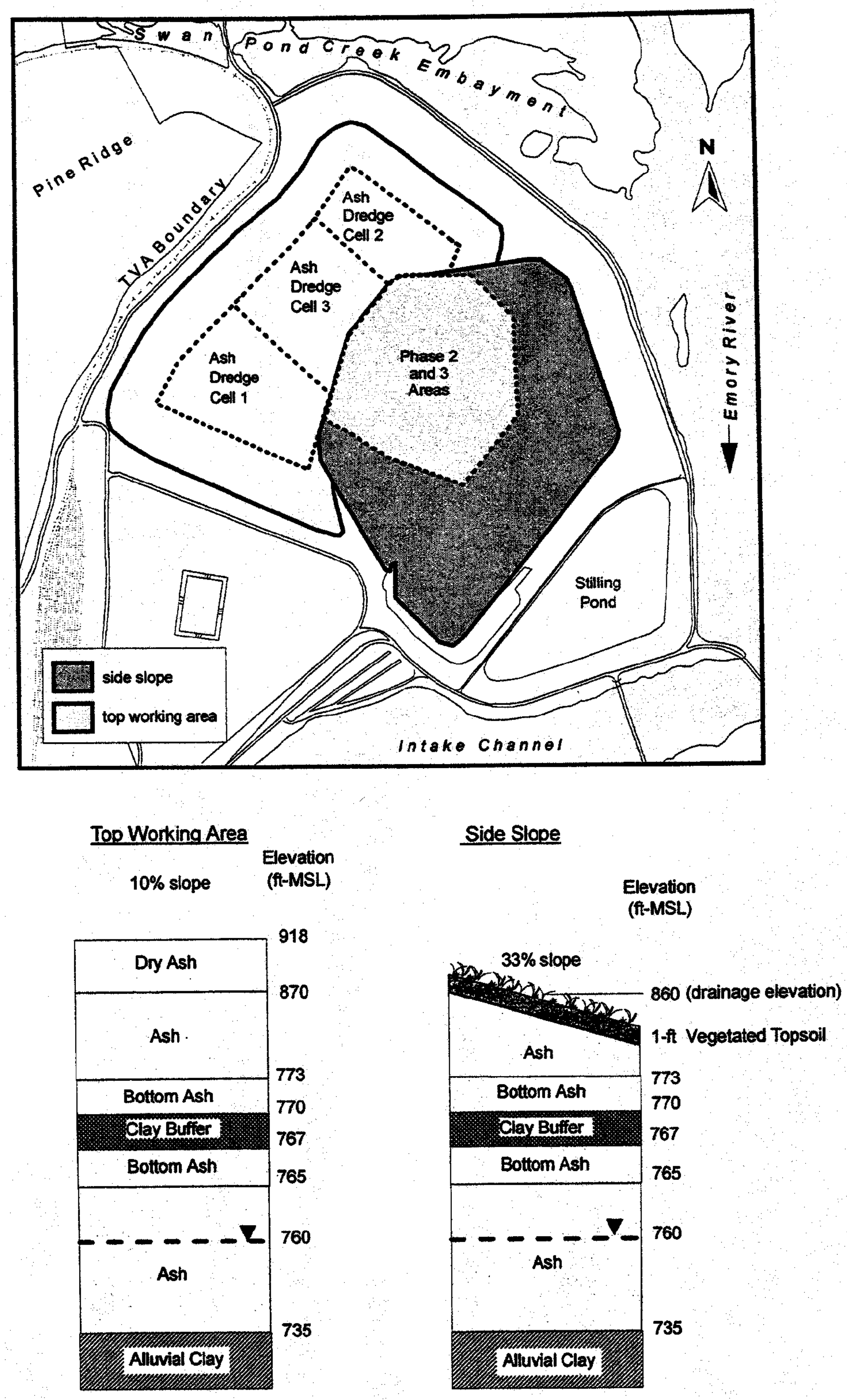

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Phase 2 and 3 Areas
Emory River
Stilling Pond
side slope
top working area
Intake Channel
Top Working Area
10% slope
Elevation (ft-MSL)
918
Dry Ash
870
Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay
Side Slope
Elevation (ft-MSL)
33% slope
860 (drainage elevation)
1-ft Vegetated Topsoil
Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-10

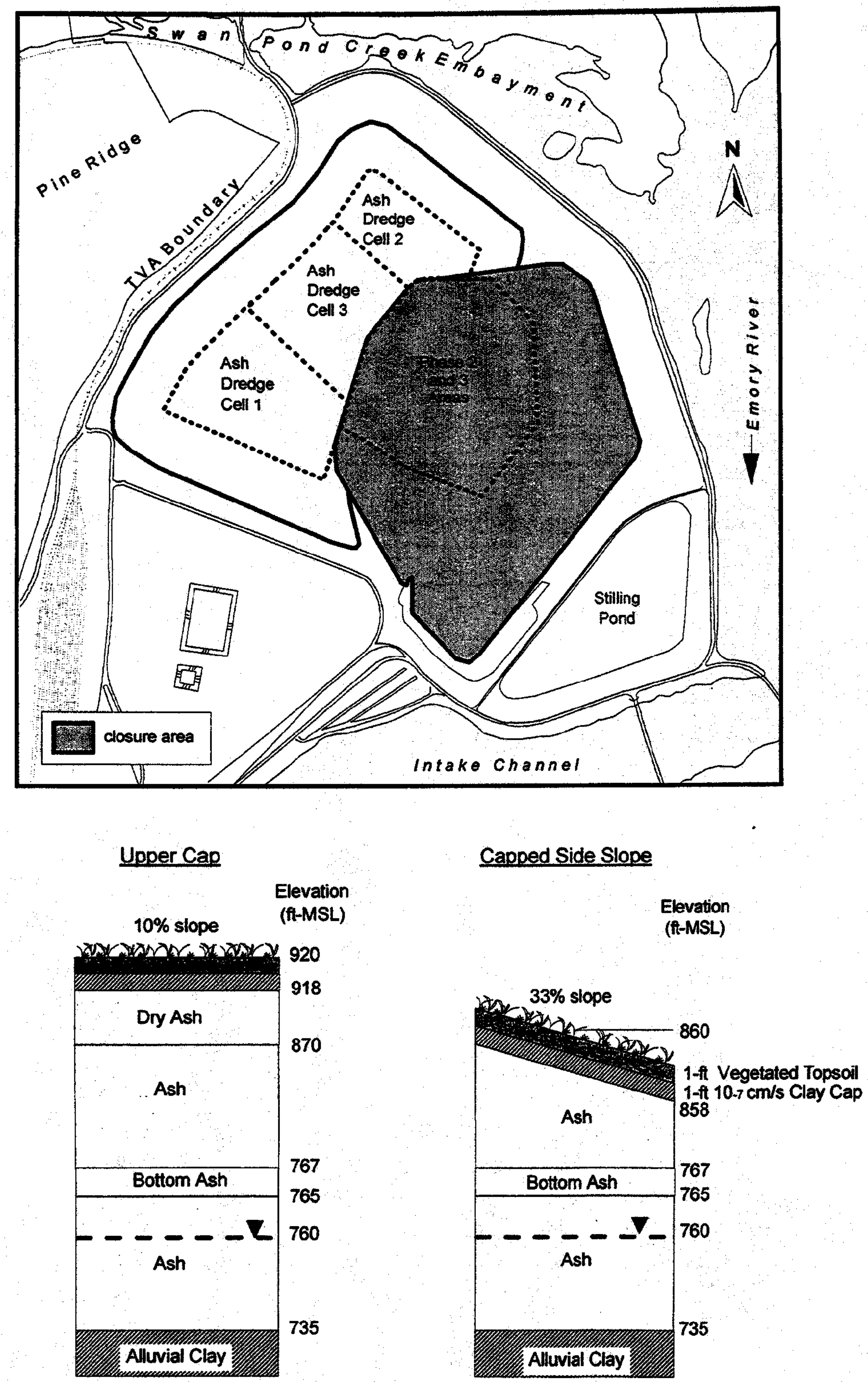

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Emory River
Stilling Pond
closure area
Intake Channel
Upper Cap
Elevation (ft-MSL)
10% slope
920
918
Dry Ash
870
Ash
767
Bottom Ash
765
760
Ash
735
Alluvial Clay
Capped Side Slope
Elevation (ft-MSL)
33% slope
860
1-ft Vegetated Topsoil
1-ft 10-7 cm/s Clay Cap
858
Ash
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-11

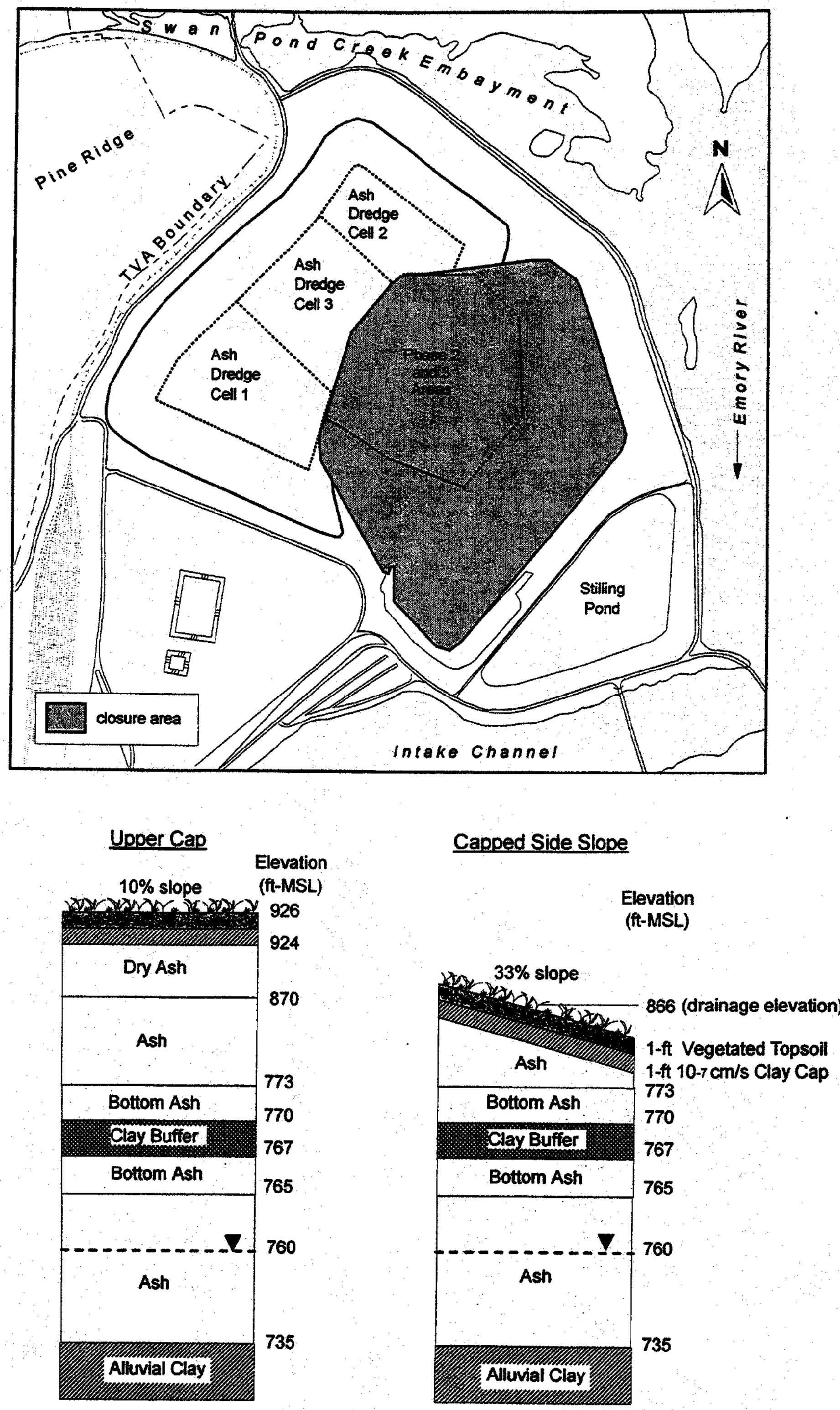

Swan Pond Creek Embayment
Pine Ridge
TVA Boundary
N
Ash Dredge Cell 2
Ash Dredge Cell 3
Ash Dredge Cell 1
Emory River
Stilling Pond
closure area
Intake Channel
Upper Cap
Elevation (ft-MSL)
10% slope
926
924
Dry Ash
870
Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay
Capped Side Slope
Elevation (ft-MSL)
33% slope
866 (drainage elevation)
1-ft Vegetated Topsoil
1-ft 10-7 cm/s Clay Cap
Ash
773
Bottom Ash
770
Clay Buffer
767
Bottom Ash
765
760
Ash
735
Alluvial Clay

Figure G-12

## APPENDIX H

## OPTION A – LEACHATE SEEPAGE AND COC MASS LOADING ESTIMATES

## Table H1. Option A – Leachate Seepage Estimates for Disposal Facility Subregions

| Facility Subregion | Start Date | End Date | Waste | Surface Area (sq ft) | Mean Seepage (%P)1 | Mean Seepage (Lpd) | Model Applied for Seepage Estimate | Subregion Figure No. (Appendix F) |
|---|---|---|---|---|---|---|---|---|
| Phase 1 - Ash Dredge Cells 1& 3 - Top Working Area | 2004 | 2014 | wet ash | 1,596,662 | 11.6 | 67,618 | HELP | F-1 |
| Phase 1 - Ash Dredge Cells 1& 3 - Side Slopes | 2004 | 2014 | wet ash | 1,799,163 | 30.7 | 200,760 | HELP | F-1 |
| Phase 1 - Ash Dredge Cell 2 (active pond) | 2004 | 2014 | wet ash | 798,350 | -- | 156,757 | MODFLOW | F-1 |
| Phase 1 - Ash Dredge Cells 1-3 - Top Working Area | 2015 | 2016 | dipped ash | 1,965,662 | 13.5 | 90,215 | HELP | F-2 |
| Phase 1 - Ash Dredge Cells 1-3 - Side Slopes | 2015 | 2016 | dipped ash | 2,581,418 | 17.4 | 153,283 | HELP | F-2 |
| Closure of Ash Dredge Cells 1-3 - Upper Cap | 2017 | 2046 | mixed ash | 1,965,662 | 19.2 | 132,247 | HELP | F-3 |
| Closure of Ash Dredge Cells 1-3 - Side Slopes | 2017 | 2046 | mixed ash | 2,581,418 | 17.2 | 155,163 | HELP | F-3 |
| Phase 1 - Dredge Cell Lateral Expansion Area - Top | 2004 | 2014 | wet ash | 496,898 | 16.9 | 12,454 | HELP | F-4 |
| Phase 1 - Dredge Cell Lateral Expansion Area - Slope | 2004 | 2014 | wet ash | 502,432 | 24.4 | 44,483 | HELP | F-4 |
| Phase 2 - Gypsum Pond A (inactive) - NO BUFFER | 2009 | 2018 | gypsum | 417,835 | 24.6 | 37,940 | HELP | F-5 |
| Phase 2 - Gypsum Pond A (inactive) - BUFFER | 2009 | 2018 | gypsum | 417,835 | 16.2 | 24,962 | HELP | F-5 |
| Phase 2 - Gypsum Pond B (active) - NO BUFFER | 2009 | 2018 | wet gypsum | 405,015 | -- | 24,347 | MODFLOW | F-5 |
| Phase 2 - Gypsum Pond B (active) - BUFFER | 2009 | 2018 | wet gypsum | 405,015 | -- | 16,545 | MODFLOW | F-5 |
| Phase 2 - Ash Pond (active) - NO BUFFER | 2009 | 2018 | wet ash | 449,658 | -- | 21,844 | MODFLOW | F-5 |
| Phase 2 - Ash Pond (active) - BUFFER | 2009 | 2018 | wet ash | 449,658 | -- | 17,370 | MODFLOW | F-5 |
| Phase 3 - Gypsum Pond A (inactive) - NO BUFFER | 2019 | 2028 | gypsum | 384,240 | 27.5 | 38,890 | HELP | F-6 |
| Phase 3 - Gypsum Pond A (inactive) - BUFFER | 2019 | 2028 | gypsum | 384,240 | 16.2 | 22,955 | HELP | F-6 |
| Phase 3 - Gypsum Pond B (active) - NO BUFFER | 2019 | 2028 | wet gypsum | 363,363 | -- | 21,844 | MODFLOW | F-6 |
| Phase 3 - Gypsum Pond B (active) - BUFFER | 2019 | 2028 | wet gypsum | 363,363 | -- | 14,843 | MODFLOW | F-6 |
| Dry Ash Stack between Phase 2&3 - NO BUFFER | 2019 | 2028 | dry ash | 249,655 | 11.2 | 10,268 | HELP | F-7 |
| Dry Ash Stack between Phase 2&3 - BUFFER | 2019 | 2028 | dry ash | 249,655 | 9.0 | 8,243 | HELP | F-7 |
| Closure of Phase 2&3 Areas - Upper Cap - NO BUFFER | 2029 | 2058 | 60:40 ash/gypsum | 1,538,324 | 12.0 | 65,409 | HELP | F-8 |
| Closure of Phase 2&3 Areas - Upper Cap - BUFFER | 2029 | 2058 | 60:40 ash/gypsum | 1,538,324 | 12.2 | 66,629 | HELP | F-9 |
| Closure of Phase 2&3 Areas - Side Slopes - NO BUFFER | 2029 | 2058 | 60:40 ash/gypsum | 2,709,399 | 11.9 | 114,047 | HELP | F-8 |
| Closure of Phase 2&3 Areas - Side Slopes - BUFFER | 2029 | 2058 | 60:40 ash / gypsum | 2,709,399 | 12.1 | 115,311 | HELP | F-9 |

*1Percent of mean annual precipitation*

## Table H2. Option A – COC Mass Loading Estimates

| Facility | Start Date | End Date | Waste | Ammonia: Weighted Average Leachate Conc. (mg/L) | Ammonia: Mass Loading SPC (kg/day) | Ammonia: Mass Loading Emory River (kg/day) | Arsenic: Weighted Average Leachate Conc. (mg/L) | Arsenic: Mass Loading SPC (kg/day) | Arsenic: Mass Loading Emory River (kg/day) | Cadmium: Weighted Average Leachate Conc. (mg/L) | Cadmium: Mass Loading SPC (kg/day) | Cadmium: Mass Loading Emory River (kg/day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phase 1 - Ash Dredge Cells 1-3 | 2004 | 2014 | wet ash | 1.00 | 0.4237 | 0.4237 | 0.004 | 0.0016 | 0.3189 | 0.001 | 0.0004 | 0.0004 |
| Phase 1 - Ash Dredge Cells 1-3 | 2015 | 2016 | dipped ash | 1.13 | 0.2754 | 0.2754 | 0.004 | 0.0009 | 0.1826 | 0.001 | 0.0002 | 0.0002 |
| Closure of Ash Dredge Cells 1-3 | 2017 | 2046 | mixed ash | 1.13 | 0.3250 | 0.3250 | 0.004 | 0.0011 | 0.0503 | 0.001 | 0.0003 | 0.0003 |
| Phase 1 - Dredge Cell Lateral Expansion Area | 2004 | 2014 | wet ash | 2.64 | -- | 0.1503 | 0.0037 | 0.0002 | 0.0427 | 0.001 | -- | 0.0001 |
| Phase 2 - Gypsum Ponds A&B - NO BUFFER | 2009 | 2018 | gypsum | 0.000 | -- | 0.000 | 0.001 | 0.000 | 0.000 | 0.012 | -- | 0.0007 |
| Phase 2 - Gypsum Ponds A&B - BUFFER | 2009 | 2018 | gypsum | 0.000 | -- | 0.000 | 0.001 | 0.000 | 0.000 | 0.012 | -- | 0.0005 |
| Phase 2 - Ash Dredge Cell - NO BUFFER | 2009 | 2018 | wet ash | 2.64 | -- | 0.0577 | 0.7500 | 0.0164 | 0.0164 | 0.002 | -- | 4.37E-05 |
| Phase 2 - Ash Dredge Cell - BUFFER | 2009 | 2018 | wet ash | 2.64 | -- | 0.0459 | 0.7500 | 0.0130 | 0.0130 | 0.002 | -- | 3.47E-05 |
| Phase 3 - Gypsum Ponds A&B - NO BUFFER | 2019 | 2028 | gypsum | 0.00 | -- | 0.0000 | 0.0005 | 0.0000 | 0.0000 | 0.012 | -- | 0.0007 |
| Phase 3 - Gypsum Ponds A&B - BUFFER | 2019 | 2028 | gypsum | 0.00 | -- | 0.0000 | 0.0005 | 0.0000 | 0.0000 | 0.012 | -- | 0.0005 |
| Phase 2&3 Dry Ash Stack - NO BUFFER | 2019 | 2028 | dry ash | 733.00 | -- | 7.5263 | 0.7500 | 0.0077 | 0.0077 | 0.002 | -- | 2.05E-05 |
| Phase 2&3 Dry Ash Stack - BUFFER | 2019 | 2028 | dry ash | 733.00 | -- | 6.0425 | 0.7500 | 0.0062 | 0.0062 | 0.002 | -- | 1.65E-05 |
| Closure of Phase 2&3 Areas - NO BUFFER | 2029 | 2058 | 60:40 ash/gyp | 284.69 | -- | 50.6395 | 0.3496 | 0.0627 | 0.0113 | 0.007 | -- | 0.0013 |
| Closure of Phase 2&3 Areas - BUFFER | 2029 | 2058 | 60:40 ash/gyp | 284.69 | -- | 51.0886 | 0.3496 | 0.0622 | 0.0105 | 0.007 | -- | 0.0013 |

## Table H2. Option A – COC Mass Loading Estimates (cont.)

| Facility | Start Date | End Date | Waste | Copper | | | Mercury | | | Nickel | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) |
| Phase 1 - Ash Dredge Cells 1-3 | 2004 | 2014 | wet ash | 0.025 | 0.0108 | 0.0108 | 0.0006 | 2.55E-04 | 2.55E-04 | 0.0466 | 1.98E-02 | 1.98E-02 |
| Phase 1 - Ash Dredge Cells 1-3 | 2015 | 2016 | dipped ash | 0.025 | 0.0062 | 0.0062 | 0.0006 | 1.46E-04 | 1.46E-04 | 0.0466 | 1.13E-02 | 1.13E-02 |
| Closure of Ash Dredge Cells 1-3 | 2017 | 2046 | mixed ash | 0.025 | 0.0073 | 0.0073 | 0.0006 | 1.72E-04 | 1.72E-04 | 0.0466 | 1.34E-02 | 1.34E-02 |
| Phase 1 - Dredge Cell Lateral Expansion Area | 2004 | 2014 | wet ash | 0.025 | -- | 0.0014 | 0.0006 | -- | 3.42E-05 | 0.0466 | -- | 0.0027 |
| Phase 2 - Gypsum Ponds A&B - NO BUFFER | 2009 | 2018 | gypsum | 0.006 | -- | 0.0003 | 0.0034 | -- | 2.12E-04 | 0.107 | -- | 0.0066 |
| Phase 2 - Gypsum Ponds A&B - BUFFER | 2009 | 2018 | gypsum | 0.006 | -- | 0.0002 | 0.0034 | -- | 1.41E-04 | 0.107 | -- | 0.0044 |
| Phase 2 - Ash Dredge Cell - NO BUFFER | 2009 | 2018 | wet ash | 0.005 | -- | 1.09E-04 | 0.0001 | -- | 2.18E-06 | 0.003 | -- | 6.55E-05 |
| Phase 2 - Ash Dredge Cell - BUFFER | 2009 | 2018 | wet ash | 0.005 | -- | 8.69E-05 | 0.0001 | -- | 1.74E-06 | 0.003 | -- | 5.21E-05 |
| Phase 3 - Gypsum Ponds A&B - NO BUFFER | 2019 | 2028 | gypsum | 0.006 | -- | 0.0003 | 0.0034 | -- | 2.06E-04 | 0.107 | -- | 0.0065 |
| Phase 3 - Gypsum Ponds A&B - BUFFER | 2019 | 2028 | gypsum | 0.006 | -- | 0.0002 | 0.0034 | -- | 1.29E-04 | 0.107 | -- | 0.0040 |
| Phase 2&3 Dry Ash Stack - NO BUFFER | 2019 | 2028 | dry ash | 0.005 | -- | 0.0001 | 0.0001 | -- | 1.03E-06 | 0.003 | -- | 3.08E-05 |
| Phase 2&3 Dry Ash Stack - BUFFER | 2019 | 2028 | dry ash | 0.005 | -- | 0.0000 | 0.0001 | -- | 8.24E-07 | 0.003 | -- | 2.47E-05 |
| Closure of Phase 2&3 Areas - NO BUFFER | 2029 | 2058 | 60:40 ash/gyp | 0.005 | -- | 0.0009 | 0.0019 | -- | 3.34E-04 | 0.058 | -- | 0.0105 |
| Closure of Phase 2&3 Areas - BUFFER | 2029 | 2058 | 60:40 ash/gyp | 0.005 | -- | 0.0009 | 0.0019 | -- | 3.31E-04 | 0.058 | -- | 0.0104 |

## Table H2. Option A – COC Mass Loading Estimates (cont.)

| Facility | Start Date | End Date | Waste | Selenium Weighted Average Leachate Conc. (mg/L) | Selenium Mass Loading SPC (kg/day) | Selenium Mass Loading Emory River (kg/day) | Zinc Weighted Average Leachate Conc. (mg/L) | Zinc Mass Loading SPC (kg/day) | Zinc Mass Loading Emory River (kg/day) |
|---|---|---|---|---|---|---|---|---|---|
| Phase 1 - Ash Dredge Cells 1-3 | 2004 | 2014 | wet ash | 0.001 | 0.0004 | 4.25E-04 | 0.209 | 0.0889 | 0.0889 |
| Phase 1 - Ash Dredge Cells 1-3 | 2015 | 2016 | dipped ash | 0.001 | 0.0002 | 2.43E-04 | 0.209 | 0.0509 | 0.0509 |
| Closure of Ash Dredge Cells 1-3 | 2017 | 2046 | mixed ash | 0.001 | 0.0003 | 2.87E-04 | 0.209 | 0.0601 | 0.0601 |
| Phase 1 - Dredge Cell Lateral Expansion Area | 2004 | 2014 | wet ash | 0.001 | -- | 5.69E-05 | 0.209 | -- | 0.0119 |
| Phase 2 - Gypsum Ponds A&B - NO BUFFER | 2009 | 2018 | gypsum | 0.137 | -- | 8.53E-03 | 0.715 | -- | 0.0445 |
| Phase 2 - Gypsum Ponds A&B - BUFFER | 2009 | 2018 | gypsum | 0.137 | -- | 5.69E-03 | 0.715 | -- | 0.0297 |
| Phase 2 - Ash Dredge Cell - NO BUFFER | 2009 | 2018 | wet ash | 0.001 | -- | 1.09E-05 | 0.005 | -- | 1.09E-04 |
| Phase 2 - Ash Dredge Cell - BUFFER | 2009 | 2018 | wet ash | 0.001 | -- | 8.69E-06 | 0.005 | -- | 8.69E-05 |
| Phase 3 - Gypsum Ponds A&B - NO BUFFER | 2019 | 2028 | gypsum | 0.137 | -- | 8.32E-03 | 0.715 | -- | 0.0434 |
| Phase 3 - Gypsum Ponds A&B - BUFFER | 2019 | 2028 | gypsum | 0.137 | -- | 5.18E-03 | 0.715 | -- | 0.0270 |
| Phase 2&3 Dry Ash Stack - NO BUFFER | 2019 | 2028 | dry ash | 0.001 | -- | 5.13E-06 | 0.005 | -- | 0.0001 |
| Phase 2&3 Dry Ash Stack - BUFFER | 2019 | 2028 | dry ash | 0.001 | -- | 4.12E-06 | 0.005 | -- | 0.0000 |
| Closure of Phase 2&3 Areas - NO BUFFER | 2029 | 2058 | 60:40 ash/gyp | 0.073 | -- | 1.32E-02 | 0.3843 | -- | 0.0690 |
| Closure of Phase 2&3 Areas - BUFFER | 2029 | 2058 | 60:40 ash/gyp | 0.073 | -- | 1.31E-02 | 0.3843 | -- | 0.0684 |

# APPENDIX I

## OPTION B – LEACHATE SEEPAGE AND COC MASS LOADING ESTIMATES

## Table I1. Option B – Leachate Seepage Estimates for Disposal Facility Subregions

| Facility Subregion | Start Date | End Date | Waste | Surface Area (sq ft) | Mean Seepage (%P)[1] | Mean Seepage (Lpd) | Model Applied for Seepage Estimate | Appendix VII Subregion Figure No. |
|---|---|---|---|---|---|---|---|---|
| Phase 1 - Ash Dredge Cells 1& 3 - Top Working Area | 2004 | 2014 | wet ash | 1,596,662 | 11.6 | 67,618 | HELP | 1 |
| Phase 1 - Ash Dredge Cells 1& 3 - Side Slope | 2004 | 2014 | wet ash | 1,799,163 | 30.7 | 200,760 | HELP | 1 |
| Phase 1 - Ash Dredge Cell 2 (active pond) | 2004 | 2014 | wet ash | 798,350 | -- | 156,757 | MODFLOW | 1 |
| Phase 1 - Ash Dredge Cells 1-3 - Top Working Area | 2015 | 2016 | dipped ash | 1,965,662 | 13.5 | 90,215 | HELP | 2 |
| Phase 1 - Ash Dredge Cells 1-3 - Side Slope | 2015 | 2016 | dipped ash | 2,581,418 | 17.4 | 153,283 | HELP | 2 |
| Closure of Ash Dredge Cells 1-3 - Upper Cap | 2017 | 2046 | mixed ash | 1,965,662 | 19.2 | 132,247 | HELP | 3 |
| Closure of Ash Dredge Cells 1-3 - Side Slope | 2017 | 2046 | mixed ash | 2,581,418 | 17.2 | 155,163 | HELP | 3 |
| Phase 1 - Dredge Cell Lateral Expansion Area - Top | 2004 | 2014 | wet ash | 496,898 | 16.9 | 12,454 | HELP | 4 |
| Phase 1 - Dredge Cell Lateral Expansion Area - Slope | 2004 | 2014 | wet ash | 502,432 | 24.4 | 44,483 | HELP | 4 |
| Phase 2 - Ash Dredge Cell - Top - NO BUFFER | 2009 | 2009 | wet ash | 900,003 | 7.1 | 23,559 | HELP | 5 |
| Phase 2 - Ash Dredge Cell - Top - BUFFER | 2017 | 2017 | wet ash | 900,003 | 5.4 | 17,950 | HELP | 6 |
| Phase 2 - Ash Dredge Cell - Slope - NO BUFFER | 2009 | 2009 | wet ash | 1,175,800 | 23.6 | 102,398 | HELP | 5 |
| Phase 2 - Ash Dredge Cell - Slope - BUFFER | 2009 | 2009 | wet ash | 1,175,800 | 17.1 | 74,052 | HELP | 6 |
| Phase 3 - Dry Ash Stack - Top - NO BUFFER | 2019 | 2019 | dry ash | 897,897 | 2.9 | 9,747 | HELP | 6 |
| Phase 3 - Dry Ash Stack - Top - BUFFER | 2019 | 2019 | dry ash | 897,897 | 1.8 | 6,013 | HELP | 7 |
| Phase 3 - Dry Ash Stack - Slope - NO BUFFER | 2019 | 2019 | dry ash | 1,307,901 | 21.0 | 101,410 | HELP | 6 |
| Phase 3 - Dry Ash Stack - Slope - BUFFER | 2019 | 2019 | dry ash | 1,307,901 | 15.3 | 74,029 | HELP | 7 |
| Phase2-3 - Dry Ash Cap - Top - NO BUFFER | 2029 | 2029 | mixed ash | 2,709,399 | 2.0 | 10,880 | HELP | 8 |
| Phase2-3 - Dry Ash Cap - Top - BUFFER | 2029 | 2029 | mixed ash | 1,538,324 | 1.9 | 10,583 | HELP | 9 |
| Phase2-3 - Dry Ash Cap - Slope - NO BUFFER | 2029 | 2029 | mixed ash | 2,709,399 | 7.8 | 77,280 | HELP | 8 |
| Phase2-3 - Dry Ash Cap - Slope - BUFFER | 2029 | 2029 | mixed ash | 1,538,324 | 5.9 | 58,254 | HELP | 9 |
| Closure of Phase 2&3 Areas - Upper Cap - NO BUFFER | 2029 | 2058 | 60:40 ash/gypsum | 1,538,324 | 14.5 | 78,822 | HELP | 10 |
| Closure of Phase 2&3 Areas - Upper Cap - BUFFER | 2029 | 2058 | 60:40 ash/gypsum | 1,538,324 | 14.2 | 77,024 | HELP | 11 |
| Closure of Phase 2&3 Areas - Side Slope - NO BUFFER | 2029 | 2058 | 60:40 ash/gypsum | 2,709,399 | 16.0 | 152,122 | HELP | 10 |
| Closure of Phase 2&3 Areas - Side Slope - BUFFER | 2029 | 2058 | 60:40 ash/gypsum | 2,709,399 | 16.0 | 152,199 | HELP | 11 |

[1] *Percent of mean annual precipitation*

## Table I2. Options B – COC Mass Loading Estimates

| Facility | Start Date | End Date | Waste | Ammonia | | | Arsenic | | | Cadmium | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) |
| Phase 1 - Ash Dredge Cells 1-3 | 2004 | 2014 | wet ash | 1.00 | 0.4237 | 0.4237 | 0.0037 | 0.0016 | 0.0016 | 0.001 | 0.0004 | 0.0004 |
| Phase 1 - Ash Dredge Cells 1-3 | 2015 | 2016 | dipped ash | 1.13 | 0.2754 | 0.2754 | 0.0037 | 0.0009 | 0.0009 | 0.001 | 0.0002 | 0.0002 |
| Closure of Ash Dredge Cells 1-3 | 2017 | 2046 | mixed ash | 1.13 | 0.3250 | 0.3250 | 0.0037 | 0.0011 | 0.0011 | 0.001 | 0.0003 | 0.0003 |
| Phase 1 - Dredge Cell Lateral Expansion Area | 2004 | 2014 | wet ash | 2.64 | -- | 0.1503 | 0.0037 | -- | 0.0002 | 0.001 | -- | 0.0001 |
| Phase 2 - Ash Dredge Cells - NO BUFFER | 2017 | 2028 | wet ash | 2.64 | -- | 0.2429 | 0.75 | -- | 0.0690 | 0.002 | -- | 0.0002 |
| Phase 2 - Ash Dredge Cells - BUFFER | 2017 | 2028 | wet ash | 2.64 | -- | 0.3325 | 0.75 | -- | 0.0945 | 0.002 | -- | 0.0003 |
| Phase 3 - Dry Ash Stack - NO BUFFER | 2029 | 2040 | dry ash | 733.00 | -- | 58.6711 | 0.75 | -- | 0.0600 | 0.002 | -- | 0.0002 |
| Phase 3 - Dry Ash Stack - BUFFER | 2029 | 2040 | dry ash | 733.00 | -- | 81.4785 | 0.75 | -- | 0.0834 | 0.002 | -- | 0.0002 |
| Phase 2&3 - Dry Ash Cap - NO BUFFER | 2041 | 2047 | dry ash | 417.21 | -- | 28.7193 | 0.75 | -- | 0.0516 | 0.002 | -- | 0.0001 |
| Phase 2&3 - Dry Ash Cap - BUFFER | 2041 | 2047 | dry ash | 417.21 | -- | 36.7811 | 0.75 | -- | 0.0661 | 0.002 | -- | 0.0002 |
| Closure of Phase 2&3 Areas - NO BUFFER | 2048 | 2077 | ash | 417.21 | -- | 96.3518 | 0.75 | -- | 0.1732 | 0.002 | -- | 0.0005 |
| Closure of Phase 2&3 Areas - BUFFER | 2048 | 2077 | ash | 417.21 | -- | 95.6339 | 0.75 | -- | 0.1719 | 0.002 | -- | 0.0005 |

## Table I2. Options B – COC Mass Loading Estimates (cont.)

| Facility | Start Date | End Date | Waste | Copper | | | Mercury | | | Nickel | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) |
| Phase 1 - Ash Dredge Cells 1-3 | 2004 | 2014 | wet ash | 0.0253 | 0.0108 | 0.0108 | 0.0006 | 0.00026 | 0.00026 | 0.0466 | 0.0198 | 0.0198 |
| Phase 1 - Ash Dredge Cells 1-3 | 2015 | 2016 | dipped ash | 0.0253 | 0.0062 | 0.0062 | 0.0006 | 0.00015 | 0.00015 | 0.0466 | 0.0113 | 0.0113 |
| Closure of Ash Dredge Cells 1-3 | 2017 | 2046 | mixed ash | 0.0253 | 0.0073 | 0.0073 | 0.0006 | 0.00017 | 0.00017 | 0.0466 | 0.0134 | 0.0134 |
| Phase 1 - Dredge Cell Lateral Expansion Area | 2004 | 2014 | wet ash | 0.0253 | -- | 0.0014 | 0.0006 | -- | 0.00003 | 0.0466 | -- | 0.0027 |
| Phase 2 - Ash Dredge Cells - NO BUFFER | 2017 | 2028 | wet ash | 0.005 | -- | 0.0005 | 0.0001 | -- | 0.00001 | 0.003 | -- | 0.0003 |
| Phase 2 - Ash Dredge Cells - BUFFER | 2017 | 2028 | wet ash | 0.005 | -- | 0.0006 | 0.0001 | -- | 0.00001 | 0.003 | -- | 0.0004 |
| Phase 3 - Dry Ash Stack - NO BUFFER | 2029 | 2040 | dry ash | 0.005 | -- | 0.0004 | 0.0001 | -- | 0.00001 | 0.003 | -- | 0.0002 |
| Phase 3 - Dry Ash Stack - BUFFER | 2029 | 2040 | dry ash | 0.005 | -- | 0.0006 | 0.0001 | -- | 0.00001 | 0.003 | -- | 0.0003 |
| Phase 2&3 - Dry Ash Cap - NO BUFFER | 2041 | 2047 | dry ash | 0.005 | -- | 0.0003 | 0.0001 | -- | 0.00001 | 0.003 | -- | 0.0002 |
| Phase 2&3 - Dry Ash Cap - BUFFER | 2041 | 2047 | dry ash | 0.005 | -- | 0.0004 | 0.0001 | -- | 0.00001 | 0.003 | -- | 0.0003 |
| Closure of Phase 2&3 Areas - NO BUFFER | 2048 | 2077 | ash | 0.005 | -- | 0.0012 | 0.0001 | -- | 0.00002 | 0.003 | -- | 0.0007 |
| Closure of Phase 2&3 Areas - BUFFER | 2048 | 2077 | ash | 0.005 | -- | 0.0011 | 0.0001 | -- | 0.00002 | 0.003 | -- | 0.0007 |

## Table I2. Options B – COC Mass Loading Estimates (cont.)

| Facility | Start Date | End Date | Waste | Selenium | | | Zinc | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) | Weighted Average Leachate Conc. (mg/L) | Mass Loading SPC (kg/day) | Mass Loading Emory River (kg/day) |
| Phase 1 - Ash Dredge Cells 1-3 | 2004 | 2014 | wet ash | 0.001 | 0.0004 | 0.0004 | 0.209 | 0.0889 | 0.0889 |
| Phase 1 - Ash Dredge Cells 1-3 | 2015 | 2016 | dipped ash | 0.001 | 0.0002 | 0.0002 | 0.209 | 0.0509 | 0.0509 |
| Closure of Ash Dredge Cells 1-3 | 2017 | 2046 | mixed ash | 0.001 | 0.0003 | 0.0003 | 0.209 | 0.0601 | 0.0601 |
| Phase 1 - Dredge Cell Lateral Expansion Area | 2004 | 2014 | wet ash | 0.001 | -- | 0.0001 | 0.209 | -- | 0.0119 |
| Phase 2 - Ash Dredge Cells - NO BUFFER | 2017 | 2028 | wet ash | 0.001 | -- | 0.0000 | 0.005 | -- | 0.0005 |
| Phase 2 - Ash Dredge Cells - BUFFER | 2017 | 2028 | wet ash | 0.001 | -- | 0.0001 | 0.005 | -- | 0.0006 |
| Phase 3 - Dry Ash Stack - NO BUFFER | 2029 | 2040 | dry ash | 0.001 | -- | 0.0000 | 0.005 | -- | 0.0004 |
| Phase 3 - Dry Ash Stack - BUFFER | 2029 | 2040 | dry ash | 0.001 | -- | 0.0001 | 0.005 | -- | 0.0006 |
| Phase 2&3 - Dry Ash Cap - NO BUFFER | 2041 | 2047 | dry ash | 0.001 | -- | 0.0000 | 0.005 | -- | 0.0003 |
| Phase 2&3 - Dry Ash Cap - BUFFER | 2041 | 2047 | dry ash | 0.001 | -- | 0.0000 | 0.005 | -- | 0.0004 |
| Closure of Phase 2&3 Areas - NO BUFFER | 2048 | 2077 | ash | 0.001 | -- | 0.0001 | 0.005 | -- | 0.0012 |
| Closure of Phase 2&3 Areas - BUFFER | 2048 | 2077 | ash | 0.001 | -- | 0.0001 | 0.005 | -- | 0.0011 |

# APPENDIX J

## SELECTED GROUNDWATER QUALITY DATA FOR MONITORING WELLS 4A, 4B, 5, 5A, AND 5B

**Groundwater Quality Data for Selected Wells**

| Well | Sample Date | Arsenic | Cadmium | Copper | Mercury | Nickel | Selenium | Zinc |
|---|---|---|---|---|---|---|---|---|
| KIF-4A | 07/02/76 | | 1 | 60 | 0.2 | 50 | 1 | 200 |
| KIF-4A | 03/09/77 | 4 | 1 | 10 | 2 | 50 | 1 | 10 |
| KIF-4A | 01/11/89 | 1 | 3 | 20 | | | 1 | 620 |
| KIF-4A | 03/29/89 | 1 | 2 | 10 | | | 1 | 440 |
| KIF-4A | 06/28/89 | 2 | 2 | 20 | | | 1 | 480 |
| KIF-4A | 09/13/89 | 2 | 5 | 10 | | 140 | 1 | 690 |
| KIF-4A | 11/29/89 | 1 | 4 | 40 | | | 1 | 1200 |
| KIF-4A | 03/06/90 | 3 | 5 | 90 | | | 1 | 820 |
| KIF-4A | 06/05/90 | 6 | 4 | 10 | | | 1 | 870 |
| KIF-4A | 09/05/90 | 4 | 5 | 40 | | | 1 | 830 |
| KIF-4A | 12/04/90 | 1 | 3 | 30 | | | 1 | 790 |
| KIF-4A | 03/20/91 | 3 | 4 | 10 | | | 1 | 860 |
| KIF-4A | 12/17/91 | 13 | 3 | 50 | | | | 670 |
| KIF-4A | 03/03/92 | 1 | 5 | 160 | | | | 830 |
| KIF-4A | 06/02/92 | 2 | 3 | 170 | | | | 810 |
| KIF-4A | 09/01/92 | 3 | 4 | 10 | | | | 790 |
| KIF-4A | 12/07/92 | 2 | 3 | 10 | | 120 | | 670 |
| KIF-4A | 06/08/93 | 1 | 2 | 10 | | 100 | | 660 |
| KIF-4A | 12/09/93 | 9 | 2 | 10 | | 180 | | 650 |
| KIF-4A | 06/13/94 | 1 | 3 | 10 | | 98 | | 580 |
| KIF-4A | 12/06/94 | 3 | 5 | 10 | | 110 | | 560 |
| KIF-4A | 06/21/95 | 2 | | 10 | | 92 | | 450 |
| KIF-4A | 12/11/95 | 1 | | 10 | | 99 | | 400 |
| KIF-4B | 07/02/76 | | 1 | 180 | 0.6 | 310 | 1 | 2 |
| KIF-4B | 03/09/77 | 4 | 1 | 10 | 2 | 80 | 1 | 10 |
| KIF-4B | 01/11/89 | 2 | 0.1 | 10 | | | 1 | 10 |
| KIF-4B | 03/29/89 | 2 | 0.1 | 10 | | | 1 | 40 |
| KIF-4B | 06/28/89 | 6 | 0.4 | 30 | | | 1 | 70 |
| KIF-4B | 09/13/89 | 4 | 0.5 | 20 | | 20 | 1 | 80 |
| KIF-4B | 11/29/89 | 6 | 0.4 | 20 | | | 1 | 110 |
| KIF-4B | 03/06/90 | 2 | 0.6 | 10 | | | 1 | 100 |
| KIF-4B | 06/05/90 | 2 | 0.3 | 10 | | | 1 | 60 |
| KIF-4B | 09/05/90 | 3 | 0.8 | 40 | | | 1 | 30 |
| KIF-4B | 12/04/90 | 6 | 0.3 | 10 | | | 1 | 70 |
| KIF-4B | 03/20/91 | 2 | 0.3 | 10 | | | 1 | 10 |
| KIF-4B | 06/04/91 | 10 | 0.4 | 10 | | | 1 | 30 |
| KIF-4B | 09/10/91 | 11 | 0.5 | 10 | | | 1 | 40 |
| KIF-4B | 12/17/91 | 7 | 0.3 | 30 | | | | 20 |
| KIF-4B | 03/03/92 | 1 | 0.1 | 10 | | | | 10 |
| KIF-4B | 06/02/92 | 1 | 0.5 | 60 | | | | 100 |
| KIF-4B | 09/01/92 | 1 | 0.3 | 10 | | | | 40 |
| KIF-4B | 12/07/92 | 5 | 0.4 | 10 | | 9 | | 60 |
| KIF-4B | 06/08/93 | 1 | 0.1 | 10 | | 3 | | 40 |
| KIF-4B | 12/09/93 | 1 | 0.1 | 10 | | 16 | | 10 |
| KIF-4B | 06/13/94 | 1 | 0.5 | 10 | | 23 | | 40 |
| KIF-4B | 12/06/94 | 1 | | 10 | | 15 | | 10 |
| KIF-4B | 06/21/95 | 1 | | 10 | | 13 | | 10 |
| KIF-4B | 12/11/95 | 6 | | 10 | | 84 | | 90 |
| KIF-4B | 12/03/96 | 2 | 0.1 | 10 | | 5 | | 10 |
| KIF-4B | 12/04/96 | 1 | 0.2 | 10 | | 7 | | 100 |
| KIF-4B | 05/07/97 | 1 | 0.3 | 10 | | 19 | | 10 |
| KIF-4B | 05/08/97 | 1 | 0.2 | 10 | | 1 | | 10 |

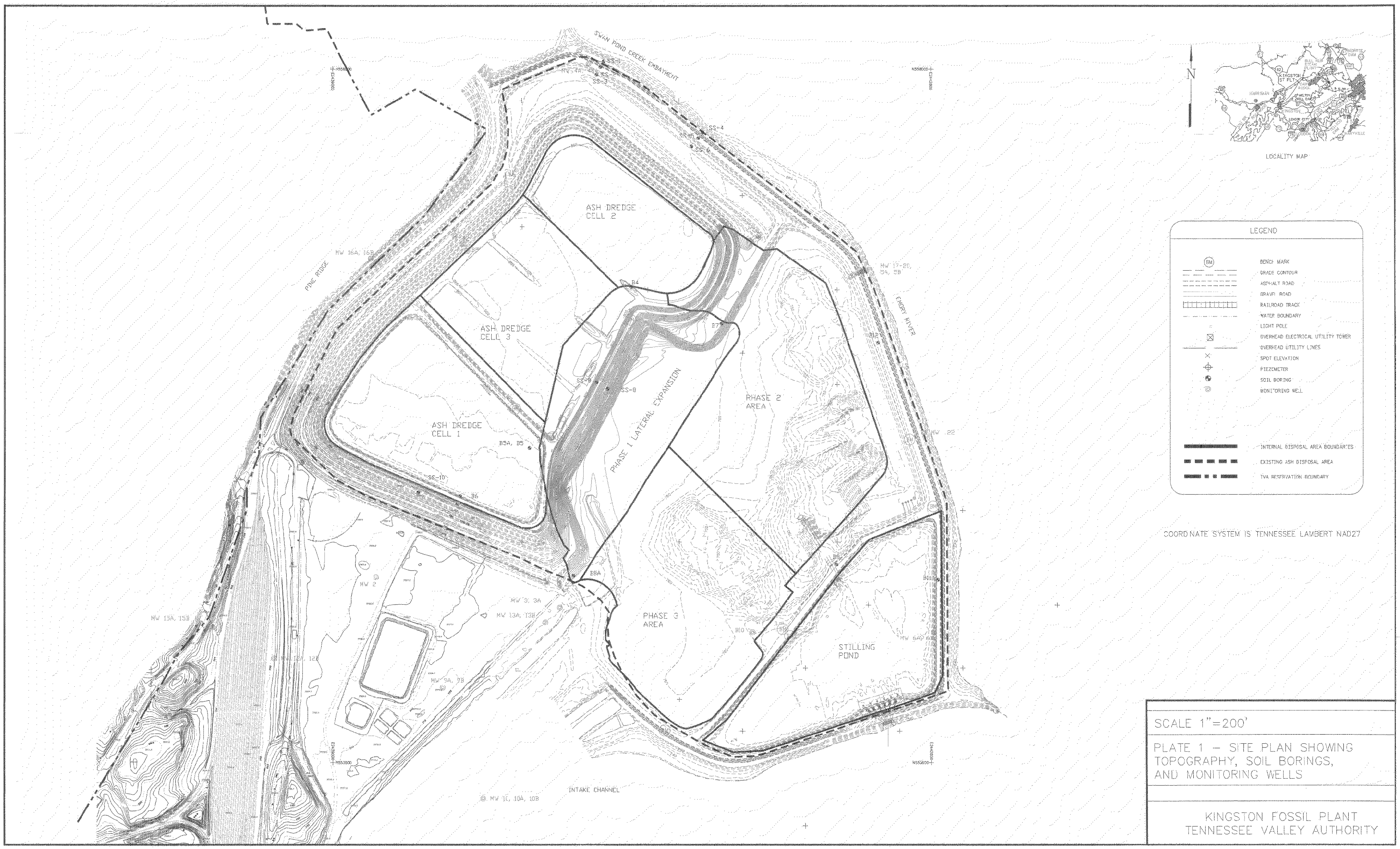
**Groundwater Quality Data for Selected Wells (continued)**

| Well | Sample Date | Arsenic | Cadmium | Copper | Mercury | Nickel | Selenium | Zinc |
|---|---|---|---|---|---|---|---|---|
| KIF-4B | 12/09/97 | 3 | 0.3 | 10 | | 16 | | 50 |
| KIF-4B | 12/10/97 | 3 | 0.9 | 10 | | 2 | | 10 |
| KIF-4B | 06/30/98 | 1 | 0.5 | 10 | | 32 | | 40 |
| KIF-4B | 12/02/98 | 1 | 0.3 | 10 | | 14 | | 20 |
| KIF-4B | 12/03/98 | 3 | 2 | 10 | | 39 | | 50 |
| KIF-4B | 12/06/99 | 1 | 0.1 | 10 | | 6 | | 10 |
| KIF-4B | 12/07/99 | 1 | 0.4 | 10 | | 11 | | 13 |
| KIF-4B | 12/14/00 | 2 | 0.1 | 10 | 0.2 | 27 | 1 | 28 |
| KIF-4B | 06/28/01 | 1 | 0.18 | 12 | 0.2 | 2 | 1 | 11 |
| KIF-4B | 12/31/01 | 4.2 | 1 | 10 | 0.1 | 3.3 | 1 | 17 |
| KIF-4B | 06/28/02 | 1 | 0.1 | 10 | 0.1 | 7 | 1 | 10 |
| KIF-4B | 01/08/03 | 4 | 0.1 | 10 | 0.1 | 7.9 | 2.2 | 10 |
| KIF-4B | 06/16/03 | 1 | 0.5 | 10 | 0.1 | 16 | 1 | 40 |
| KIF-4B | 09/02/03 | 1.2 | 0.32 | 10 | 0.1 | 8.4 | 0.9 | 20 |
| KIF-4B | 12/29/03 | 0.4 | 0.29 | 10 | 0.1 | 7.9 | 0.3 | 10 |
| KIF-4B | 03/10/04 | 2 | 0.33 | 10 | 0.1 | 1.1 | 0.5 | 10 |
| KIF-4B | 06/07/04 | 4 | 0.4 | 10 | 0.1 | 4 | 1 | 30 |
| KIF-4B | 09/14/04 | 1 | 0.1 | 10 | 0.1 | 1 | 1 | 10 |
| KIF-5 | 07/02/76 | | 1 | 40 | 0.2 | 50 | 1 | 80 |
| KIF-5 | 03/09/77 | 4 | 1 | 10 | 2 | 50 | 1 | 10 |
| KIF-5 | 01/11/89 | 2 | 0.1 | 20 | | | 1 | 130 |
| KIF-5 | 03/29/89 | 2 | 0.3 | 80 | | | 1 | 150 |
| KIF-5 | 06/28/89 | 2 | 1 | 60 | | | 1 | 100 |
| KIF-5 | 09/13/89 | 3 | 0.5 | 30 | | 33 | 1 | 230 |
| KIF-5 | 11/29/89 | 3 | 0.1 | 30 | | | 1 | 310 |
| KIF-5 | 03/06/90 | 5 | 1 | 70 | | | 1 | 210 |
| KIF-5 | 06/05/90 | 3 | 0.3 | 30 | | | 1 | 190 |
| KIF-5 | 09/05/90 | 7 | 0.5 | 30 | | | 1 | 170 |
| KIF-5 | 12/04/90 | 16 | 0.1 | 50 | | | 1 | 140 |
| KIF-5 | 03/20/91 | 4 | 0.2 | 10 | | | 1 | 120 |
| KIF-5 | 12/17/91 | 12 | 0.5 | 50 | | | | 220 |
| KIF-5 | 03/03/92 | 4 | 0.2 | 40 | | | | 140 |
| KIF-5 | 06/03/92 | 17 | 1 | 20 | | | | 60 |
| KIF-5 | 06/30/92 | | | 10 | | | | 40 |
| KIF-5 | 09/01/92 | 17 | 0.1 | 10 | | | | 30 |
| KIF-5A | 07/02/76 | | 1 | 90 | 0.2 | 180 | 1 | 410 |
| KIF-5A | 03/09/77 | 6 | 1 | 10 | 2 | 60 | 1 | 50 |
| KIF-5A | 03/28/89 | 1 | 0.3 | 10 | | | 1 | 10 |
| KIF-5A | 09/13/89 | 3 | 0.5 | 30 | | 33 | 1 | 230 |
| KIF-5A | 11/29/89 | 3 | 0.1 | 30 | | | 1 | 310 |
| KIF-5A | 03/06/90 | 5 | 1 | 70 | | | 1 | 210 |
| KIF-5A | 03/07/90 | 2 | 1 | 100 | | | 1 | 80 |
| KIF-5A | 06/07/90 | 8 | 0.6 | 10 | | | 1 | 40 |
| KIF-5A | 09/06/90 | 2 | 0.9 | 10 | | | 1 | 10 |
| KIF-5A | 12/05/90 | 1 | 0.3 | 10 | | | 1 | 1300 |
| KIF-5A | 03/21/91 | 1 | 0.5 | 20 | | | 1 | 220 |
| KIF-5A | 12/17/91 | 5 | 0.5 | 10 | | | | 90 |
| KIF-5A | 12/17/91 | 12 | 0.5 | 50 | | | | 220 |
| KIF-5A | 06/30/92 | | | 10 | | | | 250 |
| KIF-5A | 08/20/92 | | | 190 | | | | 1200 |

**Groundwater Quality Data for Selected Wells (continued)**

| Well | Sample Date | Arsenic | Cadmium | Copper | Mercury | Nickel | Selenium | Zinc |
|---|---|---|---|---|---|---|---|---|
| KIF-5B | 03/09/77 | 4 | 1 | 20 | 2 | 50 | 1 | 200 |
| KIF-5B | 01/11/89 | 1 | 0.1 | 10 | | | 1 | 10 |
| KIF-5B | 03/29/89 | 1 | 1 | 10 | | | 1 | 10 |
| KIF-5B | 06/28/89 | 2 | 0.1 | 10 | | | 1 | 20 |
| KIF-5B | 09/13/89 | 1 | 0.1 | 10 | | 12 | 1 | 60 |
| KIF-5B | 11/29/89 | 1 | 0.2 | 10 | | | 1 | 190 |
| KIF-5B | 03/06/90 | 1 | 0.4 | 20 | | | 1 | 50 |
| KIF-5B | 06/05/90 | 1 | 0.1 | 10 | | | 1 | 40 |
| KIF-5B | 09/05/90 | 1 | 0.5 | 30 | | | 1 | 20 |
| KIF-5B | 12/04/90 | 4 | 0.3 | 10 | | | 1 | 10 |
| KIF-5B | 03/20/91 | 1 | 0.1 | 20 | | | 1 | 10 |
| KIF-5B | 12/17/91 | 7 | 0.2 | 20 | | | | 110 |
| KIF-5B | 03/03/92 | 1 | 0.2 | 10 | | | | 20 |
| KIF-5B | 06/03/92 | 47 | 1 | (1000)* | | | | 250 |
| KIF-5B | 06/30/92 | | | 10 | | | | 260 |
| KIF-5B | 09/01/92 | 3 | 0.2 | 10 | | | | 110 |
| **Average Concentration =** | | **3.8** | **1.0** | **26** | **0.6** | **46** | **1.0** | **210** |

* *outlier*


SWAN POND CREEK EMBAYMENT
PINE RIDGE
ASH DREDGE CELL 2
ASH DREDGE CELL 3
ASH DREDGE CELL 1
PHASE 1 LATERAL EXPANSION
PHASE 2 AREA
PHASE 3 AREA
STILLING POND
EMORY RIVER
INTAKE CHANNEL
LOCALITY MAP
LEGEND
BENCH MARK
GRADE CONTOUR
ASPHALT ROAD
GRAVEL ROAD
RAILROAD TRACK
WATER BOUNDARY
LIGHT POLE
OVERHEAD ELECTRICAL UTILITY TOWER
OVERHEAD UTILITY LINES
SPOT ELEVATION
PIEZOMETER
SOIL BORING
MONITORING WELL
INTERNAL DISPOSAL AREA BOUNDARIES
EXISTING ASH DISPOSAL AREA
TVA RESERVATION BOUNDARY
COORDINATE SYSTEM IS TENNESSEE LAMBERT NAD27
SCALE 1"=200'
PLATE 1 – SITE PLAN SHOWING TOPOGRAPHY, SOIL BORINGS, AND MONITORING WELLS
KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY