Stantec Consulting Services Inc.
10509 Timberwood Circle, Suite 100, Louisville, Kentucky 40223-5308

October 12, 2021
File: rpt_010_let_175568465
Revision 0

Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

RE: Periodic Inflow Design Flood Control System Plan
East Ash Disposal Area
EPA CCR Rule
TVA Allen Fossil Plant
Memphis, Tennessee

1.0 PURPOSE

This letter documents certification that the East Ash Disposal Area at the Tennessee Valley Authority (TVA) Allen Fossil Plant is in compliance with the inflow design flood control system requirements set forth in 40 CFR 257.82(a)&(b) of the EPA CCR Rule. The EPA CCR Rule requires periodic inflow design assessments, certified by a professional engineer, every five years. The initial certification of the inflow design flood control system plan was placed in the operating record on October 12, 2016.

2.0 INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN ASSESSMENT

The initial inflow design flood control plan (prepared in accordance with 40 CFR 257.82(c)(1)) is attached. The 1000-year flood event was selected for the design storm based upon a hazard potential classification of "significant." The initial assessment found that East Ash Disposal Area met the requirements of 40 CFR 257.82(a)&(b).

3.0 CURRENT INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN ASSESSMENT

Stantec reviewed the result of the initial inflow design assessment and the changes in site conditions that have occurred in the past five years. The following items summarize changes that have occurred:

1. East Ash Disposal Area ceased receiving CCR and non-CCR waste streams. The main spillway has been temporarily plugged, and a drawdown/dewatering pump system has been installed that discharges to the Mississippi River.

2. East Ash Disposal Area operating pool level has decreased from El. 225.7 ft to El. 219.6 ft. With the lowered operating pool, there is enough storage capacity in the pond to contain the inflow from the 1000-year flood event without overtopping.

3. Cross-sectional geometry of the perimeter dike system has not changed.

Re: **Periodic Inflow Design Flood Control System Plan**
East Ash Disposal Area
EPA CCR Rule
TVA Allen Fossil Plant
Memphis, Tennessee

Based on our review, there are no conditions that have changed in the past five years that would cause the results of the initial inflow design flood control system assessment to have changed.

4.0 SUMMARY OF ASSESSMENT

Based on a review of the initial inflow design flood control system plan and the items listed in Section 3.0, the result of this periodic inflow design flood control system plan assessment is that the East Ash Disposal Area at the Allen Fossil Plant meets the requirements of §257.82(a)&(b) of the EPA CCR Rule.

5.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stephen H. Bickel, being a Professional Engineer in good standing in the State of Tennessee, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;
2. that the information contained herein is accurate as of the date of my signature below; and
3. that the inflow design flood control system plan for the TVA Allen Fossil Plant's East Ash Disposal Area meets the requirements specified in 40 CFR 257.82(a), (b), and (c)(1).

SIGNATURE ______________________ DATE 10/12/2021

ADDRESS: Stantec Consulting Services Inc.
10509 Timberwood Circle, Suite 100
Louisville, Kentucky 40223-5308

TELEPHONE: (502) 212-5075

ATTACHMENTS: Initial Inflow Design Flood Control System Plan

INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM ASSESSMENT

Stantec

Stantec Consulting Services Inc.
10509 Timberwood Circle Ste. 100 Louisville, Kentucky 40223-5308

October 6, 2016
File: rpt_002_let_172675014
Revision 0

Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

RE: Initial Inflow Design Flood Control System Plan
East Ash Disposal Area
EPA Final Coal Combustion Residual (CCR) Rule
TVA Allen Fossil Plant
Memphis, Tennessee

1.0 PURPOSE

This letter documents Stantec's certification of the initial inflow design flood control system plan for the TVA Allen Fossil Plant's East Ash Disposal Area. Based on the assessment, the East Ash Disposal Area complies with the inflow design flood control requirements in the EPA Final CCR Rule at 40 CFR 257.82.

2.0 INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

As described in 40 CFR 257.82(c), an inflow design flood control system plan must be prepared to document how the inflow design flood control system has been designed and constructed to manage the design storm required by the hazard classification. Stantec has assigned the East Ash Disposal Area a significant hazard potential classification rating. Thus, the inflow design storm event was selected from §257.82(a)(3) as the 1000-year flood event based upon a hazard potential classification of "Significant."

3.0 SUMMARY OF FINDINGS

The attached plan presents the analysis of the inflow design flood control system for the East Ash Disposal Area. The resulting water surface elevations are shown in the following table. The plan and results show that the impoundment meets the requirements set forth in 40 CFR 257.82(a) and (b).

Plant	Facility	Inflow Design Storm	Water Surface Elevation (feet)	Minimum Embankment Elevation (feet)
ALF	East Ash Disposal Area	1000-year storm	231.8	235.9

**RE: Initial Inflow Design Flood Control System Plan
East Ash Disposal Area
EPA Final Coal Combustion Residual (CCR) Rule
TVA Allen Fossil Plant
Memphis, Tennessee**

4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stephen H. Bickel, being a Professional Engineer in good standing in the State of Tennessee do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;

2. that the information contained herein is accurate as of the date of my signature below; and

3. that the inflow design flood control system plan for the TVA Allen Fossil Plant's East Ash Disposal Area meets the requirements specified in 40 CFR 257.82(a), (b), and (c)(1).

SIGNATURE ____________________ DATE 10/6/2016

ADDRESS: Stantec Consulting Services Inc.
10509 Timberwood Circle, Suite 100
Louisville, Kentucky 40223-5308

TELEPHONE: (502) 212-5000

ATTACHMENTS: Initial Inflow Design Flood Control System Plan

STEPHEN H. BICKEL
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 113134
STATE OF TENNESSEE

Initial Inflow Design Flood Control System Plan

Allen Fossil Plant – East Ash Disposal Area
Memphis, Tennessee

Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:
Stantec Consulting Services Inc.
Lexington, Kentucky

October 6, 2016
Revision 0

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1.0 BACKGROUND

On April 17, 2015 the "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (RIN-2050-AE81; FRL-9149-4)" (EPA Final CCR Rule) was published in the Federal Register. Stantec Consulting Services, Inc. (Stantec) was contracted by the Tennessee Valley Authority (TVA) to analyze the inflow design flood for Allen Fossil Plant (ALF) CCR surface impoundments (SI) and evaluate compliance with section §257.82 of the EPA Final CCR Rule.

ALF is a coal-fired, electric generating plant. The plant is located in Shelby County Tennessee, on McKellar Lake, which is adjacent to the Mississippi River. TVA has determined that the East Ash Pond and East Ash Stilling Pond ("referred to herein as the "East Ash Disposal Area") are CCR Surface Impoundments and therefore subject to the EPA Final CCR rule. A map showing the location of ALF in relation to the surrounding hydrologic features is included as Appendix A. Figure 1 below shows the location of the East Ash Disposal Area in relation to the other plant features.

Figure 1 Allen Fossil Plant Map

2.0 EXISTING CONDITIONS

The East Ash Disposal Area is located east of the powerhouse and south of the US Army Corps of Engineers Flood Control Levee. Fly Ash and bottom ash from ALF is sluiced into the East Ash Disposal Area. Bottom ash settles out within the dredge cell. Fly ash settles out in the East Ash Pond.

The existing stormwater system conveys run-off and plant process flow to the East Ash Pond from areas adjacent to the power house as well as the coal storage area and dredge cell. The stormwater system includes channels, catch basins, underground pipes and pumps. The plant waters are pumped into the northwest corner of the dredge cell. The flows generally travel east toward the main East Ash Pond basin, by open channel (except where culvert pipes are used to cross under access roads). However, the large dredge cell pond and Coal Yard Run-Off pond drain southwest to the main East Ash Pond basin, through spillway structures. Flow that collects at the sluice sump in the northwest area of the site is pumped to the East Ash Pond.

The East Ash Pond receives runoff and process flow from the stormwater system and eventually discharges it to the East Ash Stilling Pond (referred to as "Stilling Pond") through an overflow weir. The Stilling Pond contains two sets of spillways. Each set consists of two 4-feet diameter concrete risers with 36-inch diameter outlet pipes. Two of the four spillway structures (the East and West Spillways) act as primary spillways while the remaining two (Overflow 1 and Overflow 2) become active spillways when the water level in the Stilling Pond exceeds the riser overflow elevations. Figure 2 shows the location of the hydraulic structures in the East Ash Pond and Stilling Pond.

Figure 2 Map of Hydraulic Structures

Under normal conditions, the East and West Spillways discharge to a permitted outfall (outfall number 001) on McKellar Lake and Overflow Spillways 1 and 2 discharge to a permitted outflow on Horn Lake Cutoff (outfall number 001A). When the water level in McKellar Lake exceeds the Stilling Pond elevation, the gates in the two primary spillways are closed to prevent backflow from the lake and all of the flow through the Stilling Pond is conveyed by the overflow spillways.

A flow schematic is included in NPDES TN0005355.

Note that all elevations included in this document and appendices are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

3.0 METHODS / DESIGN CRITERIA

This Inflow Design Flood Control System Plan has been developed to document how the inflow design flood control system has been designed and constructed to meet the requirements of §257.82. The East Ash Disposal Area was classified as a significant hazard structure in September 30, 2013 and was confirmed to be a Significant Hazard structure based on the report from Stantec to TVA September 30, 2016. This plan has been developed based on that classification and the following EPA Final CCR rule criteria apply:

1. The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood. (Ref. §257.82(a)(1))

2. The inflow design flood control system must collect and control flow from the CCR unit during and following the peak discharge of the inflow design flood. (Ref. §257.82(a)(2))

3. The inflow design flood for a significant hazard potential CCR surface impoundment is the 1,000-year flood. (Ref. §257.82(a)(3)(ii))

4. Discharge from the CCR Unit must be handled in accordance with the surface water requirements under §257.3-3.

5. The owner or operator must prepare an initial inflow design flood control system plan for its existing surface impoundments by October 17, 2016. (Ref. §257.82(c)(3)(i))

6. The plan must be revised every 5 years, and amendments must be made whenever there is a change in condition(s) that would substantially affect the written plan in effect. (Ref. §257.82)(c)(4) & (2))

7. This plan will be considered complete upon its placement in the facility’s operating record. (Ref. §257.82(c)(1))

8. The owner or operator must obtain a certification from a qualified professional engineer stating that the initial and periodic inflow design flood control system plans meet the requirements of §257.82.

Hydrological calculations were performed based on Soil Conservation Service Technical Release 55 (TR-55) methods in U.S. Army Corps of Engineers’ Hydrologic Engineering Center-Hydrological Modeling System (HEC-HMS) software to analyze the performance of the impoundments for the 1000-year storm. The EPA Final CCR rule does not specify the storm duration for the inflow design flood. For this analysis, a duration of 6-hour was chosen based on recommendations from TVA. This duration is reasonable given the size of the watershed and the travel time to the watershed outlet.

The following sections describe the hydrologic parameter inputs to the HEC-HMS model, including curve number and lag times, in addition to the channel and detention basin hydraulics.

3.1 MODELING ASSUMPTIONS

1. Pipes are assumed to be flowing freely and not clogged or leaking.
2. Wave action is not considered in this analysis. Overtopping is assumed to occur when the water surface elevation of the pond exceeds the minimum crest elevation of the dike.
3. McKellar Lake acts as tailwater for the Stilling Pond primary discharge structures. Since there is a large difference in drainage area between the Mississippi River (which controls the elevations on McKellar Lake) and the East Ash Pond watershed, the level of the McKellar Lake was not assumed to be the 1000-year lake level. The water surface elevation of McKellar Lake was assumed to be equal to the 100-year flood elevation of the lake (225 feet) obtained from Flood Insurance Study for Shelby County and Incorporated areas published by the Federal Emergency Management Agency in February 2013.
4. The tailwater elevation for the two overflow structures that discharge to Horn Lake Cutoff was assumed to be equal to the 100-year lake elevation (225 feet).
5. Natural Resources Conservation Service (NRCS) TR-55 methods were used for hydrologic run-off computations. In some areas, the ground surface is covered with a mix of fly ash and bottom ash. For these areas, a curve number consistent with fly ash was applied.
6. Storage for the East Ash Pond and the Stilling Pond was included in the model. Storage for other impoundments within the watershed, including the dredge cell, was ignored.

3.2 HYDROLOGY INPUTS

3.2.1 Watershed Parameters

Subwatersheds were delineated using topographic data developed from LiDAR dated March 11, 2014 provided by TVA. The estimated watershed parameters are summarized in Table 1. A figure showing the watershed delineations is included in Appendix B.

Table 1 Watershed Parameters

Watershed	Drainage Area (acres)	Composite Curve Number	Estimated Lag Time (min)
East Ash Pond	136.0	93	12.2
Stilling Pond	9.7	96	3.5
Sluice Sump	6.3	98	3.5

*HEC-HMS model uses minimum lag time of 3.5 minutes. Therefore, any time less than 3.5 minutes will be modified to 3.5 minutes.

3.2.1.1 Curve Number (CN)

The curve number for each watershed was calculated using the approach outlined in NRCS's TR-55. Utilizing NRCS's Web Soil Survey it was determined that a major portion of the project area is classified as "Filled Land" and consequently does not have a Hydrologic Soil Group associated with it. Therefore, a Hydrologic Soil Group rating of "D" was assumed for the entire project area. Road were either classified as paved (CN 98) or gravel (CN 91). Areas of vegetation were assumed to be in "good condition" (CN 80).

TVA report "Hydrogeologic Evaluation of Coal-Combustion Byproduct Disposal Facility Expansion", Kingston Fossil Plant, dated November 2004 was utilized to determine the CN for exposed Bottom Ash (CN 86) and Fly Ash (CN 91).

The remaining project area is comprised of the coal pile (CN 89), riprap (CN 89), or surface water (CN 100).

A summary of curve number calculations and a map showing the curve numbers for each sub-area is included in Appendix C.

3.2.1.2 Lag Time

The time of concentration for each subwatershed was calculated using the NRCS segmental approach described in TR-55. The longest hydraulic flow path in each subwatershed was delineated within contour data developed from aerial survey dated March 11, 2014 and provided to Stantec by TVA. The flowpaths were subdivided into sheet and shallow-concentrated components. No open-channel flow components were identified along the selected longest hydraulic flow path. The following methods were used to calculate flow velocities (time of concentration was then found by dividing flow length by velocity) for each flow component:

- Sheet Flow: Sheet flow velocity was computed based on methods presented in TR-55. This equation calculates time of concentration based on Manning's roughness coefficient for sheet flow, flow length (up to a maximum distance of 100 feet, unless the area is paved), slope, and the 2-year 24-hour rainfall event depth.

- Shallow Concentrated Flow: Shallow Concentrated Flow was computed based on methods presented in TR-55. The travel time is computed based on the flow length and average velocity. The equations used to calculate average velocity are dependent upon the Watercourse slope and whether the surface is “Paved” or “Unpaved”. The equations were derived from the graph Average velocities for estimating travel time for shallow concentrated flow presented in TR-55.

Lag time calculations are included in Appendix D.

3.2.2 Spillway Data

Flow from the East Ash Pond is conveyed to the Stilling Pond across a weir structure. As described in Section 2, there are four drop inlet type spillways within the Stilling Pond which discharge to McKellar Lake and Horn Lake Cutoff. The East Spillway and West spillways act as the two primary spillways and Overflow Spillway 1 and Overflow Spillway 2 act as the two overflow spillways. Gates on the East and West Spillways are closed to prevent backflow from McKellar Lake during periods of flooding. Flow from the Stilling Pond is conveyed to McKellar Lake and Horn Lake Cutoff under normal conditions and to Horn Lake Cutoff only when the gates on the two principal spillways are closed. See Section 2 for information on how the spillways are operated.

Dimensions and elevations for the weir structure and four drop inlet structures were obtained from TVA Drawings 10-507-03, 10-507-05, 10N226, and 10N227. These drawings are included in Appendix E.

Riser geometry for the Stilling Pond outflow structures are summarized in Table 2.

Table 2 Stilling Pond Spillway Data

Pond	Weir/Riser Structure	Riser Diameter (inches)	Rim Elevation (ft)	Outlet Pipe Diameter (inches)	Pipe Inlet Invert (ft)	Pipe Outlet Invert (ft)	Appx. Outlet Pipe Length (ft)
Stilling Pond	East	48	225.40	36	216	215	220
Stilling Pond	West	48	225.39	36	216	215	200

Pond	Weir/Riser Structure	Riser Diameter (inches)	Rim Elevation (ft)	Outlet Pipe Diameter (inches)	Pipe Inlet Invert (ft)	Pipe Outlet Invert (ft)	Appx. Outlet Pipe Length (ft)
Stilling Pond	Overflow 1	48	226.47	36	216	213	155
Stilling Pond	Overflow 2	48	226.30	36	216	213	155

Flow from the East Ash Pond flow is conveyed to the Stilling Pond through a concrete weir structure. The weir is approximately 27.9' wide and has an overflow elevation of 229.31 ft.

The drop inlet spillways consist of a stacked concrete riser in the Stilling Pond Area and an outlet pipe that penetrates the embankment. These structures can be controlled by weir or orifice flow through the riser, or by orifice, open-channel flow, or pipe flow through the outlet pipe. In developing a hydraulic rating curve for these structures, these four potential limiting flows are computed for a range of headwater elevations and the limiting flow is applied to develop a comprehensive rating curve for the structure. The methods used to estimate the discharge for each of these components are described below:

Riser – Weir flow

Flow just above the riser crest or stoplogs behaves as weir flow and was computed using:

$$Q = C_w L H^{\frac{3}{2}}$$ **Eqn. 1**

Where: Q = discharge (cubic feet per second); C_w = weir coefficient; L = weir length (ft); and H = head above the riser crest (ft). The weir was assumed to behave as a sharp-crested weir and a weir coefficient of 3.27 (Chow 1959) was selected.

Riser – Orifice flow

As head develops above the riser crest, orifice flow in the riser may limit flow through the spillway system. Orifice flow in the riser was computed as:

$$Q = C_0 A(2gH)^{0.5}$$ **Eqn. 2**

Where C_0 = orifice discharge coefficient, A = cross sectional area of the riser, g = gravitational constant, and H = head above the riser crest. An orifice discharge coefficient of 0.6 (Brater and King 1976) was selected.

Outlet Pipe – Orifice flow

Orifice flow in the outlet pipe was computed for the range of hydraulic conditions using:

$$Q = C_0 A[2g(H_C)]^{0.5} \quad \textbf{Eqn. 3}$$

Where H_c = head above the centroid of the outlet pipe, A = cross sectional area of the outlet pipe. This equation reflects that the head acts on the centroid of flow in the outlet pipe.

Outlet Pipe – Open-channel/submerged inlet flow

Open-channel and submerged inlet flow in the outlet pipe was computed using the HY-8 Culvert Hydraulic Analysis Program developed by the US Department of Transportation Federal Highway Administration (FHWA).

Computed rating curves for the structures are included in Appendix F.

3.2.3 Precipitation Data

The rainfall depth for the 1000-yr, 6-hour storm is 7.4 inches based on NOAA Atlas 14 at ALF. Early", "Middle" and "Late Peak" hyetographs were obtained from HydroCAD for a 6-hr storm duration assuming an SCS Type II shape. The modeled distributions are included in Appendix G.

3.2.4 Stage-Storage Data

Storage volumes computed at 1-foot increments for the Stilling Pond and East Ash Pond using AutoCAD Civil3D as included as Appendix G. Impoundment bottom surfaces were created using topographic data (dated March 11, 2014) and supplemented with hydrographic survey data (dated February 2-3, 2015) provided by TVA.

The embankment crest elevations for the Stilling Pond and East Ash Pond are 237.2 ft. and 235.9 ft, respectively based on the topographic data.

3.2.5 Plant Process Flow

A flow schematic (dated January 2010 and provided by TVA), shows the average daily process flows into the East Bottom Ash Pond (East Ash Pond). The average process flow into the pond is 8.8 MGD neglecting the effects of evaporation. A constant inflow of 8.8 MGD (13.62 cfs) was applied to the East Ash Pond watershed.

3.2.6 Starting Water Surface Elevations

The starting water surface elevations for the East Ash Pond and Stilling Pond were set to the water surface elevation at which the outflow structures would pass the plant process flow.

3.3 HYDROLOGIC AND HYDRAULIC MODELING

Hydrologic and hydraulic modeling was performed using HEC-HMS 4.0 based on the model inputs summarized in Section 3.2. A model schematic is included in Figure 3. This schematic shows that the East Ash Pond receives flow from the Sluice Sump and the East Ash Pond watershed. Flow from the East Ash Pond is conveyed to the Stilling Pond.

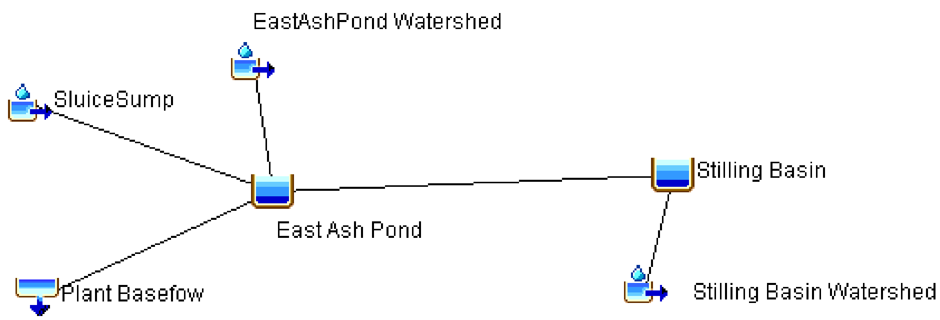

Figure 3 HEC-HMS Model Schematic

Two different operating conditions were analyzed:

1. Normal operations – For this scenario, all four spillways are assumed active and flow discharges to both McKellar Lake and Horn Lake Cutoff (when the overflow elevation of the two overflow spillways is exceeded).

2. Gate Closure Scenario – For this scenario, it is assumed that the two overflow spillways are active and discharging to the Horn Lake Cutoff. The gates for the primary spillways are assumed to be closed.

Note that an iterative process was used to account for the tailwater effect of the Stilling Pond on the overflow weir between the Stilling Pond and East Ash Pond. The hydrologic model was initially run assuming that the Stilling Pond elevation does not affect flows from the East Ash Pond. If the peak water surface elevation of the Stilling Pond exceeded the overflow elevation of the East Ash Pond weir (229.3 ft), a time series of tailwater values was generated from the water surface elevations in the Stilling Pond. For subsequent iterations, the tailwater acting on the East Ash Pond was set to the time series of tailwater elevations for the Stilling Pond from the previous iteration.

The model scenarios analyzed are summarized in Table 3.

Table 3 Summary of Hydrologic/Hydraulic Modeling Scenarios

Scenario Number	Condition Assumed	Rainfall Hyetograph Type	Starting Water Surface Method	Tailwater Method East Ash Pond	Tailwater Method Stilling Pond[1]
1	Normal Operations	SCS 6-hour "Early" Peak	Inflow=Outflow	No Tailwater (Weir elevation not exceeded)	Constant Tailwater at Elevation 225'
2	Normal Operations	SCS 6-hour "Middle" Peak	Inflow=Outflow	No Tailwater (Weir elevation not exceeded)	Constant Tailwater at Elevation 225'
3	Normal Operations	SCS 6-hour Late" Peak	Inflow=Outflow	No Tailwater (Weir elevation not exceeded)	Constant Tailwater at Elevation 225'
4	Gate Closure Scenario	SCS 6-hour "Early" Peak	Inflow=Outflow	Iterative Tailwater Time series	Constant Tailwater at Elevation 225'
5	Gate Closure Scenario	SCS 6-hour "Middle" Peak	Inflow=Outflow	Iterative Tailwater Time series	Constant Tailwater at Elevation 225'
6	Gate Closure Scenario	SCS 6-hour Late" Peak	Inflow=Outflow	Iterative Tailwater Time series	Constant Tailwater at Elevation 225'

[1] The tailwater was set to the 100-year flood elevation for McKellar Lake obtained from the Flood Insurance Study for Shelby County and Incorporated Areas published by the Federal Emergency Management Agency in February 2013.

4.0 CALCULATION RESULTS

The hydrologic modeling results were reviewed to determine the performance of the East Ash Pond and Stilling Pond for the 1000-year, 6-hour storm for the three precipitation events described in Section 3.2.3.

4.1 CAPACITY AND FREEBOARD RESULTS

The peak pool elevation, inflow and outflow for each pond is summarized in Tables 4 and 5. The results showed that the Stilling Pond and East Ash Pond can convey the flow from the 1000-year 6-hour scenarios modeling without overtopping.

Table 4 Hydrologic and Hydraulic Modeling Results for Normal Operations

Scenario	Pond	Storm	Peak Water Surface Elevation (ft)	Peak Inflow (cfs)	Peak Outflow (cfs)	Minimum Embankment Elevation (ft)	Freeboard (ft)
1	Stilling Pond	SCS Type II "Early Peak"	228.0	287	233	237.2	9.2
2	Stilling Pond	SCS Type II "Middle Peak"	228.6	361	251	237.2	8.6
3	Stilling Pond	SCS Type II "Late Peak"	228.7	418	258	237.2	8.5
1	East Ash Pond	SCS Type II "Early Peak"	231.4	1,033	270	235.9	4.5
2	East Ash Pond	SCS Type II "Middle Peak"	231.7	1,312	344	235.9	4.2
3	East Ash Pond	SCS Type II "Late Peak"	231.8	1,280	366	235.9	4.1

Table 5 Hydrologic and Hydraulic Modeling Results for Gate Closure Scenario

Scenario	Pond	Storm	Peak Water Surface Elevation (ft)	Peak Inflow (cfs)	Peak Outflow (cfs)	Minimum Embankment Elevation (ft)	Freeboard (ft)
4	Stilling Pond	SCS Type II "Early Peak"	230.3	287	161	237.2	6.9
5	Stilling Pond	SCS Type II "Middle Peak"	231.0	361	173	237.2	6.2
6	Stilling Pond	SCS Type II "Late Peak"	230.9	418	171	237.2	6.3
4	East Ash Pond	SCS Type II "Early Peak"	231.4	1,033	270	235.9	4.5
5	East Ash Pond	SCS Type II "Middle Peak"	231.7	1,312	344	235.9	4.2
6	East Ash Pond	SCS Type II "Late Peak"	231.8	1,280	366	235.9	4.1

5.0 CONCLUSIONS

The calculations included in this report demonstrate that the inflow design flood control system adequately manages flow into and from the CCR unit during and following the peak discharge of the inflow design flood (1,000-year flood). In addition, the CCR unit discharges through a NPDES permitted outfall, and is therefore handled in accordance with the surface water requirements under §257.3-3. Therefore, the East Ash Disposal Area meets the requirements of §257.82 of the EPA Final CCR rule.

6.0 REFERENCES

1. Boggs, Mark J. and Julian, Hank, E., “Hydrogeologic Evaluation of Coal-Combustion Byproduct Disposal Facility Expansion”, Kingston Fossil Plant, Tennessee Valley Authority, November 2004.

2. Bonnin G. M. et all, NOAA Atlas 14, “Precipitation Frequency Atlas of the United States”, Volume 2, Version 3, 2006.

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4. Chow, V.T. (1959), “Open-Channel Hydraulics”, McGraw-Hill, 680 p.

5. Environmental Protection Agency, “Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities”, Federal Register, April 17, 2015.

6. Federal Emergency Management Agency, Flood Insurance Study, Shelby County, Tennessee (and Incorporated Areas), Washington, DC, February 2013

7. Federal Highway Administration, “HY-8 Culvert Hydraulic Analysis Program”, Version 7.2, January 17, 2012.

8. Stantec Consulting Services Inc., As-Built Drawings, “East Stilling Pond, Eastern Perimeter Dike Remedial Improvements”, Work Plan 6, Allen Fossil Plant, March 1, 2012.

9. Stantec Consulting Services Inc., “Breach Analysis and Inundation Mapping. Allen Fossil Plant Ash Pond Complex”, Prepared for Tennessee Valley Authority, September 27, 2013.

10. Stantec Consulting Services Inc., “Initial Hazard Classification Assessment - East Ash Disposal Area”, September 30, 2016.

11. Tennessee Valley Authority, “Flow Schematic, TVA Allen Fossil Plant, NPDES Permit No. TN0005355”, January 2010.

12. Tennessee Valley Authority, Thomas H. Allen Steam Plant. Drawings Nos. 10N226 and 10N227, September 5, 1975.

13. United States Army Corps of Engineers, “Hydrologic Modeling System (HEC-HMS)”, Version 4.0, December 31, 2013.

14. United States Department of Agriculture, “Urban Hydrology for Small Watersheds”, June 1986.

APPENDIX A
HYDROLOGIC OVERVIEW MAP

Figure No.
1

Title

HYDROLOGIC OVERVIEW MAP EAST ASH POND DISPOSAL AREA

Client/Project
Tennessee Valley Authority
Inflow Design Flood Control Plan
172675014

Project Location:
Memphis, TN

Prepared by tgc on 01-06-16
Technical Review by mmm on 01-06-16
Independent Review by wrm on 09-30-16

172675014

0 1,500 3,000 Feet
1:18,000 (At Original document size of 11x17)

Legend

Flow Arrows

Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet

Stantec

APPENDIX B
WATERSHED MAP

Figure No.
2

Title
WATERSHED MAP
EAST ASH POND DISPOSAL AREA

Client/Project
Tennessee Valley Authority
Inflow Design Flood Control Plan
172675014

Project Location:
Memphis, TN

Prepared by tgc on 9-22-15
Technical Review by mmm on 9-23-15
Independent Review by wrm on 9-30-16

172675014

0 500 1,000 Feet
1:6,000 (At Original document size of 11x17)

Watershed Name	Area (Acres)
East Ash Pond	136.0
Stilling Pond	9.7
Sluice Sump	6.3

Legend

Flow Paths
Topographic Mapping

Sub-Watersheds

EastPond
Stilling Pond
SluiceSump

Notes
1. Coordinate System: NAD 1927 StatePlane Tennessee FIPS 4100
2. Topographic mapping was developed form LiDAR dated March 11, 2014.
3. TVA Aerial Imagery dated 2015.

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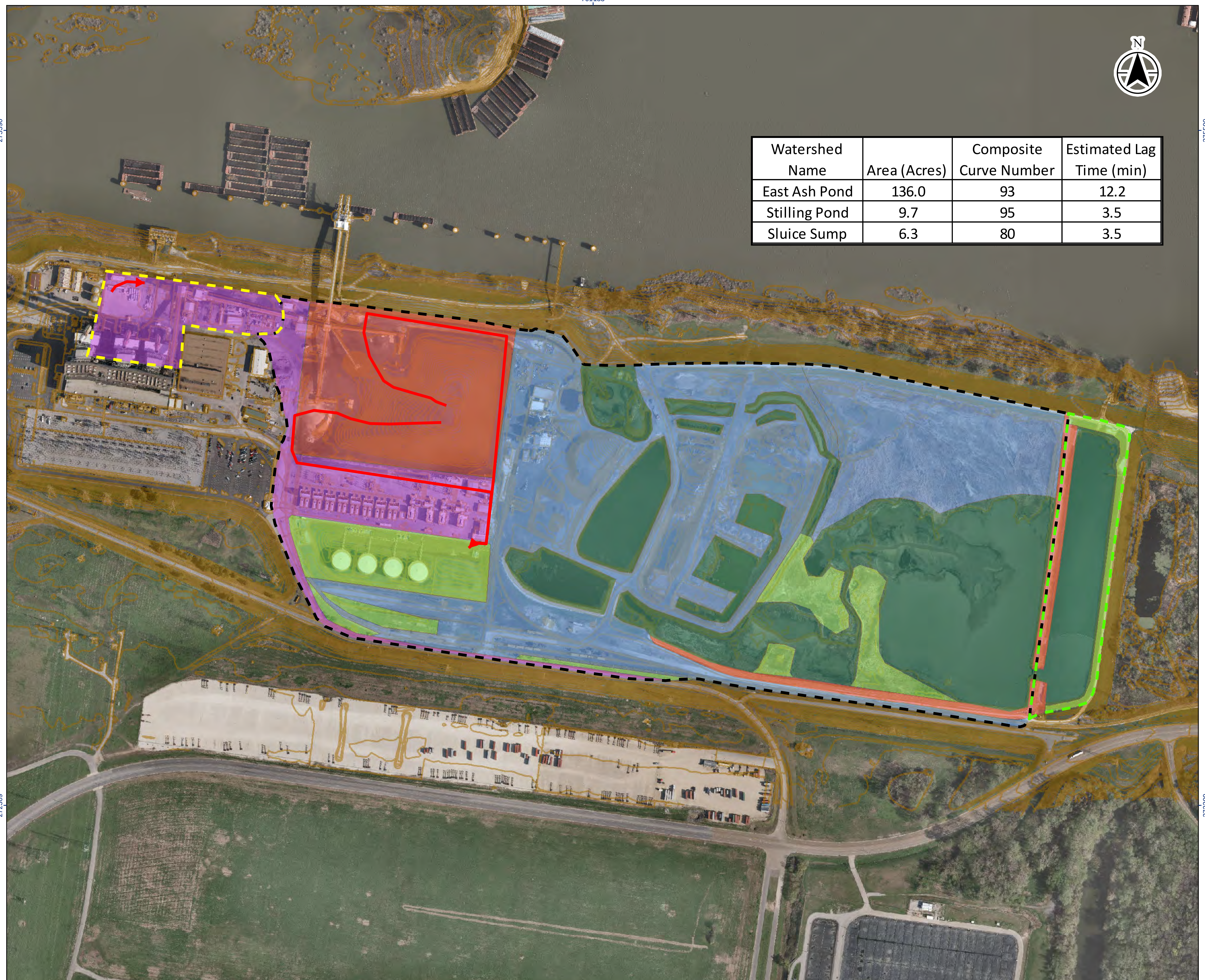
APPENDIX C
CURVE NUMBER MAP AND COMPUTATIONS



Watershed Name	Area (Acres)	Composite Curve Number	Estimated Lag Time (min)
East Ash Pond	136.0	93	12.2
Stilling Pond	9.7	95	3.5
Sluice Sump	6.3	80	3.5

Figure No.
3

Title
CURVE NUMBER MAP
EAST ASH POND DISPOSAL AREA

Client/Project
Tennessee Valley Authority
Inflow Design Flood Control Plan
172675014

Project Location:
Memphis, TN

Prepared by MIA on 9-22-15
Technical Review by TGC on 9-23-15
Independent Review by MMM on 9-30-16

172675014

0 500 1,000 Feet
1:6,000 (At Original document size of 11x17)

Legend

Flow Paths
Topographic Mapping

Curve Number

80
89
91
98
100

Watershed

EastPond
SluiceSump
StillingP

Notes
1. Coordinate System: NAD 1927 StatePlane Tennessee FIPS 4100
2. Topographic mapping was developed form LiDAR dated March 11, 2014.
3. TVA Aerial Imagery dated 2015.

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Curve Number Calculation
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: MIA Calculation Date: 9/25/2015
Checked by: MAM Checked By Date: 9/25/2015

Watershed	Subbasin	Subbasin Curve Number	Subbasin Area, Acre	Area Weighted Curve Number	Composite Curve Number
East Ash Pond	EastPond	91	39.70	26.55	
	EastPond	100	32.40	23.81	
	EastPond	89	17.19	11.25	
	EastPond	91	14.64	9.79	
	EastPond	98	10.80	7.78	
	EastPond	80	6.27	3.87	
	EastPond	100	5.95	4.37	
	EastPond	89	2.41	1.58	
	EastPond	80	2.31	1.36	
	EastPond	80	2.18	1.28	
	EastPond	80	0.91	0.54	
	EastPond	80	0.51	0.30	
	EastPond	80	0.39	0.23	
	EastPond	80	0.38	0.22	
		sum	136.0	92.9	93
Stilling Pond	StillingP	100	6.68	69.09	
	StillingP	80	1.57	12.99	
	StillingP	89	1.17	10.78	
	StillingP	89	0.25	2.28	
		sum	9.7	95.1	95
Sluice Sump	SluiceSump	98	6.34	98.00	98

Curve Number Key:		
	CN - Grass over Ash	80
	CN - Bottom Ash	86
	CN- Fly Ash	91
	CN - Riprap	89
	CN- Gravel road	91
	CN- Water	100
	CN - Paved road	98
	CN- Coal pile	89

APPENDIX D
LAG TIME COMPUTATIONS

Lag Time Calculation
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: MIA Calculation Date: 9/18/2015
Checked by: MAM Checked By Date: 9/25/2015

Watershed ID: SB-SluiceSump

Sheet Flow	Units	Segment ID 3			Total
1. Surface description		Smooth surfaces (concrete, asphalt, gravel, bare soil)			
2. Manning's roughness coef., n		0.011			
3. Flow length, L (Total L less than 300/100	ft	180			
4. Two-year, 24-hour Rainfall, P2	in	3.72			
5a. Upstream elevation	ft	240			
5b. Downstream elevation	ft	238			
5. Land slope, S	ft / ft	0.011			
6. $Tt = [0.007(nL)^{0.8}]/[sqrt(P2)\ S^{0.4}]$	hr	0.04		=	0.04 hr

Shallow Concentrated Flow	Units	Segment ID			Total
7. Surface description (paved or unpaved)					
8. Flow length, L	ft				
9a. Upstream elevation	ft				
9b. Downstream elevation	ft				
9. Watercourse slope, S	ft / ft				
10. Average velocity, V	ft / s				
11. Tt = L / 3600V	hr			=	0.00 hr

Open Channel Flow	Units	Segment ID			Total
12. Pipe or Open Channel					
13. Diam (pipe) or depth (open)	ft				
14. Base width (open)	ft				
15. Channel side slope	XH:1V				
16. Cross sectional flow area	ft2				
17. Wetted perimeter, Pw	ft				
18. Hydraulic radius, r = a/Pw	ft				
19a. Upstream elevation	ft				
19b. Downstream elevation	ft				
19. Channel slope, S	ft / ft				
20. Runoff surface / pipe material		earth, winding, grass weeds			
21. Manning's roughness coef., n					
22. V= (1.49 r2/3 S1/2 / n)	ft / s				
23. Flow length, L	ft				
24. Tt = L / 3600V	hr			=	0.00 hr

25. Watershed Tc (sum Tt from 6, 11, 24) 0.04 hr

26. Watershed lag time, TL (=0.6 x Tc) 0.023 hr

Lag Time Calculation
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: MIA Calculation Date: 9/25/2015
Checked by: MAM Checked By Date: 9/25/2015

Watershed ID: SB-EastPond

Sheet Flow					
	Segment ID	1	2		
1. Surface description		Smooth surfaces (concrete, asphalt	(concrete, asphalt, gravel, bare soil)		
2. Manning's roughness coef., n		0.011	0.011		
3. Flow length, L (Total L less than 300/100	ft	100	100		
4. Two-year, 24-hour Rainfall, P2	in	3.72	3.72		
5a. Upstream elevation	ft	292	292		
5b. Downstream elevation	ft	270	281		
5. Land slope, S	ft / ft	0.220	0.110		
6. Tt = $[0.007(nL)^{0.8}]/[\text{sqrt}(P2)\ S^{0.4}]$	hr	0.01	0.01	=	0.01 hr

Shallow Concentrated Flow					
	Segment ID	1	2		
7. Surface description (paved or unpaved)		Unpaved	Unpaved		
8. Flow length, L	ft	2375	2165		
9a. Upstream elevation	ft	270	281		
9b. Downstream elevation	ft	234	234		
9. Watercourse slope, S	ft / ft	0.015	0.022		
10. Average velocity, V	ft / s	2.0	2.4		
11. Tt = L / 3600V	hr	0.33	0.25	=	0.33 hr

Open Channel Flow					
	Segment ID				
12. Pipe or Open Channel					
13. Diam (pipe) or depth (open)	ft				
14. Base width (open)	ft				
15. Channel side slope	XH:1V				
16. Cross sectional flow area	ft2				
17. Wetted perimeter, Pw	ft				
18. Hydraulic radius, r = a/Pw	ft				
19a. Upstream elevation	ft				
19b. Downstream elevation	ft				
19. Channel slope, S	ft / ft				
20. Runoff surface / pipe material		earth, winding, grass weeds			
21. Manning's roughness coef., n					
22. V= (1.49 r2/3 S1/2 / n)	ft / s				
23. Flow length, L	ft				
24. Tt = L / 3600V	hr			=	0.00 hr

25. Watershed Tc (sum Tt from 6, 11, 24) 0.34 hr

26. Watershed lag time, TL (=0.6 x Tc) 0.204 hr

Lag Time Calculation
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: MIA Calculation Date: 9/18/2015
Checked by: MAM Checked By Date: 9/25/2015

Watershed ID: SB-Pond1

Sheet Flow	Unit	Segment ID 1			
1. Surface description		Grass, short prairie			
2. Manning's roughness coef., n		0.15			
3. Flow length, L (Total L less than 300/100	ft	40			
4. Two-year, 24-hour Rainfall, P2	in	3.72			
5a. Upstream elevation	ft	236			
5b. Downstream elevation	ft	230			
5. Land slope, S	ft / ft	0.150			
6. Tt = $[0.007(nL)^{0.8}]/[\text{sqrt}(P2)\ S^{0.4}]$	hr	0.03		=	0.03 hr

Open Channel Flow	Unit	Segment ID 2			
12. Pipe or Open Channel					
13. Diam (pipe) or depth (open)	ft				
14. Base width (open)	ft				
15. Channel side slope	XH:1V				
16. Cross sectional flow area	ft2				
17. Wetted perimeter, Pw	ft				
18. Hydraulic radius, r = a/Pw	ft				
19a. Upstream elevation	ft				
19b. Downstream elevation	ft				
19. Channel slope, S	ft / ft				
20. Runoff surface / pipe material		earth, winding, grass weeds			
21. Manning's roughness coef., n					
22. V= (1.49 r2/3 S1/2 / n)	ft / s				
23. Flow length, L	ft				
24. Tt = L / 3600V	hr			=	0.00 hr

25. Watershed Tc (sum Tt from 6, 11, 24) 0.03 hr

26. Watershed lag time, TL (=0.6 x Tc) 0.020 hr

Lag Time Calculation
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: MIA Calculation Date: 9/25/2015
Checked by: MAM Checked By Date: 9/25/2015

Lag Time Summary			
	T_L(hr)	T_L(hr) Used	T_L(min) Used*
SB-SluiceSump	0.023	0.058	3.5
SB-EastPond	0.204	0.204	12.2
SB-Pond1	0.020	0.058	3.5

*HEC-HMS model uses minimum lag time of 3.5 minutes. Therefore, any time less than 3.5 minutes will be modified to 3.5 minutes.

APPENDIX E
REFERENCE DRAWINGS

PLANS FOR CONSTRUCTION

EAST STILLING POND
EASTERN PERIMETER DIKE
REMEDIAL IMPROVEMENTS
WORK PLAN 6 (ALF-110510-WP-06)
ALLEN FOSSIL PLANT

SHELBY COUNTY, TENNESSEE

PREPARED FOR

TENNESSEE VALLEY AUTHORITY

SITE LOCATION MAP
NOT TO SCALE

PREPARED BY

Stantec

Stantec Consulting Services Inc.
601 Grassmere Park Road, Ste. 22
Nashville, Tennessee
37211
Tel. 615.885.1144
Fax 616.885.1102
www.stantec.com

INDEX OF SHEETS

RECORD DRAWING

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX0003002011000 5

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	
R 1	03/01/12	RGS	PS	SFF	SFF	SEB	MST	JCK	–	–	–
ISSUED AS-BUILT AS PER WORKPLAN 6 (ALF-110510-WP-06)											
R 0	05/10/11	RGS	PS	PVK	SFF	SEB	MST	JCK	–	–	–
ISSUED FOR CONSTRUCTION											

SCALE: NONE EXCEPT AS NOTED

YARD
EAST STILLING POND–EASTERN PERIMETER DIKE
REMEDIAL IMPROVEMENTS
COVER SHEET
WORK PLAN 6 (ALF–110510–WP–06)

RICHARD G. SCHUFF — STATE OF TENNESSEE

DESIGNED BY	DRAWN BY	CHECKED BY	SUPERVISED BY	REVIEWED BY	APPROVED BY	ISSUED BY
R.G. SCHUFF	P. SILPACHARN	P.V. KISER	S.F. FIELD	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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Nashville, Tennessee 37211
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Fax 616.885.1102
www.stantec.com

ALLEN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 05/10/11 | 38 | C | 10W507–01 | R 1

STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

WORK TO BE DONE

THE WORK DESCRIBED IN THIS DRAWING SET CONSISTS OF STEPS TO IMPROVE THE EXISTING SPILLWAY STRUCTURES IN THE ASH STILLING POND AT TVA'S ALLEN FOSSIL PLANT. WORK INCLUDES INSTALLATION AND OPERATION OF SIPHONS TO TEMPORARILY DRAW THE STILLING POND POOL DOWN 6 FEET TO ELEVATION 224 FT TO ALLOW FOR CLEANING, INSPECTING, AND RETROFITTING OF THE EXISTING RISER STRUCTURES. DURING RETROFITTING, THE EXISTING STEEL SKIMMERS WILL BE REMOVED, INSPECTED AND REINSTALLED AFTER THE HEIGHT OF THE RISERS HAS BEEN REDUCED BY SAWCUTTING AND REMOVING FOUR FEET OF RISER SECTIONS. ONCE EXISTING SPILLWAY RETROFITS ARE COMPLETE, THE STILLING POND POOL WILL BE RAISED TO A PERMANENT ELEVATION OF APPROXIMATELY 226 FT.

GENERAL PROVISIONS

1. THE CONTRACTOR SHALL CONFINE ALL SPECIFIC WORK ACTIVITIES TO THE AREA DEFINED BY THE PLANS OR APPROVED BY THE OWNER (TENNESSEE VALLEY AUTHORITY). ACCESS INTO THE WORK AREA FOR DELIVERY OF EQUIPMENT, MATERIALS AND WORKFORCE SHALL BE REVIEWED DAILY BY THE CONTRACTOR, AND CONTROLLED AS NEEDED TO PREVENT ANY DAMAGE TO THE CREST AND SLOPES OF THE DIKES SURROUNDING THE ASH POND.
2. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER TO DETERMINE THE LOCATION AND AREA FOR EQUIPMENT OR MATERIAL STORAGE AND FOR OTHER CONSTRUCTION LAY DOWN ACTIVITY.
3. WHENEVER REFERENCE IS MADE TO TENNESSEE DEPARTMENT OF TRANSPORTATION (TDOT) STANDARD SPECIFICATIONS, AMERICAN CONCRETE INSTITUTE (ACI), AMERICAN WELDING SOCIETY (AWS), AMERICAN WATER WORKS ASSOCIATION (AWWA), AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM) AND OTHER PUBLISHED STANDARDS OR SPECIFICATIONS, IT SHALL MEAN THE LATEST VERSION IN ITS ENTIRETY.
4. HORIZONTAL AND VERTICAL SURVEY CONTROL POINTS FOR CONSTRUCTION STAKING SHALL BE THE RESPONSIBILITY OF THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SURVEYING AND STAKING NECESSARY FOR LAYOUT AND CONSTRUCTION OF THE PROJECT. STAKING SHALL BE PERFORMED BY OR UNDER THE DIRECTION OF A LICENSED LAND SURVEYOR.
5. UTILITY STAKING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
6. ACCEPTABLE CONSTRUCTION TOLERANCES FROM PLAN DIMENSIONS, ELEVATIONS, AND GRADES SHALL BE AS FOLLOWS:
   - EXCAVATIONS AND FINAL GRADES FOR EARTH SURFACES AND SLOPES: ± 0.25 FEET
   - RIPRAP: FINAL GRADE +0.5 FEET, THICKNESS ZERO TO +0.5 FEET
   - OUTLET WEIR: ±0.05 FEET, AND ALL STRUCTURES WITHIN 0.5 INCHES
7. NO DEVIATIONS FROM THE PLANS OR APPROVED SHOP DRAWINGS SHALL BE MADE WITHOUT PRIOR APPROVAL FROM THE ENGINEER. THE CONTRACTOR SHALL MAINTAIN A RECORD OF ALL DEVIATIONS IN LOCATION OR ELEVATION OF ANY INSTALLATION FROM THAT SHOWN ON THE PLANS, AND ANY DEVIATIONS IN INSTALLATIONS FROM APPROVED SHOP DRAWINGS. AT COMPLETION OF THE PROJECT A SET OF RECORD DRAWINGS WILL BE PREPARED BY THE ENGINEER BASED ON THE AS-BUILT RECORD PROVIDED BY THE CONTRACTOR. THE CONTRACTOR SHALL COOPERATE FULLY AND ASSIST WITH PREPARATION OF THE FINAL RECORD DRAWINGS.
8. TEMPORARY EXCAVATIONS SHALL BE PREPARED IN ACCORDANCE WITH OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS. STABILITY OF EXCAVATION SLOPES IS THE RESPONSIBILITY OF THE CONTRACTOR.
9. UNLESS OTHERWISE INDICATED, THE DESIGN DRAWINGS WERE COMPILED USING SURVEY INFORMATION PROVIDED BY TVA. HYDROGRAPHIC SURVEY DRAWING FILE AL00097 (APRIL 2011) WAS UTILIZED. RECORD SURVEY DATA WAS PROVIDED BY TVA IN SURVEY FILE AL000110 DATED SEPTEMBER 19, 2011. HORIZONTAL COORDINATES ARE REFERENCED TO TENNESSEE STATE PLANE COORDINATE SYSTEM, NAD 27. ELEVATIONS ARE BASED ON NGVD 29.
10. THE ENGINEER WILL PROVIDE QUALITY ASSURANCE AND WILL OBSERVE CONSTRUCTION ACTIVITIES.
11. THE PERMANENT POOL WATER ELEVATION OF THE STILLING POND SHALL BE LOWERED BY FOUR FEET. THE ASH POND WILL BE CONTROLLED BY USING THE DIVIDER DIKE WEIR (TO BE SET AT ELEVATION 229.31'±) RESULTING IN A SURFACE ELEVATION OF ABOUT 229.8'±. SEE SHEET 06 FOR AS-BUILT ELEVATION.
12. A SIPHON SYSTEM SHALL BE INSTALLED AND OPERATED TO LOWER THE EXISTING POOL DURING CLEANING, INSPECTION, AND RETROFITS TO THE EXISTING SPILLWAYS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING, OPERATING AND MAINTAINING THE SYSTEM IN A MANNER THAT ENSURES SAFETY AND STABILITY OF THE ASH POND DIKES AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR SHALL NOT REDUCE THE POOL LEVEL MORE THAN 0.5 FEET PER 24 HOURS NOR MORE THAN 0.1 FEET PER FOUR HOUR PERIOD DURING DRAWDOWN AND SHALL IMMEDIATELY HALT SIPHON OPERATION IF ANY SIGN OF INTERIOR PERIMETER SLOPE INSTABILITY IS NOTED. DIKE INSPECTIONS WILL BE MADE BY GEOTECHNICAL ENGINEER (STANTEC) OR HIS REPRESENTATIVE.
13. THE CONTRACTOR SHALL INSTALL A NEW TEMPORARY STAFF GAUGE (TO BE USED DURING CONSTRUCTION) WITH ALTERNATING MARKS AT 0.1' INCREMENTS AND WHOLE FOOT CALL-OUTS. THE CONTRACTOR SHALL MONITOR THE GAUGE AND REGULATE THE SIPHON FLOWS TO MAINTAIN THE POND AT ELEVATION 224 FEET (±0.5 FEET) DURING CLEANING, INSPECTION, AND MODIFICATIONS TO THE EXISTING SPILLWAYS. DURING DRAWDOWN, THE CONTRACTOR SHALL PROVIDE 24-HOUR MONITORING OF THE SIPHON SYSTEM TO ENSURE CONTINUOUS OPERATION.
14. CONTRACTOR WILL RECALIBRATE ELECTRONIC WATER LEVEL GAUGE FOR NEW OPERATING RANGE.
15. CONTRACTOR SHALL REPLACE EXISTING PERMANENT STAFF GAUGE LOCATED NEAR THE OUTFALL RISERS WITH A NEW UNIT CONSISTING OF TEE POST, CEDAR WOOD BACKING BOARD AND METAL GAUGE MARKED IN HUNDRETHS OF A FOOT.
16. THE CONTRACTOR SHALL EXERCISE EVERY REASONABLE PRECAUTION AT ALL TIMES TO MINIMIZE SOIL EROSION AND PREVENT WATER POLLUTION BY DEPOSITION OF SEDIMENT INTO THE SPILLWAY DISCHARGE CHANNEL. EROSION PREVENTION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED AND MAINTAINED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
17. THE OUTLETS OF THE PRIMARY SPILLWAYS ARE A PERMITTED DISCHARGE, "OUTFALL 001", FOR NPDES PERMIT TN0005355. DURING CONSTRUCTION, WORK IN THE ASH POND MAY CAUSE CHANGES IN PERMITTED EFFLUENT CHARACTERISTICS.
18. POOL DRAWDOWN WILL RESULT IN A DECREASED POND SURFACE AREA DURING CONSTRUCTION. THIS DECREASED SURFACE AREA MAY AFFECT SETTLING TIMES. THE OWNER OR A DESIGNATED REPRESENTATIVE SHALL BE ALLOWED TO MEASURE TURBIDITY DAILY AND PRIOR TO EVERY 0.5 FOOT LOWERING OF THE POOL LEVEL.
19. THE OWNER SHALL BE RESPONSIBLE FOR MITIGATING EFFECTS OF POOL DRAWDOWN ON PH, TOTAL SUSPENDED SOLIDS (TSS), AMMONIA AND DIKE STABILITY.
20. CONCRETE FOR STOP LOGS SHALL BE 4,000 PSI MEETING THE REQUIREMENETS FOR PRE-CAST CONCRETE IDENTIFIED IN THE PROJECT SPECIFICATIONS.
21. SIPHON CONTROL VALVES AND SIPHON FILL PORT BALL VALVES SHALL BE EQUIPPED WITH A LOCKING MECHANISM TO PREVENT OPERATION OF THE HANDWHEEL.
22. CRANE OUTRIGGER PADS SHALL BE SUPPORTED ON TIMBER CRANE MATS. CONTRACTOR SHALL PREPARE AND SUBMIT A SKIMMER EQUIPMENT AND RISER REMOVAL PLAN DETAILING CRANE TYPE, SIZE, WEIGHT; LOCATION AND ORIENTATION OF CRANE SETUP FOR EACH LIFT; CRANE PAD NUMBER, TYPE, AND SIZES TO BE USED.
23. LOCATION FOR DIPOSAL OF DREDGED MATERIALS IS SHOWN ON SHEET 10W507-03.

GENERAL PROJECT WORK SEQUENCING

* 1. CONSTRUCT AND INSTALL PRE-CAST STOP LOG(S) ON THE DIVIDER DIKE WEIR
* 2. INSTALL SEDIMENT CONTROL CURTAIN
* 3. PLACE RIP-RAP ALONG THE EAST TOE OF THE DIVIDER DIKE
* 4. INSTALL SIPHON AND LOWER WATER LEVEL TO 224'. MAINTAIN WITHIN ±0.1' DURING CONSTRUCTION.
5. REMOVE SPILLWAY SKIMMERS, INSPECT AND MAKE RECOMMENDED REPAIRS
6. INSPECT CONDITION OF RISERS AND CCTV INSPECT OUTLET PIPES.
7. INSTALL CIPP LINER IN PRIMARY AND SECONDARY SPILLWAY OUTLET PIPES (4). ENGINEER TO CONFIRM THIS WORK BASED ON TV INSPECTION PRIOR TO PROCEEDING.
8. INSTALL PIPE PLUGS
9. INSTALL SPECTRASHIELD LINER
10. REMOVE SPILLWAY WIERS, INSPECT AND MAKE RECOMMENDED REPAIRS
11. CUT OFF RISERS
12. DREDGE ASH NEAR SPILLWAYS
13. PLACE RIP-RAP AROUND SPILLWAYS
14. REMOVE PIPE PLUGS
15. REINSTALL SPILLWAY WEIRS
16. REINSTALL SKIMMERS.
17. REMOVE SEDIMENT CONTROL CURTAIN.
18. INSTALL JERSEY BARRIERS FOR LONG-TERM PROTECTION OF FILL PORTS

* CRITICAL PATH ITEMS. CONTRACTOR SHALL COMPLETE LOWERING OF STILLING POND WATER LEVEL TO REQUIRED ELEVATION BY JUNE 30, 2011.

*ESTIMATED QUANTITIES

ITEM	QUANTITY	UNITS
CLASS A-1 RIP-RAP ON DIVIDER DIKE	7,500	CY
CONCRETE STOP LOG	2	EA
SEDIMENT CONTROL CURTAIN**	1	LS
REMOVE AND REINSTALL SURFACE SKIMMER	1	LS
SIPHON SYSTEM-COMPLETE ***	1	LS
SIPHON OPERATION ****	1	LS
#57 STONE FOR RAMP AND CRANE PAD	150	CY
RISER REHABILITATION-COMPLETE *****	4	EA
36" CIPP LINING	450	LF
SKIMMER REHABILITATION	4	EA
SPILLWAY WEIR REHABILITATION	4	EA
SPECTRASHEILD LINING OF RISERS	4	EA
ASH DREDGING	700	CY
CLASS A-3 RIP-RAP-AROUND RISERS	350	CY
SEED AND MULCH	1.0	ACRES
WATER LEVEL GAUGES ******	1	LS
BOLLARDS	8	EA
CONCRETE BOLLARD PADS	110	SF

* ESTIMATED BID QUANTITES ONLY. TABLE NOT UPDATED POST-CONSTRUCTION TO REFLECT ACTUAL QUANTITIES INSTALLED.

** INCLUDES INSTALLATION, MAINTENANCE AND REMOVAL

*** SIPHON SYSTEM INCLUES ALL HDPE AND STEEL PIPING, FITTINGS, VALVES, SAMPLING TAP, SANDBAGS AND OTHER APPURTENANCES FOR COMPLETE SYSTEM AS SHOWN ON DRAWINGS.

**** SIPHON OPERATION INCLUDES OPERATION OF SIPHON SYSTEM INCLUDING PROVIDING, FUELING AND OPERATING PRIMING PUMPS DURING DURATION OF PROJECT.

***** RISER REHABILITATION INCLUDES REMOVAL AND REPLACMENT OF SKIMMERS AND WEIRS, INSPECTION, CCTV, PIPE PLUGS, CUT OFF OF RISER SECTIONS

****** INSTALL TEMPORARY AND PERMANENT WATER LEVEL GAUGES AS DESCRIBED IN NOTES 13-15 THIS SHEET AND RECALIBRATE ELECTRONIC GAUGE.

SECTION OR DETAIL NO.
SHEET WHERE SHOWN
REFERENCE KEY

RECORD DRAWING

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX00030020110005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/01/12	RGS	PS	SFF	SFF	SEB	MST	JCK	-	-
ISSUED AS-BUILT AS PER WORK PLAN 6 (ALF-110510-WP-06)										
R 0	05/10/11	RGS	PS	PVK	SFF	SEB	MST	JCK	-	-
ISSUED FOR CONSTRUCTION										

SCALE: NONE EXCEPT AS NOTED

YARD
EAST STILLING POND – EASTERN PERIMETER DIKE

REMEDIAL IMPROVEMENTS
GENERAL NOTES
WORK PLAN 6 (ALF-110510-WP-06)

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
R.G. SCHUFF	P. SILPACHARN	P.V. KISER	S.F. FIELD	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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RICHARD G. SCHUFF No. 00101950 STATE OF TENNESSEE

ALLEN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

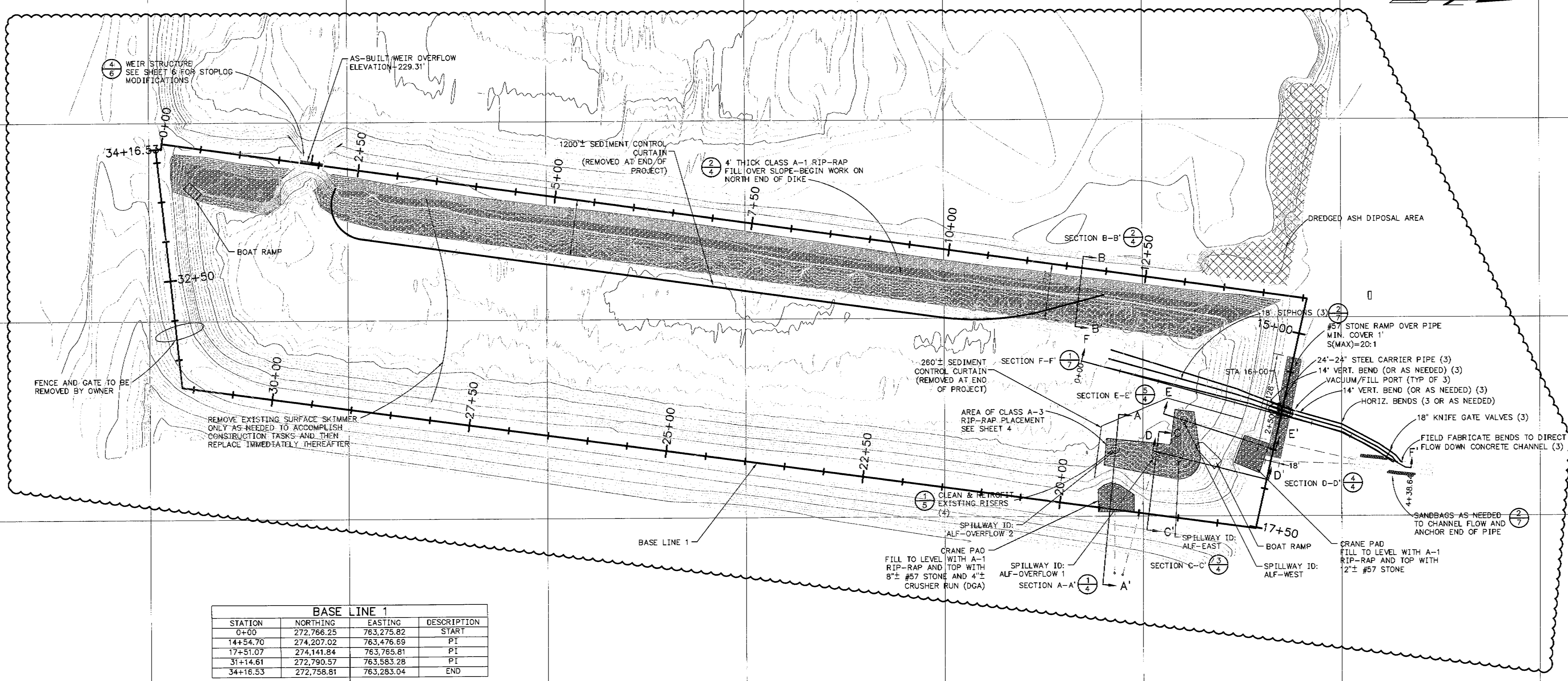
AUTOCAD R 2000 | DATE 05/10/11 | 38 | C | 10W507-02 | R 1

STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 04/12/2012



BASE LINE 1			
STATION	NORTHING	EASTING	DESCRIPTION
0+00	272,766.25	763,275.82	START
14+54.70	274,207.02	763,476.69	PI
17+51.07	274,141.84	763,765.81	PI
31+14.61	272,790.57	763,583.28	PI
34+16.53	272,758.81	763,283.04	END

RECORD DRAWING

PLAN VIEW
SCALE: 1"=50'

GRAPHIC SCALE: 1"=50' (25 0 50 100 FEET)
CONTOUR INTERVAL = '

SURVEY CONTROL NOTE:

A GLOBAL POSITIONING SYSTEM (GPS) BASE STATION HAS BEEN ESTABLISHED AND TRANSFORMATION PARAMETERS DETERMINED BY TVA USING SELECTED SURVEY CONTROL MONUMENTS. CONTACT WITH TVA SURVEYING DEPARTMENT (423)751-8416 OR (423)751-2571 SHALL BE MADE BEFORE ANY SURVEY OR CONSTRUCTION WORK IS COMMENCED. BASE STATION FREQUENCIES AND TRANSFORMATION PARAMETERS WILL BE PROVIDED TO THE CONTRACTOR FOR USE IN CONSTRUCTION ACTIVITIES AT THE SITE. PREVIOUSLY USED OR ESTABLISHED CONTROL POINTS AND MONUMENTS SHALL NOT BE USED BY THE CONTRACTOR WITHOUT PRIOR APPROVAL BY TVA SURVEYING DEPARTMENT.

REFERENCE KEY: SECTION OR DETAIL NO. / SHEET WHERE SHOWN

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX00030020110005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/01/12	RGS	PS	SFF	SFF	MST	JCK	–	–	–
ISSUED AS-BUILT AS PER WORK PLAN 6 (ALF-110510-WP-06)										
R 0	05/10/11	RGS	PS	PVK	SFF	SEB	MST	JCK	–	–
ISSUED FOR CONSTRUCTION										

SCALE: 1"=50' EXCEPT AS NOTED

YARD
EAST STILLING POND – EASTERN PERIMETER DIKE
REMEDIAL IMPROVEMENTS
PLAN
WORK PLAN 6 (ALF-110510-WP-06)

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
R.G. SCHUFF	P. SILPACHARN	P.V. KISER	S.F. FIELD	S.E. BENNETT	M.S TURNBOW	J.C. KAMMEYER

RICHARD G. SCHUFF — STATE OF TENNESSEE — NO. 00101950

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ALLEN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 05/10/11 | 38 | C | 10W507-03 | R 1

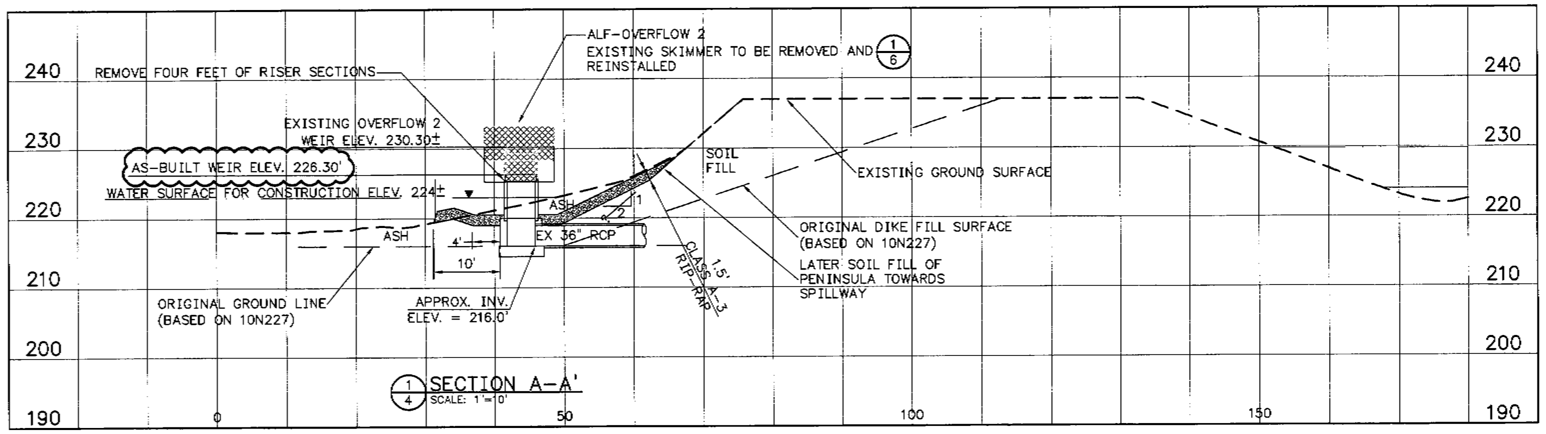
STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:50
W_TVA

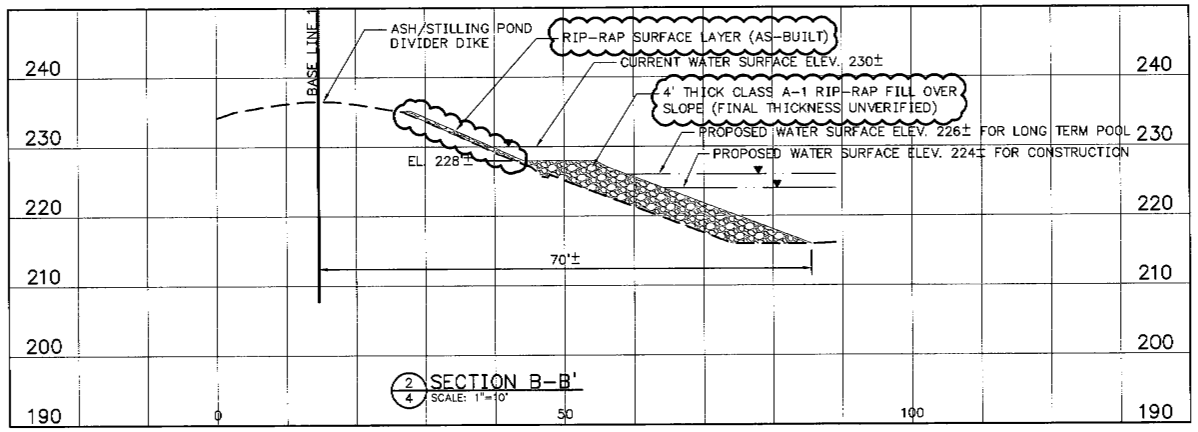
C.A.D. DRAWING DO NOT ALTER MANUALLY

PLOT DATE: 04/12/2012

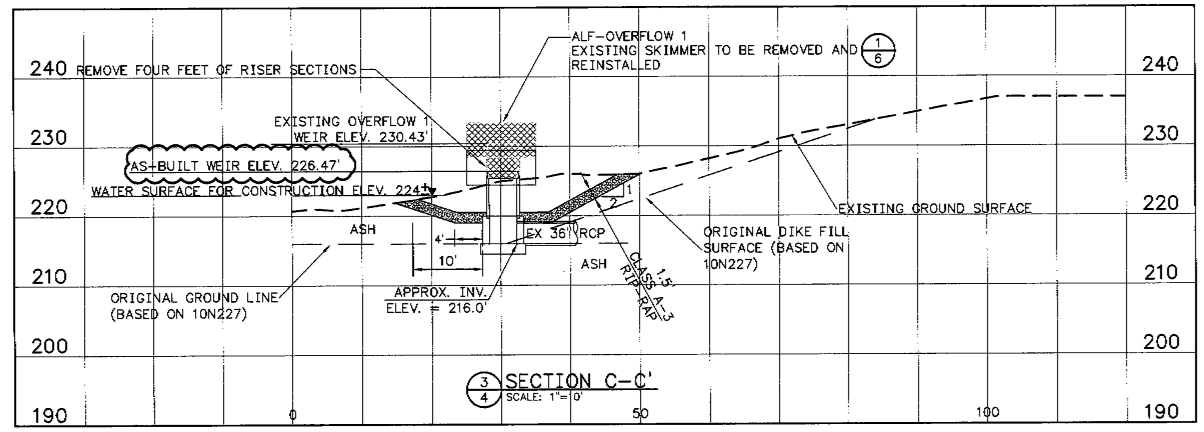
38 C 10W507-04



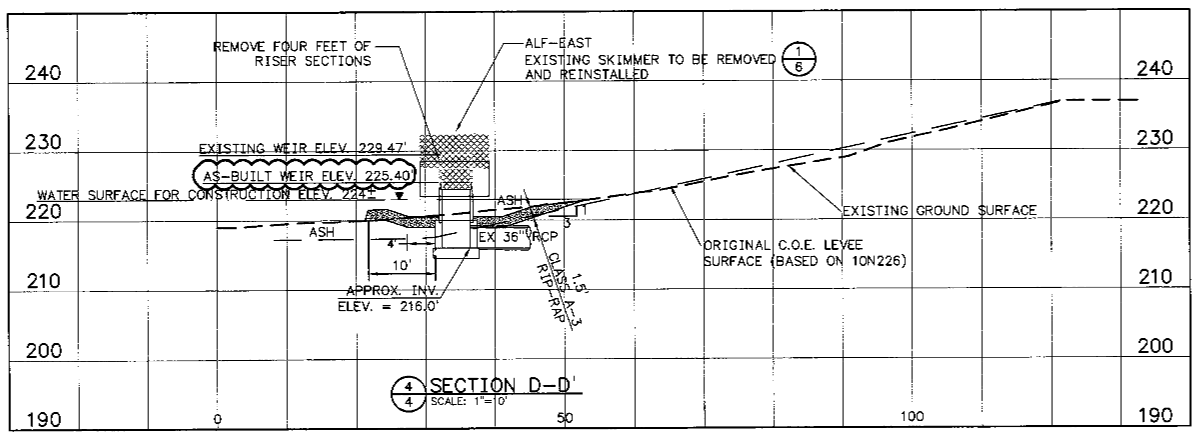
SECTION A-A' SCALE: 1"=10'



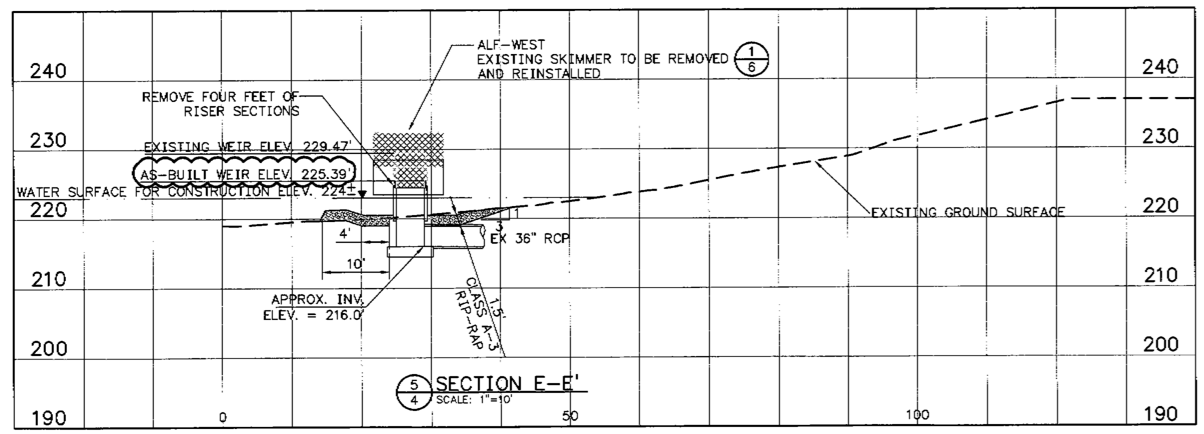
SECTION B-B' SCALE: 1"=10'



SECTION C-C' SCALE: 1"=10'



SECTION D-D' SCALE: 1"=10'



SECTION E-E' SCALE: 1"=10'

RECORD DRAWING

DREDGING AND STONE PLACEMENT (TYP OF 4):

1. DREDGE ASH TO AN ELEVATION OF 219.0 FEET (1' BELOW TOP OF LOWER SQUARE RISER SECTION) EXTENDING LATERALLY 4' OUT FROM RISER. DREDGING SHALL BE CONDUCTED WITH EXTREME CAUTION WITH USE OF DIVER CONTROLLED SUCTION EQUIPMENT.
2. SLOPE DREDGED ASH SURFACE AT 3:1 OR 2:1 TO DAYLIGHT AS INDICATED IN DRAWING.
3. PLACE 18" OF TDOT CLASS A-3 RIP-RAP OVER CUT ASH SURFACE FROM RISER TO AT LEAST 10' FROM RISER.
4. CONTRACTOR SHALL NOTE THE PRESENCE OF 36" OUTLET PIPE AT BASE OF THE RISER AND SHALL TAKE CARE NOT TO DAMAGE SAME WHEN DREDGING OR PLACING RIP-RAP

DIVIDER DIKE RIP-RAP PLACEMENT

1. CONTRACTOR SHALL PLACE RIP-RAP ON THE DIVIDER DIKE SLOPE FROM NORTH TO SOUTH AND FROM THE BOTTOM OF THE SLOPE UPWARDS
2. CONTRACTOR SHALL VERIFY THE THICKNESS AND WIDTH OF THE RIP-RAP PLACEMENT BY A PREFILL SURVEY AND DAILY SURVEY OF PLACED MATERIAL AS WORK PROCEEDS.
3. RIP-RAP SHALL NOT BE STOCKPILED ON THE DIVIDER DIKE EXCEPT IN AREAS ABOVE WHICH THE RIP-RAP FILL HAS BEEN COMPLETED.

SECTION OR DETAIL NO.
SHEET WHERE SHOWN
REFERENCE KEY

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX000300201100005

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD			
R 1	03/01/12	RGS	PS	SFF	SFF	SEB	MST	JCK	–	–
	ISSUED AS-BUILD AS PER WORK PLAN 6 (ALF-110510-WP-06)									
R 0	05/10/11	RGS	PS	PVK	SFF	SEB	MST	JCK	–	–
	ISSUED FOR CONSTRUCTION									

SCALE: 1"=10' EXCEPT AS NOTED

YARD
EAST STILLING POND – EASTERN PERIMETER DIKE
REMEDIAL IMPROVEMENTS
SECTIONS
WORK PLAN 6 (ALF-110510-WP-06)

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
R.G. SCHUFF	P. SILPACHARN	P.V. KISER	S.F. FIELD	S.E. BENNETT	M.S TURNBOW	J.C. KAMMEYER

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TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 05/10/11 | 38 | C | 10W507-04 | R 1

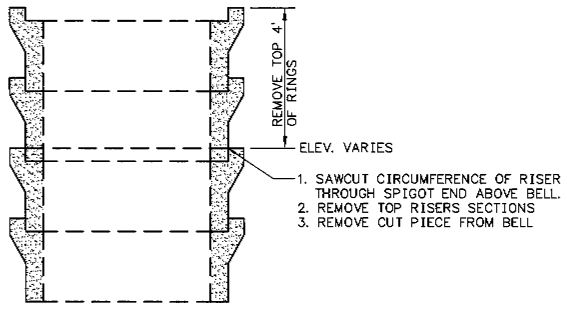
STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:10
W_TVA

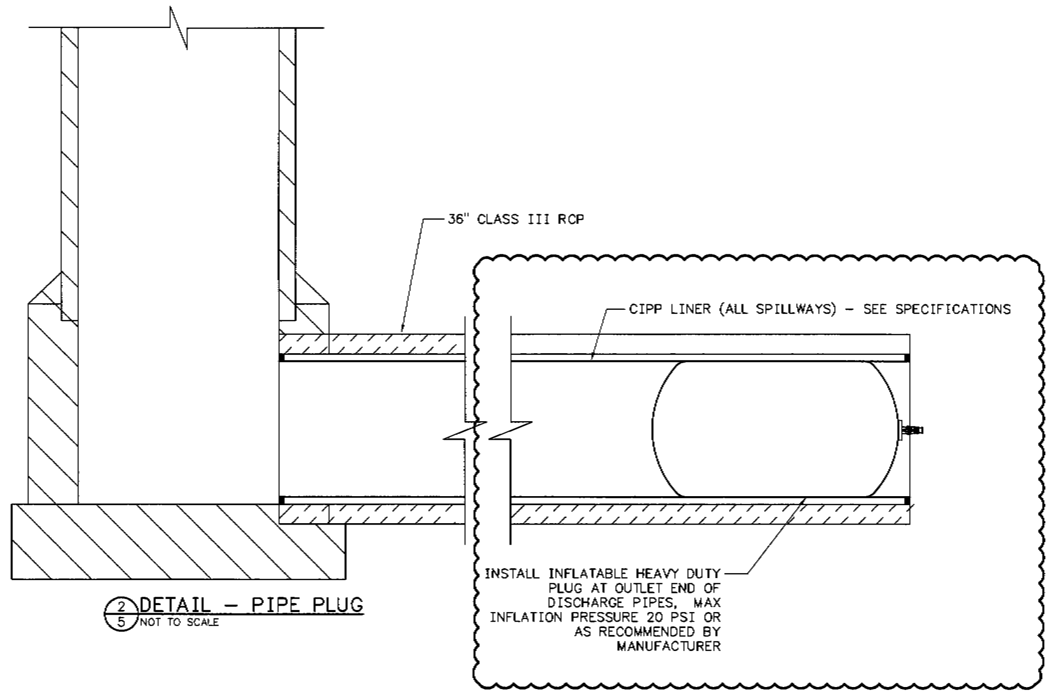
C.A.D. DRAWING DO NOT ALTER MANUALLY

WEIR ELEVATIONS:

SPILLWAY ID	EXISTING ELEV. (FT)	AS-BUILT ELEV. (FT)
ALF-EAST	229.47	225.40
ALF-WEST	229.47	225.39
ALF-OVERFLOW 1	230.43	226.47
ALF-OVERFLOW 2	230.30	226.30



1/5 DETAIL – EXISTING RISER RETROFITS
NOT TO SCALE



2/5 DETAIL – PIPE PLUG
NOT TO SCALE

SPILLWAY RETROFIT SEQUENCING:

1. TO BEGIN AFTER STILLING POND WATER SURFACE HAS BEEN LOWERED TO EL. 224±.
2. REMOVE EXISTING SKIMMER. INSPECT CONDITION, COMPLETE RECOMMENDED REPAIRS, AND PRESERVE FOR REINSTALLATION
3. CONFIRM STRUCTURAL ADEQUACY OF RISERS WITH THE ENGINEER
4. CLEAN EACH SPILLWAY OUTLET PIPE AND RISER.
5. CCTV OUTLET PIPES. INSTALL CIPP LINER IN ALL SPILLWAY OUTLET PIPES, PER RECOMMENDATIONS BY ENGINEER
6. INSTALL PIPE PLUG.
7. LINE RISER SEGMENTS TO REMAIN WITH SPECTRASHEILD IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.
8. REMOVE EXISTING SPILLWAY SKIMMER AND WEIR. INSPECT CONDITION, COMPLETE RECOMMENDED REPAIRS, AND PRESERVE FOR REINSTALLATION
9. SAWCUT THE EXISTING RISERS TO ALLOW FOR REMOVAL OF RISER SECTIONS.
10. REMOVE FOUR FEET OF RISER FROM EACH SPILLWAY
11. DREDGE ASH NEAR RISERS
12. PLACE RIP-RAP AROUNG SPILLWAYS
13. REINSTALL SPILLWAY SKIMMER AND WEIR
14. REMOVE PIPE PLUG
15. REINSTALL SKIMMER STRUCTURE.

INFLATABLE PLUG NOTES:

1. CONTRACTOR SHALL PROVIDE PRESSURE GAUGES AND PRESSURE RELIEF VALVES TO PREVENT INTERIOR PLUG PRESSURES FROM EXCEEDING THE MAXIMUM ALLOWABLE INFLATION PRESSURE

SECTION OR DETAIL NO.
SHEET WHERE SHOWN
REFERENCE KEY

RECORD DRAWING

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX00030020110005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R 1	03/01/12	RGS	PS	SFF	SFF	MST	JCK	–	–	–	–
	ISSUED AS-BUILT AS PER WORK PLAN 6 (ALF-110510-WP-06)										
R 0	05/10/11	RGS	PS	PVK	SFF	SEB	MST	JCK	–	–	–
	ISSUED FOR CONSTRUCTION										

DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
EAST STILLING POND – EASTERN DIVIDER DIKE

REMEDIAL IMPROVEMENTS
DETAILS
WORK PLAN 6 (ALF-110510-WP-06)

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
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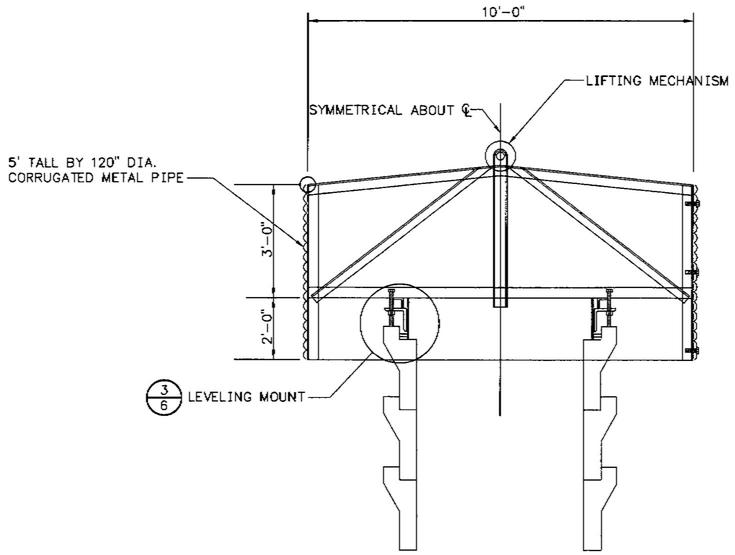
ALLEN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 05/10/11 | 38 | C | 10W507–05 | R 1

STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:1
W_TVA

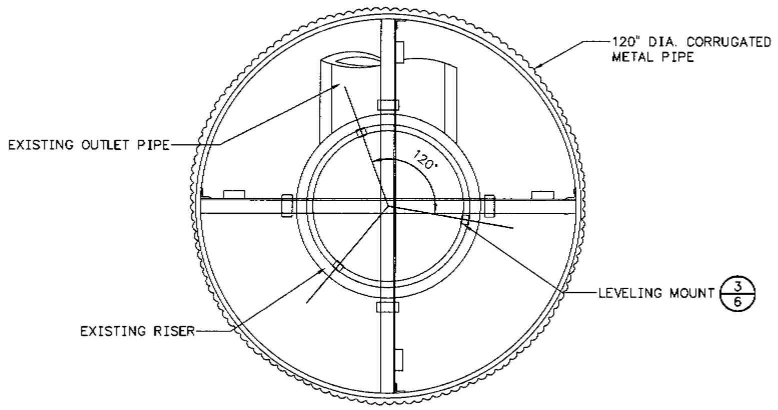
C.A.D. DRAWING
DO NOT ALTER MANUALLY



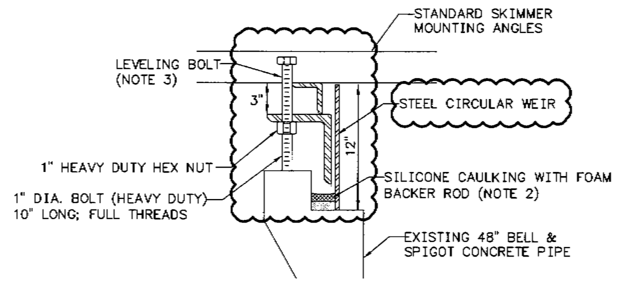
(1/6) DETAIL – EXISTING SKIMMER
NOT TO SCALE

NOTES:

1. SKIMMER SHALL BE CAREFULLY REMOVED BY CONTRACTOR, PRESSURE WASHED AND STORED FOR REINSTALLATION UPON COMPLETION OF RISER MODIFICATIONS.
2. CONTRACTOR SHALL USE CLEAN WATER ONLY FOR SKIMMER WASHING AND DISCHARGE WATER TO STILLING POND.
3. DETAILS SHOWN ON THESE PLANS ARE FOR CONTRACTOR GENERAL REFERENCE ONLY AND WERE OBTAINED FROM TVA STANDARD DRAWINGS 10N214, 10N229-1, AND 10N229-2.
4. SKIMMERS SHALL BE INSPECTED BY ENGINEER. RECOMMENDED REPAIRS WILL BE COMPLETED PRIOR TO REINSTALLATION.



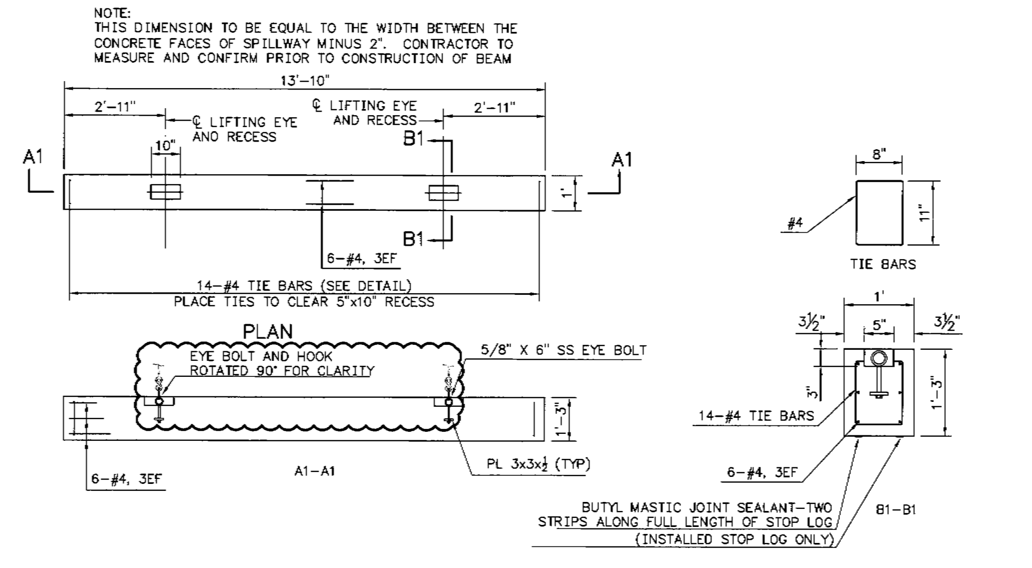
(2/6) DETAIL – TOP VIEW OF SKIMMER
NOT TO SCALE



(3/6) DETAIL – LEVELING MOUNT
NOT TO SCALE

NOTES:

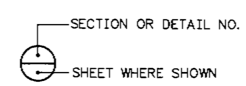
1. FOR SKIMMER AND SPILLWAY DETAILS, REFER TO TVA DRAWING 10N229-2.
2. CAULKING SHALL EXTEND COMPLETELY AROUND THE WEIR AND FORM A WATER TIGHT SEAL.
3. WHEN THE WEIR IS REINSTALLED, THE TOP SHALL BE LEVELED WITH THE USE OF LEVELING BOLTS.



(4/6) DETAIL – PRE-CAST STOP LOG
SCALE: 1"=1'-0"

NOTES:

1. CONTRACTOR TO FABRICATE TWO PRE-CAST CONCRETE STOP LOGS AS DETAILED
2. ONE NEW STOP LOG TO BE INSTALLED IN SOUTH SPILLWAY CHANNEL. SECOND STOP LOG TO BE STORED ON SITE AS PER OWNER DIRECTION.
3. TOP OF EXISTING STOP LOG IN SOUTH CHANNEL – 228.05' (PER SURVEY DATA PROVIDED BY TRANSASH 5-6-11)
4. HEIGHT OF NEW STOP LOG – 1.25'
5. TOP OF NEW STOP LOG ELEVATION – 229.31' (AS-BUILT)
6. USE LIFTING BEAM FOR TRANSPORTATION AND PLACEMENT OF STOP LOGS



REFERENCE KEY

RECORD DRAWING

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESC0X000300201100005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R 1	03/01/12	RGS	PS	SFF	SFF	SEB	MST	JCK	–	–
	ISSUED AS-BUILT AS PER WORK PLAN 6 (ALF-110510-WP-06)									
R 0	05/10/11	RGS	PS	PVK	SFF	SEB	MST	JCK	–	–
	ISSUED FOR CONSTRUCTION									

SCALE: AS SHOWN — EXCEPT AS NOTED

YARD
EAST STILLING POND – EASTERN PERIMETER DIKE

REMEDIAL IMPROVEMENTS
DETAILS
WORK PLAN 6 (ALF-110510-WP-06)

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
R.G. SCHUFF	P. SILPACHARN	P.V. KISER	S.F. FIELD	S.E. BENNETT	N.S. TURNBOW	J.C. KAMMEYER

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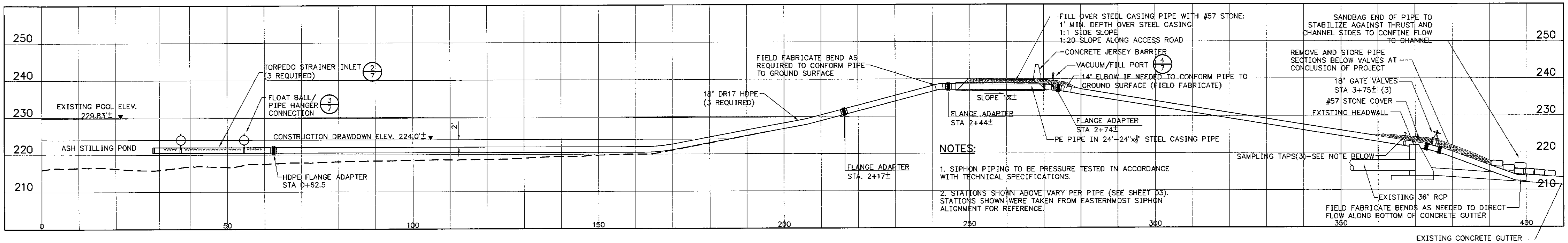
AUTOCAD R 2000 | DATE 05/10/11 | 38 | C | 10W507-06 | R 1

PLOT FACTOR:2

STANTEC | 1
TASK COMPLETED BY: | REV NO.

C.A.D. DRAWING
DO NOT ALTER MANUALLY



NOTES:

1. SIPHON PIPING TO BE PRESSURE TESTED IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.
2. STATIONS SHOWN ABOVE VARY PER PIPE (SEE SHEET 03). STATIONS SHOWN WERE TAKEN FROM EASTERNMOST SIPHON ALIGNMENT FOR REFERENCE.

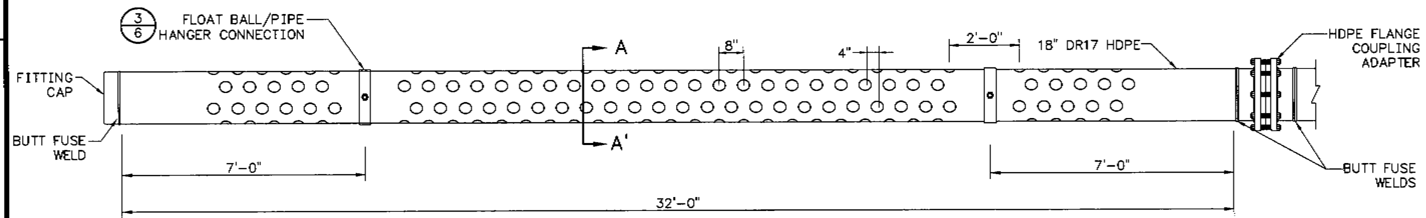
(1/7) SECTION F-F'
SCALE: 1"=10'

NOTE:

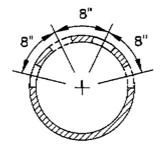
POOL ELEVATIONS BASED ON SURVEYED WEIR ELEVATIONS PLUS 0.36' [CALCULATED ELEVATION OF FLOW OVER TWO WEIRS AT 12 MDG]

SAMPLING TAP NOTES:

SAMPLING TAP ASSEMBLY TO INCLUDE:
1. 18"X3/4" STAINLESS STEEL, CAST IRON OR BRASS SERVICE SADDLE
2. CORPORATION STOP
3. 3/4" GALV. IPS PIPE AND FITTINGS
4. 3/4" BRONZE BALL VALVE
5. 3' – RUBBER HOSE



PLAN

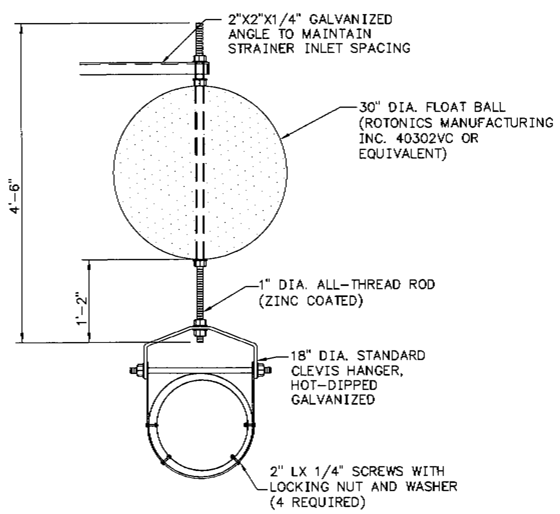


SECTION A-A'

NOTES:

1. HOLES WILL BE ON TOP HALF OF PIPE ONLY.
2. 4" DIA. HOLES (±1/8") AT 8" CENTER TO CENTER (±0.5").
3. 140 HOLES PER STRAINER (4 ROWS WITH 35 HOLES EACH).
4. ROWS ARE TO BE 8"(±0.5") APART CENTER TO CENTER, AND THE HOLES WILL BE OFFSET BY 4"(±0.5").
5. PROVIDE 2 FOOT LENGTH WITHOUT HOLES AT 7 FEET FROM EACH END FOR FLOAT BALL HANGERS.

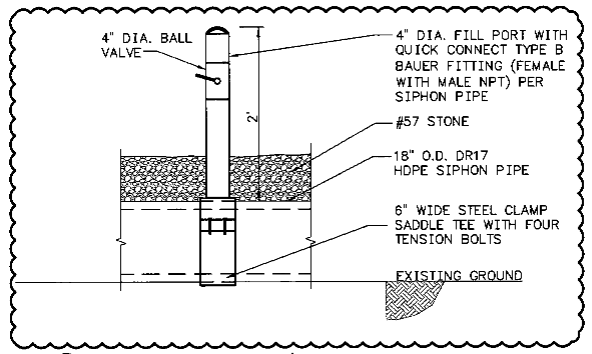
(2/7) DETAIL – TORPEDO STRAINER INLET
SCALE: 1/2"=1'-0"



NOTE:

ADJUST POSITION OF FLOAT BALL ON ALL TREAD ROD TO PLACE TOP OF TORPEDO STRAINER 2' BELOW WATER SURFACE ±1"

(3/7) DETAIL – FLOAT BALL/PIPE HANGER CONNECTION
SCALE: 1"=1'-0"



(4/7) DETAIL – VACUUM/FILL PORT
NOT TO SCALE

SECTION OR DETAIL NO.
SHEET WHERE SHOWN
REFERENCE KEY

RECORD DRAWING

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX00030020110005

REV	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD
R 1	03/01/12	RGS	PS	SFF	SFF	SEB	MST	JCK
ISSUED AS-BUILT AS PER WORK PLAN 6 (ALF-110510-WP-06)								
R 0	05/10/11	RGS	PS	PVK	SFF	SEB	MST	JCK
ISSUED FOR CONSTRUCTION								

SCALE: AS SHOWN — EXCEPT AS NOTED

YARD
EAST STILLING POND – EASTERN PERIMETER DIKE
REMEDIAL IMPROVEMENTS
DETAILS
WORK PLAN 6 (ALF-110510-WP-06)

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
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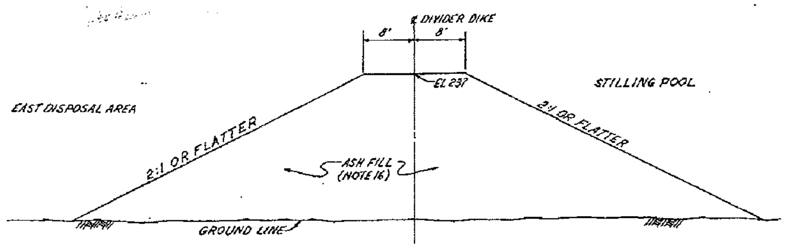
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 05/10/11 | 38 | C | 10W507-07 | R 1

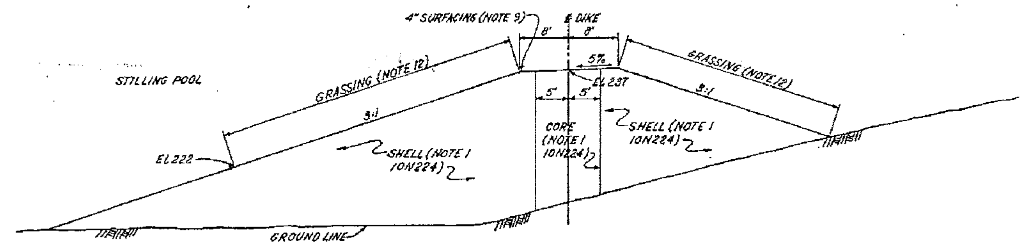
STANTEC | 1
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:10
W_TVA

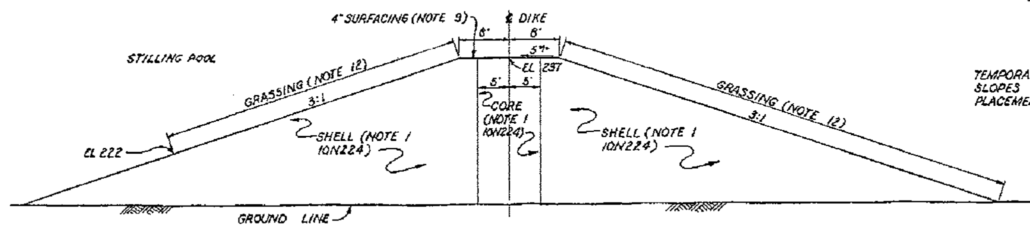
C.A.D. DRAWING DO NOT ALTER MANUALLY



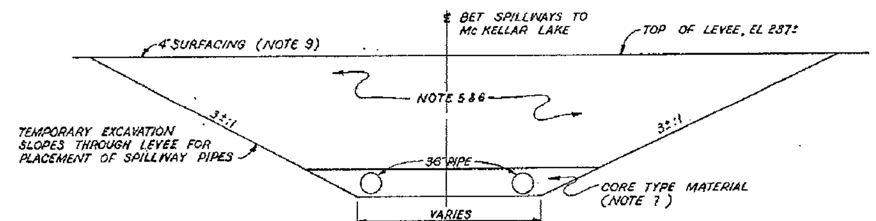
SECTION A-A
TYPICAL DIVIDER DIKE SECTION



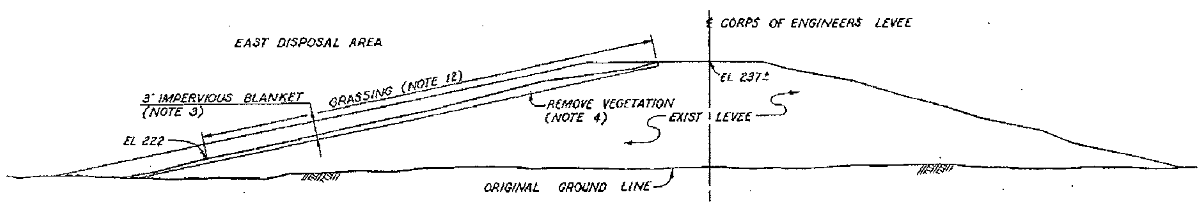
SECTION B-B



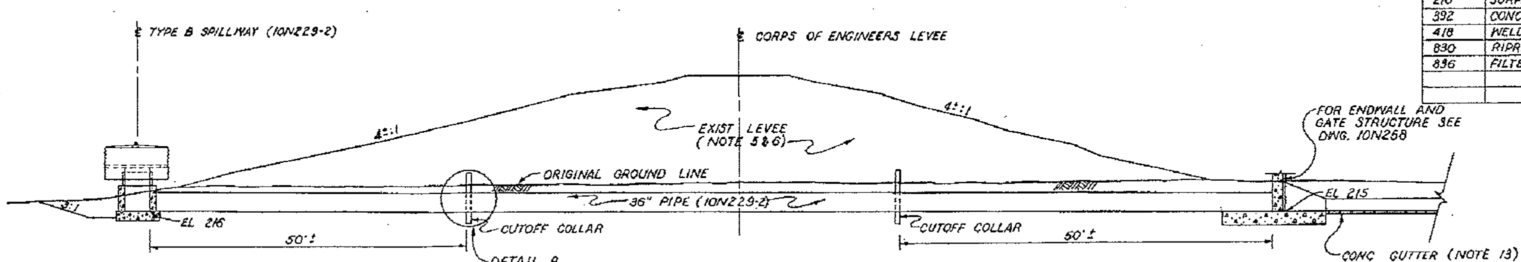
SECTION C-C
TYPICAL DIKE SECTION
STA 41+00± TO STA 53+00±



SECTION J-J
BREACH OF LEVEE SECTION



SECTION D-D
TYPICAL LEVEE SECTION



SECTION F-F
SPILLWAY TO McKELLAR LAKE

NOTES:

1. FOR GENERAL NOTES SEE DRAWING 10N224.
2. FIELD SHALL USE EXTREME CAUTION TO AVOID DAMAGE TO THE 60" RAW SEWER LINE LYING OUTSIDE AND SOUTH OF THE DISPOSAL AREA.
3. THE IMPERVIOUS BLANKET PLACED ON THE LANDSIDE SLOPE OF THE CORPS OF ENGINEERS' LEVEE SHALL BE OF CORE TYPE MATERIAL (MINIMUM 3 FEET THICK). PLACEMENT AND COMPACTION SHALL BE AS SPECIFIED FOR THE CORE MATERIAL (NOTE 1, 10N224). AT THE INTERSECTION OF THE LEVEE AND THE DIKE, THE IMPERVIOUS BLANKET ON THE SLOPE OF THE LEVEE SHALL EXTEND TO INTERSECT WITH THE CORE OF THE DIKE.
4. EXISTING VEGETATION SHALL BE STRIPPED FROM THE LANDSIDE SLOPE OF THE LEVEE BEFORE PLACEMENT OF THE IMPERVIOUS BLANKET AND STOCKPILED. AFTER PLACEMENT OF THE IMPERVIOUS BLANKET, THE STOCKPILED MATERIAL SHALL BE UNIFORMLY SPREAD OVER THE IMPERVIOUS BLANKET. THIS SLOPE SHALL THEN BE SEEDED PER NOTE 7, DRAWING 10N224.
5. THE BREACH IN THE LEVEE FOR CONSTRUCTION OF THE DISCHARGE SPILLWAYS TO McKELLAR LAKE SHALL NOT BE MADE UNTIL THE DIKES FOR THE EAST DISPOSAL AREA ARE CONSTRUCTED.
6. MATERIALS EXCAVATED FROM THE BREACH IN THE LEVEE SHALL BE STOCKPILED AND USED IN REFILLING THE BREACH AFTER INSTALLATION OF THE SPILLWAY PIPES. COMPACTION SHALL BE AS SPECIFIED FOR OTHER DIKE MATERIALS, (NOTE 1, 10N224), WITH CONTROLS AS ESTABLISHED BY THE CENTRAL SOILS LABORATORY. THE EXISTING LEVEE BREACH WHERE THE ASH SLUICE PIPES ARE LOCATED SHALL BE FILLED WITH SHELL TYPE MATERIAL, (NOTE 1, 10N224). THE LANDSIDE LEVEE SLOPE AT BOTH BREACHES SHALL BE PROVIDED WITH THE IMPERVIOUS BLANKET OF NOTE 3. SEVERAL ROUTINE FILL COMPACTION TESTS SHALL BE MADE ON THE COMPACTED FILL IN EACH BREACH, WELL DISTRIBUTED IN PLAN AND ELEVATION TO OBTAIN GOOD REPRESENTATION THROUGHOUT THE FILLS.
7. PIPE BACKFILL AND BEDDING MATERIAL SHALL CONSIST OF CORE TYPE MATERIAL (NOTE 1 10N224) AND SHALL BE PLACED IN ACCORDANCE WITH SECTION 7.7 OF THE G-9 SPECIFICATIONS.
8. THE ASH, HYDRAULIC FILL, AND FOUNDATION STRIPPING, EXCEPT FOR THAT REMOVED FROM THE CORPS OF ENGINEERS' LEVEE EXCAVATED FOR CONSTRUCTION OF THE EAST DISPOSAL AREA DIKES SHALL BE DISPOSED OF INSIDE THE DISPOSAL AREA.
9. CRUSHED STONE OR GRAVEL SURFACING, 4" THICK, SHALL BE APPLIED FOR THE FULL WIDTH OF THE TOP OF DIKE AND ALL DISTURBED SECTIONS OF THE CORPS OF ENGINEERS' LEVEE IN ACCORDANCE WITH SECTION 210 OF T-1 SPECIFICATIONS.
10. RIPRAP SHALL BE PLACED AT SPILLWAY OUTLETS AS SHOWN. AT LEAST 50%, BY WEIGHT, OF THE RIPRAP SHALL CONSIST OF STONES AT LEAST 200 POUNDS EACH. RIPRAP SHALL CONFORM TO SECTION 830 OF THE T-1 SPECIFICATIONS.
11. FILTER SHALL CONFORM TO SECTION 836.
12. ALL CUT AND FILL SLOPES AND OTHER DISTURBED AREAS SHALL BE SEEDED WITH TYPE 6, MIXTURE B OR TYPE 7, MIXTURE A IN ACCORDANCE WITH SECTION 180 OF T-1 SPECIFICATIONS. DEPENDING ON THE TIME OF CONSTRUCTION, IT MAY BE NECESSARY TO PROVIDE A TEMPORARY COVER (TYPE 9) ON THE DIKE AND LEVEE SLOPES. ALL GRASSED AREAS SHALL BE FERTILIZED AND MULCHED IN ACCORDANCE WITH SECTIONS 180 AND 182 RESPECTIVELY.
13. CONCRETE GUTTER SHALL CONFORM TO SECTION 390. INTERMEDIATE ANCHORS AND 3/4" EXPANSION JOINTS SHALL BE PLACED AT INTERVALS NOT TO EXCEED 50'.
14. WELDED WIRE FABRIC SHALL CONFORM TO ASTM SPECIFICATION A185 PLAIN FINISH, AND SHALL HAVE A MINIMUM LAP DISTANCE OF 6 INCHES.
15. THE MINIMUM FACTOR OF SAFETY FOR ALL LOADING CONDITIONS ON THE EAST DISPOSAL AREA IS 1.42. THIS FACTOR OF SAFETY IS FOR THE END OF CONSTRUCTION CONDITION.
16. THE DIVIDER DIKE SHALL BE CONSTRUCTED OF BOTTOM ASH PLACED IN NOT MORE THAN 9-INCH LAYERS, AND WELL COMPACTED WITH RUBBER-TIRED HAULING EQUIPMENT.

SUMMARY OF QUANTITIES EAST DISPOSAL AREA

ITEM	DESCRIPTION	QUANTITY	UNIT
101	CLEARING AND GRUBBING (DIKE)	3.4	AC.
120	CHAN EXCAV (TO HORN LAKE CUTOFF)	290	C.Y.
	ASH FILL (DIVIDER DIKE)	74,000	C.Y.
120	UNCLASSIFIED EXCAVATION (BREACH LEVEE)	4,745	C.Y.
123	EARTH BORROW - SHELL MATERIAL (DIKE)	102,000	C.Y.
	- CORE MATERIAL (DIKE)	13,500	C.Y.
	- SHELL MATERIAL (LEVEE)	5,945	C.Y.
	- CORE MATERIAL (LEVEE)	26,000	C.Y.
180	GRASSING (DIKE)	21,000	S.Y.
	GRASSING (LEVEE)	26,000	S.Y.
210	SURFACING (DIKE)	610	TONS
392	CONCRETE GUTTER (LEVEE)	300	L.F.
418	WELDED WIRE FABRIC	810	S.Y.
830	RIPRAP (DIKE)	990	C.Y.
836	FILTER (DIKE)	460	TONS

P.A. 3092
AND W.O. P33-544-82-31401-J6

COMPANION DWGS., 10N223, 224, 225, 227, 228, 229-1, 229-2
SCALE 1" = 10'

INSPECTED AND APPROVED FOR ISSUE
B.M. Montgomery

REV NO.	ECN NO.	DATE	DSGN	DRWN	CHKD	SUPV	ENGR	INSP	SUBM	RECM	APPR
2		3-16-77	RGP	JSB	RGP	WLG	KWB		RJB		
REVISED RIPRAP & FILTER QUANTITIES P.A. 3076											
1		10-11-76	RGP	GRO	RGP	WLG	KWB		RJB		
ADD DIVIDER DIKE - P.A. 3076; EXTEND ASH AREA DIKE TO RR FILL - P.A. 3092											

DSGN J.L. GLOVER
DRWN J.S. BERRY
CHKD R.W. SCHENK
SUPV J.L. GLOVER
INSP
ENGINEER K.W. Burnett

MAIN PLANT - ASH DISPOSAL AREAS

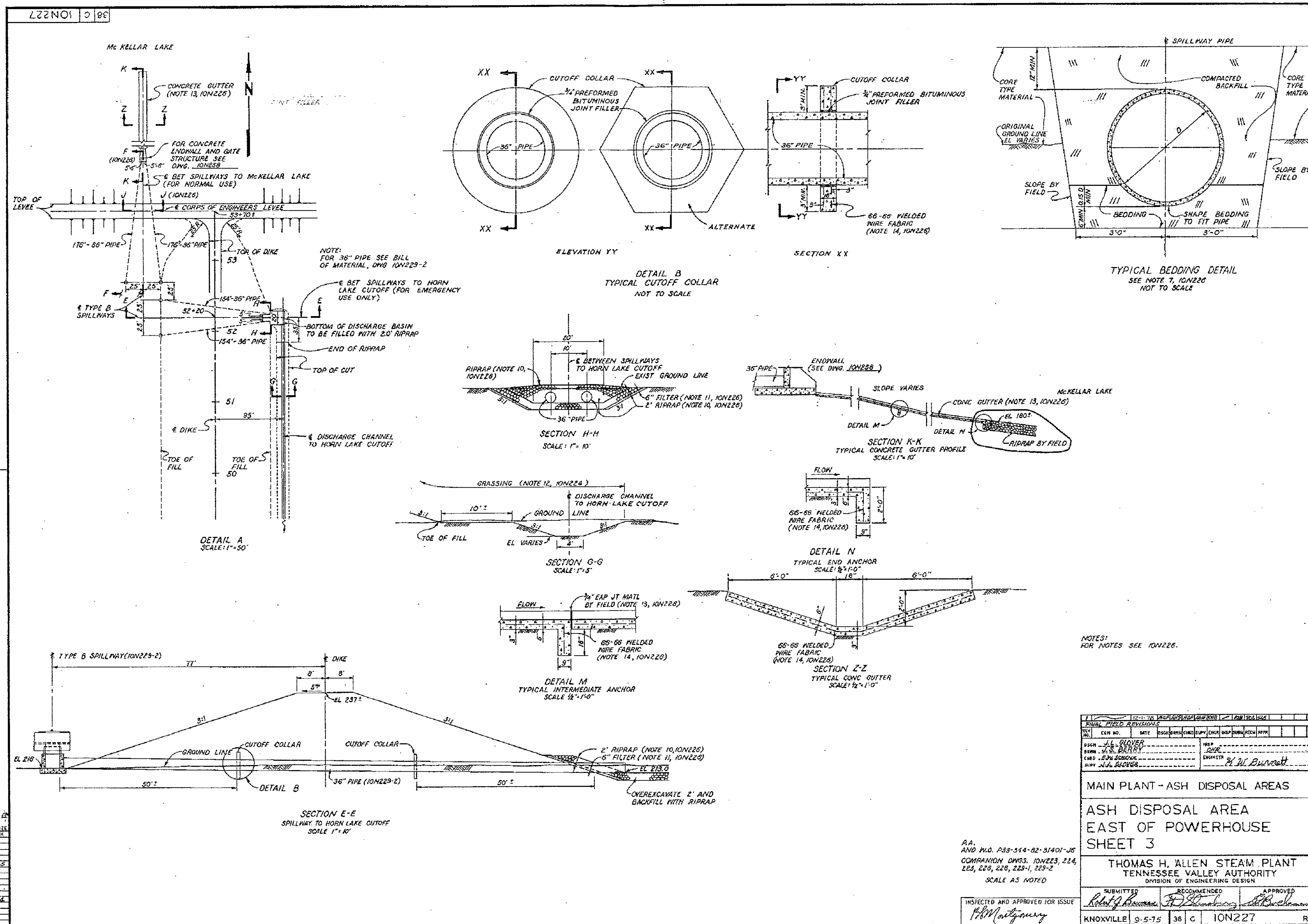
ASH DISPOSAL AREA
EAST OF POWERHOUSE
SHEET 2

THOMAS H. ALLEN STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
Robert J. Bowman	F.D. [signature]	[signature]

KNOXVILLE | 9-5-75 | 38 | C | 10N226 | R2

RECORD DRAWING AS CONSTRUCTED
[signature] 11-6-78 R2



P.A. AND W.O. P83-514-82-31401-J5
COMPANION DWGS. 10N223, 224, 225, 226, 228, 229-1, 229-2
SCALE AS NOTED

INSPECTED AND APPROVED FOR ISSUE

FINAL FIELD REVISIONS

DSGN J.L. GLOVER
DRWN J.S. BERRY
CHKD
SUPV J.L. GLOVER

MAIN PLANT - ASH DISPOSAL AREAS

ASH DISPOSAL AREA
EAST OF POWERHOUSE
SHEET 3

THOMAS H. ALLEN STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE 9-5-75 | 38 | C | 10N227 | R1

RECORD DRAWING AS CONSTRUCTED

APPENDIX F
RATING CURVES

Rating Curve Inputs
Inflow Design Flow Control System Plan
East Ash Disposal Area, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/29/2015
Checked by: MMM Checked By Date: 9/30/2015

East Ash Pond Outlet Structures

East Ash Pond -Weir 1		Data Source
Overflow Elev =	229.31 feet (NGVD29)	2
Length =	27.66667 feet (NGVD29)	2
C=	3.27	1 (Assumed to behave as sharp-crested weir)

East Stilling Pond Outlet Structures

	ALF Overflow 1 - Concrete Riser Structure		ALF Overflow 2 - Concrete Riser Structure		ALF East - Concrete Riser Structure		ALF West - Concrete Riser Structure	Data Source
Weir Elev=	226.47 feet (NGVD29)	Weir Elev=	226.3 feet (NGVD29)	Weir Elev=	225.4 feet (NGVD29)	Weir Elev=	225.39 feet (NGVD29)	2
Riser D =	48 in	Riser D =	48 in	Riser D =	48 in	Riser D =	48 in	2
Pipe Inlet=	216 feet (NGVD29)	Pipe Inlet=	216 feet (NGVD29)	Pipe Inlet=	216 feet (NGVD29)	Pipe Inlet=	216 feet (NGVD29)	2
Pipe Outlet=	213 feet (NGVD29)	Pipe Outlet=	213 feet (NGVD29)	Pipe Outlet=	215 feet (NGVD29)	Pipe Outlet=	215 feet (NGVD29)	3
Pipe D=	36 in	Pipe D=	36 in	Pipe D=	36 in	Pipe D=	36 in	2
Length=	155 feet	Length=	155 feet	Length=	220 feet	Length=	220 feet (NGVD29)	2
C=	3.27	C=	3.27	C=	3.27	C=	3.27	1 (Assumed to behave as sharp crested weir)
C_0=	0.6	C_0=	0.6	C_0=	0.6	C_0=	0.6	1 (Based on Brater and King 1976)

Computed Values		Computed Values		Computed Values		Computed Values		Equation
L_{weir}=	12.56637 ft	L_{weir}=	12.56637 ft	L_{weir}=	12.56637 ft	L_{weir}=	12.56637 ft	Circumpherence=PI()*D
A_{riser}=	12.56637 sq. ft.	A_{riser}=	12.56637 sq. ft.	A_{riser}=	12.56637 sq. ft.	A_{riser}=	12.56637 sq. ft.	Area = $PI*D^2/4$
A_{pipe}=	7.068583 sq. ft.	A_{pipe}=	7.068583 sq. ft.	A_{pipe}=	7.068583 sq. ft.	A_{pipe}=	7.068583 sq. ft.	Area = $PI*D^2/4$
Elev C*=	217.5 feet (NGVD29)	Elev C*=	217.5 feet (NGVD29)	Elev C*=	217.5 feet (NGVD29)	Elev C=	217.5 feet (NGVD29)	

*C is the elevation of centerline of the outlet pipe inlet.

References:

1 "Spillway Rating Curve Development" V:\1755\active\175565240\geotechnical\analysis\H&H\rating_curve_methodology.docx
2 Remedial Improvements Work Plan 6 \\us1243-f01\workgroup\1755\active\175565240\geotechnical\analysis\H&H\H&H Data\ALF\Spillway Information & Elevations
3 Report of Hydrologic and Hydraulic Analysis \\us1243-f01\workgroup\1755\active\175565240\geotechnical\analysis\H&H\H&H Data\ALF\Previous H&H Models & Reports
Ash Pond and Stilling Pond, TVA Allen Fossil Plant
4 TVA Drawings 10N226 and 10N227. (Included in Appendix to Reference 4)

Rating Curve Development: Stiling Pond, ALF Overflow 1
Inflow Design Flow Control System Plan
East Ash Disposal Area, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/29/2015
Checked by: MMM Checked By Date: 9/30/2015

Indicates Controlling Flow (yellow highlight)

ALF Overflow 1										
	Weir Flow		Orifice Flow		Pipe Orifice Flow		Outlet Pipe Flow (from HY-8)		Rating Curve for HEC-HMS	
Elevation	H (ft)	$Q=CLH^{1.5}$ (cfs)	H (ft)	$Q=C_0A(2gH)^{0.5}$ (cfs)	H_c (ft)[1]	$Q=C_0A(2gH_c)^{0.5}$ (cfs)	Assumed TW (ft)	Q (cfs)	HW Elevation (ft)	Q (cfs)
226.47	0.00	0.00	0	0.00	8.97	101.93	225	40.65	226.47	0.00
226.50	0.03	0.21	0.03	10.48	9.00	102.11	225	41.07	226.50	0.21
227.00	0.53	15.86	0.53	44.05	9.50	104.90	225	48.08	227.00	15.86
227.50	1.03	42.95	1.03	61.41	10.00	107.63	225	55.09	227.50	42.95
228.00	1.53	77.77	1.53	74.84	10.50	110.29	225	61.26	228.00	61.26
228.50	2.03	118.85	2.03	86.21	11.00	112.88	225	65.48	228.50	65.48
229.00	2.53	165.36	2.53	96.24	11.50	115.42	225	69.69	229.00	69.69
229.50	3.03	216.73	3.03	105.32	12.00	117.90	225	73.90	229.50	73.90
230.00	3.53	272.53	3.53	113.68	12.50	120.33	225	78.12	230.00	78.12
230.50	4.03	332.44	4.03	121.47	13.00	122.72	225	82.33	230.50	82.33
231.00	4.53	396.19	4.53	128.78	13.50	125.05	225	86.54	231.00	86.54
231.50	5.03	463.56	5.03	135.70	14.00	127.35	225	90.54	231.50	90.54
232.00	5.53	534.37	5.53	142.29	14.50	129.60	225	93.55	232.00	93.55
232.50	6.03	608.46	6.03	148.58	15.00	131.82	225	96.55	232.50	96.55
233.00	6.53	685.69	6.53	154.62	15.50	134.00	225	99.56	233.00	99.56
233.50	7.03	765.93	7.03	160.43	16.00	136.14	225	102.57	233.50	102.57
234.00	7.53	849.08	7.53	166.04	16.50	138.25	225	105.57	234.00	105.57
234.50	8.03	935.04	8.03	171.46	17.00	140.33	225	108.58	234.50	108.58
235.00	8.53	1,023.72	8.53	176.72	17.50	142.38	225	111.58	235.00	111.58
235.50	9.03	1,115.04	9.03	181.82	18.00	144.40	225	114.59	235.50	114.59
236.00	9.53	1,208.92	9.53	186.79	18.50	146.39	225	117.60	236.00	117.60
237.00	10.53	1,404.11	10.53	196.34	19.50	150.29	225	122.80	237.00	122.80

[1] Pipe Orifice flow computed without consideration of tailwater. Tailwater was considered in "Outlet Pipe Flow" computation.

Rating Curve Development: Stilling Pond, ALF Overflow 2
Inflow Design Flow Control System Plan
East Ash Disposal Area, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/29/2015
Checked by: MMM Checked By Date: 9/30/2015

Indicates Controlling Flow

ALF Overflow 2										
	Weir Flow		Orifice Flow		Pipe Orifice Flow		Outlet Pipe Flow (from HY-8)		Rating Curve for HEC-HMS	
Elevation	H (ft)	$Q=CLH^{1.5}$ (cfs)	H (ft)	$Q=C_0A(2gH)^{0.5}$ (cfs)	H_c (ft)[1]	$Q=C_0A(2gH_c)^{0.5}$ (cfs)	Assumed TW (ft)	Q (cfs)	HW Elevation (ft)	Q (cfs)
226.30	0.00	0.00	0	0.00	8.80	100.96	225	38.02	226.30	0.00
226.50	0.20	3.68	0.2	27.06	9.00	102.11	225	40.78	226.50	3.68
227.00	0.70	24.07	0.7	50.62	9.50	104.90	225	47.70	227.00	24.07
227.50	1.20	54.02	1.2	66.28	10.00	107.63	225	54.61	227.50	54.02
228.00	1.70	91.08	1.7	78.89	10.50	110.29	225	60.91	228.00	60.91
228.50	2.20	134.09	2.2	89.75	11.00	112.88	225	65.06	228.50	65.06
229.00	2.70	182.31	2.7	99.42	11.50	115.42	225	69.20	229.00	69.20
229.50	3.20	235.22	3.2	108.24	12.00	117.90	225	73.34	229.50	73.34
230.00	3.70	292.46	3.7	116.39	12.50	120.33	225	77.49	230.00	77.49
230.50	4.20	353.70	4.2	124.00	13.00	122.72	225	81.63	230.50	81.63
231.00	4.70	418.70	4.7	131.18	13.50	125.05	225	85.77	231.00	85.77
231.50	5.20	487.26	5.2	137.98	14.00	127.35	225	89.92	231.50	89.92
232.00	5.70	559.20	5.7	144.46	14.50	129.60	225	92.91	232.00	92.91
232.50	6.20	634.37	6.2	150.66	15.00	131.82	225	95.87	232.50	95.87
233.00	6.70	712.64	6.7	156.62	15.50	134.00	225	98.83	233.00	98.83
233.50	7.20	793.88	7.2	162.36	16.00	136.14	225	101.80	233.50	101.80
234.00	7.70	878.00	7.7	167.90	16.50	138.25	225	104.76	234.00	104.76
234.50	8.20	964.89	8.2	173.27	17.00	140.33	225	107.73	234.50	107.73
235.00	8.70	1,054.48	8.7	178.47	17.50	142.38	225	110.69	235.00	110.69
235.50	9.20	1,146.67	9.2	183.53	18.00	144.40	225	113.66	235.50	113.66
236.00	9.70	1241.41	9.7	188.45	18.50	146.39	225	116.62	236.00	116.62
237.00	10.70	1438.25	10.7	197.92	19.50	150.29	225	121.98	237.00	121.98

[1] Pipe Orifice flow computed without consideration of tailwater. Tailwater was considered in "Outlet Pipe Flow" computation.

Stantec

Rating Curve Development: Stilling Pond, ALF East
Inflow Design Flow Control System Plan
East Ash Disposal Area, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/29/2015
Checked by: MMM Checked By Date: 9/30/2015

Indicates Controlling Flow

ALF East										
	Weir Flow		Orifice Flow		Pipe Orifice Flow		Outlet Pipe Flow (from HY-8)		Rating Curve for HEC-HMS	
Elevation	H (ft)	$Q=CLH^{1.5}$ (cfs)	H (ft)	$Q=C_0A(2gH)^{0.5}$ (cfs)	H_c (ft)[1]	$Q=C_0A(2gH_c)^{0.5}$ (cfs)	Assumed TW (ft)	Q (cfs)	HW Elevation (ft)	Q (cfs)
225.40	0.00	0.00	0	0.00	7.90	95.66	225	14.81	225.40	0.00
225.50	0.10	1.30	0.1	19.13	8.00	96.27	225	18.52	225.50	1.30
226.00	0.60	19.10	0.6	46.87	8.50	99.23	225	32.33	226.00	19.10
226.50	1.10	47.41	1.1	63.46	9.00	102.11	225	38.45	226.50	38.45
227.00	1.60	83.16	1.6	76.54	9.50	104.90	225	44.57	227.00	44.57
227.50	2.10	125.05	2.1	87.68	10.00	107.63	225	50.69	227.50	50.69
228.00	2.60	172.27	2.6	97.56	10.50	110.29	225	56.82	228.00	56.82
228.50	3.10	224.28	3.1	106.53	11.00	112.88	225	61.77	228.50	61.77
229.00	3.60	280.68	3.6	114.80	11.50	115.42	225	65.47	229.00	65.47
229.50	4.10	341.14	4.1	122.52	12.00	117.90	225	69.16	229.50	69.16
230.00	4.60	405.41	4.6	129.77	12.50	120.33	225	72.86	230.00	72.86
230.50	5.10	473.27	5.1	136.64	13.00	122.72	225	76.55	230.50	76.55
231.00	5.60	544.55	5.6	143.19	13.50	125.05	225	80.25	231.00	80.25
231.50	6.10	619.09	6.1	149.44	14.00	127.35	225	83.94	231.50	83.94
232.00	6.60	696.74	6.6	155.44	14.50	129.60	225	87.64	232.00	87.64
232.50	7.10	777.40	7.1	161.23	15.00	131.82	225	90.95	232.50	90.95
233.00	7.60	860.95	7.6	166.81	15.50	134.00	225	93.58	233.00	93.58
233.50	8.10	947.29	8.1	172.21	16.00	136.14	225	96.21	233.50	96.21
234.00	8.60	1,036.35	8.6	177.44	16.50	138.25	225	98.84	234.00	98.84
234.50	9.10	1,128.03	9.1	182.53	17.00	140.33	225	101.47	234.50	101.47
235.00	9.60	1,222.26	9.6	187.47	17.50	142.38	225	104.11	235.00	104.11
235.50	10.10	1,318.98	10.1	192.29	18.00	144.40		106.74	235.50	106.74
236.00	10.60	1,418.13	10.60	197.00	18.50	146.39	225	109.37	236.00	109.37
237.00	11.60	1,623.47	11.60	206.08	19.50	150.29	225	114.63	237.00	114.63

[1] Pipe Orifice flow computed without consideration of tailwater. Tailwater was considered in "Outlet Pipe Flow" computation.

Rating Curve Development: Stilling Pond, ALF West
Inflow Design Flow Control System Plan
East Ash Disposal Area, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/29/2015
Checked by: MMM Checked By Date: 9/30/2015

Indicates Controlling Flow

ALF West

Elevation	Weir Flow		Orifice Flow		Pipe Orifice Flow		Outlet Pipe Flow (from HY-8)		Rating Curve for HEC-HMS	
	H (ft)	$Q=CLH^{1.5}$ (cfs)	H (ft)	$Q=C_0A(2gH)^{0.5}$ (cfs)	H_c (ft)[1]	$Q=C_0A(2gH_c)^{0.5}$ (cfs)	Assumed TW (ft)	Q (cfs)	HW Elevation (ft)	Q (cfs)
225.39	0.00	0.00	0	0.00	7.89	95.60	225	14.44	225.39	0.00
225.50	0.11	1.50	0.11	20.07	8.00	96.27	225	18.52	225.50	1.50
226.00	0.61	19.58	0.61	47.26	8.50	99.23	225	32.36	226.00	19.58
226.50	1.11	48.06	1.11	63.75	9.00	102.11	225	38.55	226.50	38.55
227.00	1.61	83.95	1.61	76.77	9.50	104.90	225	44.75	227.00	44.75
227.50	2.11	125.95	2.11	87.89	10.00	107.63	225	50.95	227.50	50.95
228.00	2.61	173.27	2.61	97.75	10.50	110.29	225	57.15	228.00	57.15
228.50	3.11	225.37	3.11	106.70	11.00	112.88	225	62.00	228.50	62.00
229.00	3.61	281.85	3.61	114.96	11.50	115.42	225	65.70	229.00	65.70
229.50	4.11	342.39	4.11	122.67	12.00	117.90	225	69.41	229.50	69.41
230.00	4.61	406.73	4.61	129.91	12.50	120.33	225	73.11	230.00	73.11
230.50	5.11	474.67	5.11	136.78	13.00	122.72	225	76.81	230.50	76.81
231.00	5.61	546.01	5.61	143.31	13.50	125.05	225	80.52	231.00	80.52
231.50	6.11	620.61	6.11	149.56	14.00	127.35	225	84.22	231.50	84.22
232.00	6.61	698.33	6.61	155.56	14.50	129.60	225	87.93	232.00	87.93
232.50	7.11	779.04	7.11	161.34	15.00	131.82	225	91.17	232.50	91.17
233.00	7.61	862.65	7.61	166.92	15.50	134.00	225	93.82	233.00	93.82
233.50	8.11	949.05	8.11	172.31	16.00	136.14	225	96.47	233.50	96.47
234.00	8.61	1,038.16	8.61	177.54	16.50	138.25	225	99.12	234.00	99.12
234.50	9.11	1,129.89	9.11	182.63	17.00	140.33	225	101.77	234.50	101.77
235.00	9.61	1,224.17	9.61	187.57	17.50	142.38	225	104.42	235.00	104.42
235.50	10.11	1,320.94	10.11	192.39	18.00	144.40	225	107.07	235.50	107.07
236.00	10.61	1,420.14	10.61	197.09	18.50	146.39	225	109.72	236.00	109.72
237.00	11.61	1,625.57	11.61	206.17	19.50	150.29	225	115.02	237.00	115.02

[1] Pipe Orifice flow computed without consideration of tailwater. Tailwater was considered in "Outlet Pipe Flow" computation.

Rating Curves - HY-8 Output, Stilling Pond
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/23/2015
Checked by: MAM Checked By Date: 9/28/2015

HY-8 Output

ALF Overflow 1		ALF Overflow 2		ALF East		ALF West	
Q (cfs)	**Headwater (ft)**	**Q (cfs)**	**Headwater (ft)**	**Q (cfs)**	**Headwater (ft)**	**Q (cfs)**	**Headwater (ft)**
0	225	0	225	0	225	0	225
30	225.71	30	225.72	30	225.81	30	225.81
60	227.85	60	227.89	60	228.26	60	228.23
90	231.41	90	231.51	90	232.32	90	232.28
120	236.4	120	236.57	120	238.02	120	237.94

Rating Curve - Weir between East Ash Pond and Stilling Pond
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/23/2015
Checked by: MMM Checked By Date: 9/29/2015

Elevation	Weir Flow	
	H (ft)	$Q=CLH^{1.5}$ (cfs)
229.31	0.00	0.00
230.00	0.69	51.85
230.50	1.19	117.44
231.00	1.69	198.76
231.50	2.19	293.20
232.00	2.69	399.15
232.50	3.19	515.45
233.00	3.69	641.27
233.50	4.19	775.94
234.00	4.69	918.89
234.50	5.19	1,069.68
235.00	5.69	1,227.93
235.50	6.19	1,393.29
236.00	6.69	1,565.47
236.50	7.19	1,744.21
237.00	7.69	1,929.27
237.50	8.19	2,120.46
238.00	8.69	2,317.58
238.50	9.19	2,520.45
239.00	9.69	2,728.92
239.50	10.19	2,942.83

NOTE - This rating curve was not used directly in the modeling. The weir was modeled as an outflow structure in HEC-HMS. The hydrologic calculations adjusted the flow through the structure to account for tailwater from the Stilling Pond downstream. The rating curve shown on this sheet represents the unadjusted rating curve.

Rating Curves - HEC-HMS Input, Stilling Pond
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/28/2015
Checked by: MMM Checked By Date: 9/29/2015

Rating Curves Under Normal Operation
No Gates Closed

Elevation	Discharge (cfs)	Storage (acre-ft)
225.40	0.00	46.40
225.50	2.80	47.02
226.00	38.68	50.11
226.50	80.89	53.27
227.00	129.24	56.43
227.50	198.62	59.73
228.00	236.14	63.02
228.50	254.31	66.44
229.00	270.06	69.85
229.50	285.82	73.42
230.00	301.57	76.99
230.50	317.33	80.69
231.00	333.08	84.39
231.50	348.62	88.19
232.00	362.01	91.99
232.50	374.54	95.87
233.00	385.79	99.76
233.50	397.04	103.75
234.00	408.29	107.74
234.50	419.54	111.84
235.00	430.80	115.94
235.50	442.05	120.15
236.00	453.30	124.36
237.00	474.44	133.08

Rating Curves Under Emergency Operation
Gates to McKellar Lake are closed

Elevation	Discharge (cfs)	Storage (acre-ft)
226.30	0.00	52.01
226.47	3.12	53.08
226.50	3.89	53.27
227.00	39.92	56.43
227.50	96.97	59.73
228.00	122.18	63.02
228.50	130.53	66.44
229.00	138.89	69.85
229.50	147.25	73.42
230.00	155.60	76.99
230.50	163.96	80.69
231.00	172.32	84.39
231.50	180.46	88.19
232.00	186.45	91.99
232.50	192.42	95.87
233.00	198.39	99.76
233.50	204.36	103.75
234.00	210.33	107.74
234.50	216.30	111.84
235.00	222.27	115.94
235.50	228.25	120.15
236.00	234.22	124.36
237.00	244.79	133.08

APPENDIX G
PRECIPITATION DATA

Rainfall Distribution
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/23/2015
Checked by: MM Checked By Date: 9/24/2015

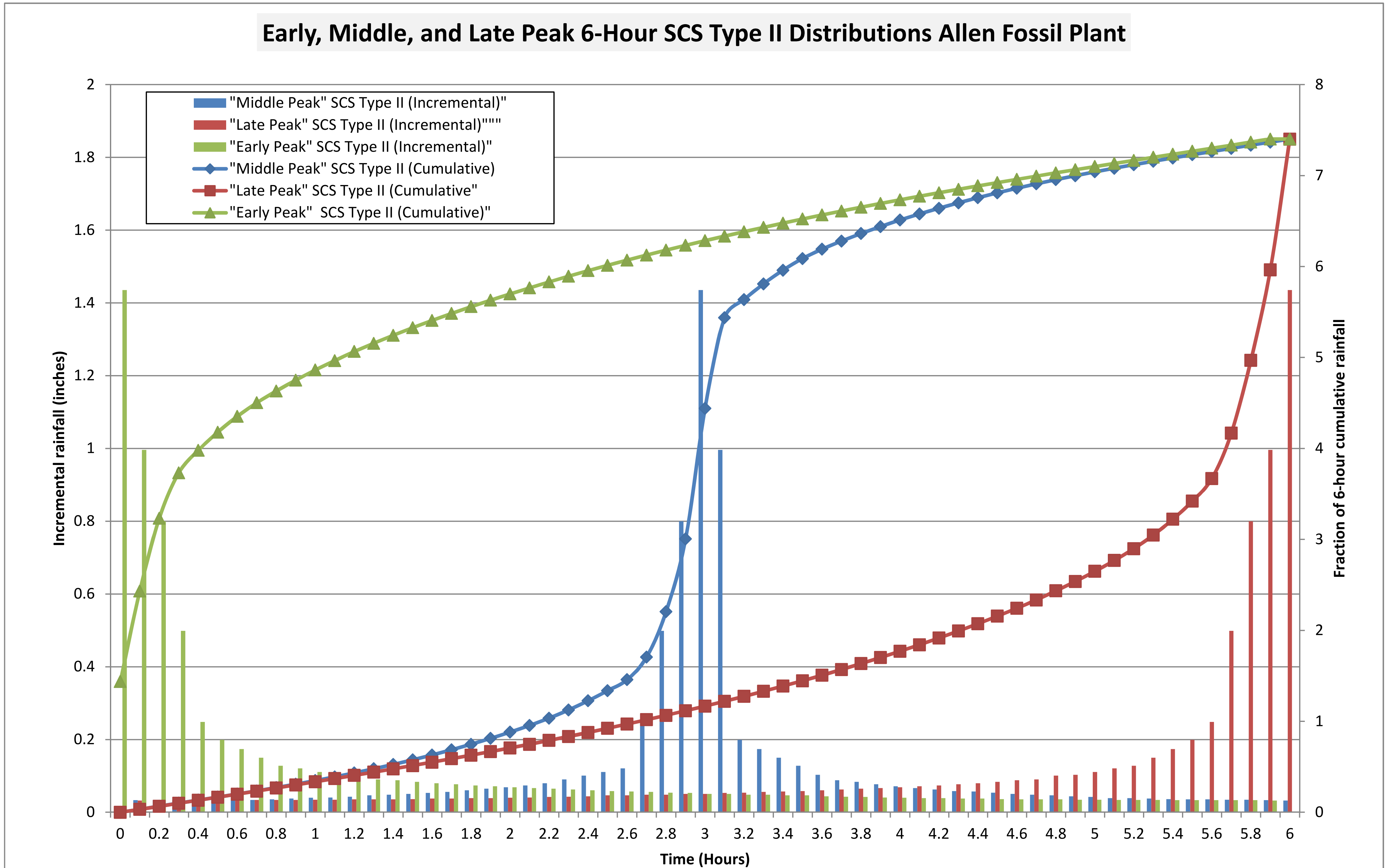
1000-year, 6-hour Rainfall Depth equals 7.40 inches
From NOAA Atlas 14

1000-year 6-hour SCS Type II "Late Peak" Hydrograph		
Time	Incremental Depth	Cumulative Depth
0.00	0.00	0.00
0.10	0.03	0.03
0.20	0.03	0.07
0.30	0.03	0.10
0.40	0.03	0.13
0.50	0.03	0.17
0.60	0.03	0.20
0.70	0.03	0.23
0.80	0.03	0.27
0.90	0.03	0.30
1.00	0.03	0.34
1.10	0.03	0.37
1.20	0.04	0.41
1.30	0.04	0.44
1.40	0.04	0.48
1.50	0.04	0.51
1.60	0.04	0.55
1.70	0.04	0.59
1.80	0.04	0.63
1.90	0.04	0.67
2.00	0.04	0.71
2.10	0.04	0.75
2.20	0.04	0.79
2.30	0.04	0.83
2.40	0.04	0.88
2.50	0.05	0.92
2.60	0.05	0.97
2.70	0.05	1.02
2.80	0.05	1.07
2.90	0.05	1.12
3.00	0.05	1.17
3.10	0.05	1.22
3.20	0.05	1.27
3.30	0.06	1.33
3.40	0.06	1.39
3.50	0.06	1.45
3.60	0.06	1.51
3.70	0.06	1.57
3.80	0.07	1.63
3.90	0.07	1.70
4.00	0.07	1.77
4.10	0.07	1.84
4.20	0.07	1.92
4.30	0.08	1.99
4.40	0.08	2.07
4.50	0.08	2.16
4.60	0.09	2.24
4.70	0.09	2.33
4.80	0.10	2.44
4.90	0.10	2.54
5.00	0.11	2.65
5.10	0.12	2.77
5.20	0.13	2.90
5.30	0.15	3.05
5.40	0.17	3.22
5.50	0.20	3.42
5.60	0.25	3.67
5.70	0.50	4.17
5.80	0.80	4.97
5.90	1.00	5.96
6.00	1.44	7.40

1000-year 6-hour SCS Type II "Middle Peak" Hydrograph		
Time	Incremental Depth	Cumulative Depth
0.00	0.00	0.00
0.10	0.03	0.03
0.20	0.03	0.07
0.30	0.03	0.10
0.40	0.03	0.13
0.50	0.03	0.17
0.60	0.03	0.20
0.70	0.03	0.24
0.80	0.04	0.27
0.90	0.04	0.31
1.00	0.04	0.35
1.10	0.04	0.39
1.20	0.04	0.43
1.30	0.05	0.48
1.40	0.05	0.53
1.50	0.05	0.58
1.60	0.05	0.63
1.70	0.06	0.69
1.80	0.06	0.75
1.90	0.07	0.81
2.00	0.07	0.88
2.10	0.07	0.96
2.20	0.08	1.04
2.30	0.09	1.13
2.40	0.10	1.23
2.50	0.11	1.34
2.60	0.12	1.46
2.70	0.25	1.71
2.80	0.50	2.21
2.90	0.80	3.01
3.00	1.44	4.44
3.10	1.00	5.44
3.20	0.20	5.64
3.30	0.17	5.81
3.40	0.15	5.96
3.50	0.13	6.09
3.60	0.10	6.19
3.70	0.09	6.28
3.80	0.08	6.36
3.90	0.08	6.44
4.00	0.07	6.51
4.10	0.07	6.58
4.20	0.06	6.64
4.30	0.06	6.70
4.40	0.06	6.76
4.50	0.05	6.81
4.60	0.05	6.86
4.70	0.05	6.91
4.80	0.05	6.96
4.90	0.04	7.00
5.00	0.04	7.04
5.10	0.04	7.08
5.20	0.04	7.12
5.30	0.04	7.16
5.40	0.04	7.19
5.50	0.04	7.23
5.60	0.04	7.26
5.70	0.03	7.30
5.80	0.03	7.33
5.90	0.03	7.37
6.00	0.03	7.40

1000-year 6-hour SCS Type II "Early Peak" Hydrograph		
Time	Incremental Depth	Cumulative Depth
0.00	1.44	1.44
0.10	1.00	2.43
0.20	0.80	3.23
0.30	0.50	3.73
0.40	0.25	3.98
0.50	0.20	4.18
0.60	0.17	4.35
0.70	0.15	4.50
0.80	0.13	4.63
0.90	0.12	4.75
1.00	0.11	4.86
1.10	0.10	4.96
1.20	0.10	5.07
1.30	0.09	5.16
1.40	0.09	5.24
1.50	0.08	5.33
1.60	0.08	5.41
1.70	0.08	5.48
1.80	0.07	5.56
1.90	0.07	5.63
2.00	0.07	5.70
2.10	0.07	5.77
2.20	0.07	5.83
2.30	0.06	5.89
2.40	0.06	5.95
2.50	0.06	6.01
2.60	0.06	6.07
2.70	0.06	6.13
2.80	0.05	6.18
2.90	0.05	6.23
3.00	0.05	6.28
3.10	0.05	6.33
3.20	0.05	6.38
3.30	0.05	6.43
3.40	0.05	6.48
3.50	0.05	6.52
3.60	0.04	6.57
3.70	0.04	6.61
3.80	0.04	6.65
3.90	0.04	6.69
4.00	0.04	6.73
4.10	0.04	6.77
4.20	0.04	6.81
4.30	0.04	6.85
4.40	0.04	6.89
4.50	0.04	6.92
4.60	0.04	6.96
4.70	0.04	6.99
4.80	0.04	7.03
4.90	0.03	7.06
5.00	0.03	7.10
5.10	0.03	7.13
5.20	0.03	7.17
5.30	0.03	7.20
5.40	0.03	7.23
5.50	0.03	7.27
5.60	0.03	7.30
5.70	0.03	7.33
5.80	0.03	7.37
5.90	0.03	7.40
6.00	0.00	7.40

Rainfall Distribution - Hydrograph
Inflow Design Flow Control System Plan
East Ash Disposal Areas, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/23/2015
Checked by: MM Checked By Date: 9/24/2015



NOAA Atlas 14, Volume 2, Version 3
Location name: Memphis, Tennessee, USA*
Latitude: 35.072°, Longitude: -90.139°
Elevation: 229.07 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.419 (0.391-0.452)	0.490 (0.457-0.528)	0.558 (0.519-0.599)	0.610 (0.566-0.656)	0.672 (0.623-0.722)	0.716 (0.661-0.769)	0.760 (0.699-0.816)	0.799 (0.731-0.858)	0.847 (0.771-0.910)	0.883 (0.798-0.950)
10-min	0.670 (0.624-0.722)	0.784 (0.732-0.845)	0.893 (0.832-0.960)	0.975 (0.906-1.05)	1.07 (0.992-1.15)	1.14 (1.05-1.22)	1.21 (1.11-1.30)	1.27 (1.16-1.36)	1.34 (1.22-1.44)	1.39 (1.26-1.50)
15-min	0.837 (0.780-0.902)	0.986 (0.920-1.06)	1.13 (1.05-1.21)	1.23 (1.15-1.33)	1.36 (1.26-1.46)	1.45 (1.33-1.55)	1.53 (1.40-1.64)	1.60 (1.46-1.72)	1.69 (1.53-1.81)	1.75 (1.58-1.88)
30-min	1.15 (1.07-1.24)	1.36 (1.27-1.47)	1.60 (1.49-1.73)	1.79 (1.66-1.92)	2.01 (1.86-2.16)	2.18 (2.01-2.33)	2.34 (2.15-2.51)	2.49 (2.28-2.67)	2.69 (2.44-2.88)	2.83 (2.56-3.04)
60-min	1.43 (1.33-1.54)	1.71 (1.59-1.84)	2.06 (1.92-2.21)	2.33 (2.16-2.50)	2.68 (2.48-2.88)	2.95 (2.72-3.16)	3.22 (2.96-3.46)	3.49 (3.19-3.75)	3.85 (3.50-4.14)	4.13 (3.73-4.44)
2-hr	1.77 (1.65-1.90)	2.11 (1.97-2.27)	2.55 (2.38-2.75)	2.90 (2.69-3.12)	3.37 (3.11-3.61)	3.73 (3.44-4.00)	4.11 (3.77-4.41)	4.49 (4.10-4.81)	5.01 (4.54-5.38)	5.41 (4.87-5.82)
3-hr	1.90 (1.76-2.05)	2.27 (2.11-2.45)	2.74 (2.55-2.96)	3.13 (2.90-3.37)	3.64 (3.36-3.92)	4.05 (3.73-4.36)	4.47 (4.10-4.82)	4.91 (4.46-5.28)	5.51 (4.97-5.93)	5.98 (5.36-6.44)
6-hr	2.33 (2.17-2.52)	2.78 (2.58-3.01)	3.35 (3.11-3.63)	3.82 (3.54-4.13)	4.46 (4.12-4.81)	4.97 (4.57-5.36)	5.50 (5.03-5.92)	6.04 (5.49-6.51)	6.79 (6.12-7.32)	7.40 (6.60-7.97)
12-hr	2.82 (2.61-3.05)	3.36 (3.12-3.65)	4.09 (3.79-4.43)	4.67 (4.32-5.05)	5.47 (5.04-5.90)	6.10 (5.60-6.58)	6.76 (6.16-7.29)	7.44 (6.74-8.02)	8.37 (7.52-9.04)	9.12 (8.13-9.86)
24-hr	3.30 (3.07-3.54)	3.94 (3.68-4.25)	4.83 (4.50-5.19)	5.54 (5.15-5.95)	6.51 (6.03-6.99)	7.30 (6.73-7.83)	8.11 (7.44-8.70)	8.95 (8.18-9.62)	10.1 (9.15-10.9)	11.0 (9.93-11.9)
2-day	3.91 (3.66-4.17)	4.67 (4.37-4.99)	5.68 (5.31-6.07)	6.47 (6.04-6.90)	7.55 (7.03-8.05)	8.40 (7.79-8.97)	9.28 (8.56-9.91)	10.2 (9.33-10.9)	11.4 (10.4-12.2)	12.3 (11.1-13.3)
3-day	4.16 (3.89-4.45)	4.96 (4.64-5.32)	6.02 (5.63-6.45)	6.85 (6.39-7.33)	7.96 (7.40-8.51)	8.83 (8.18-9.46)	9.71 (8.96-10.4)	10.6 (9.74-11.4)	11.8 (10.8-12.8)	12.8 (11.5-13.8)
4-day	4.41 (4.12-4.73)	5.26 (4.92-5.65)	6.37 (5.94-6.83)	7.22 (6.73-7.75)	8.37 (7.77-8.98)	9.26 (8.57-9.95)	10.2 (9.36-10.9)	11.1 (10.1-11.9)	12.3 (11.2-13.3)	13.2 (11.9-14.4)
7-day	5.19 (4.86-5.56)	6.21 (5.82-6.64)	7.50 (7.02-8.03)	8.50 (7.93-9.09)	9.82 (9.13-10.5)	10.8 (10.1-11.6)	11.9 (11.0-12.7)	12.9 (11.9-13.9)	14.3 (13.0-15.4)	15.4 (13.9-16.6)
10-day	5.92 (5.55-6.32)	7.07 (6.62-7.54)	8.46 (7.92-9.03)	9.50 (8.89-10.1)	10.9 (10.1-11.6)	11.9 (11.1-12.7)	12.9 (12.0-13.8)	13.9 (12.9-14.9)	15.3 (14.0-16.4)	16.3 (14.8-17.5)
20-day	7.97 (7.48-8.49)	9.46 (8.88-10.1)	11.2 (10.5-11.9)	12.4 (11.6-13.2)	14.0 (13.1-14.9)	15.2 (14.2-16.2)	16.3 (15.2-17.4)	17.3 (16.1-18.5)	18.7 (17.3-20.0)	19.7 (18.1-21.1)
30-day	9.67 (9.09-10.3)	11.4 (10.8-12.2)	13.4 (12.6-14.3)	14.9 (14.0-15.8)	16.7 (15.7-17.8)	18.1 (16.9-19.3)	19.4 (18.1-20.7)	20.7 (19.2-22.1)	22.3 (20.6-23.8)	23.4 (21.6-25.1)
45-day	12.1 (11.4-12.8)	14.3 (13.4-15.2)	16.7 (15.6-17.7)	18.4 (17.2-19.5)	20.5 (19.2-21.8)	22.1 (20.7-23.5)	23.6 (22.0-25.1)	25.0 (23.3-26.6)	26.7 (24.8-28.5)	27.9 (25.8-29.9)
60-day	14.3 (13.5-15.2)	16.9 (15.9-18.0)	19.6 (18.4-20.9)	21.6 (20.2-22.9)	24.0 (22.4-25.5)	25.7 (24.0-27.3)	27.3 (25.5-29.0)	28.8 (26.8-30.7)	30.6 (28.4-32.6)	31.9 (29.5-34.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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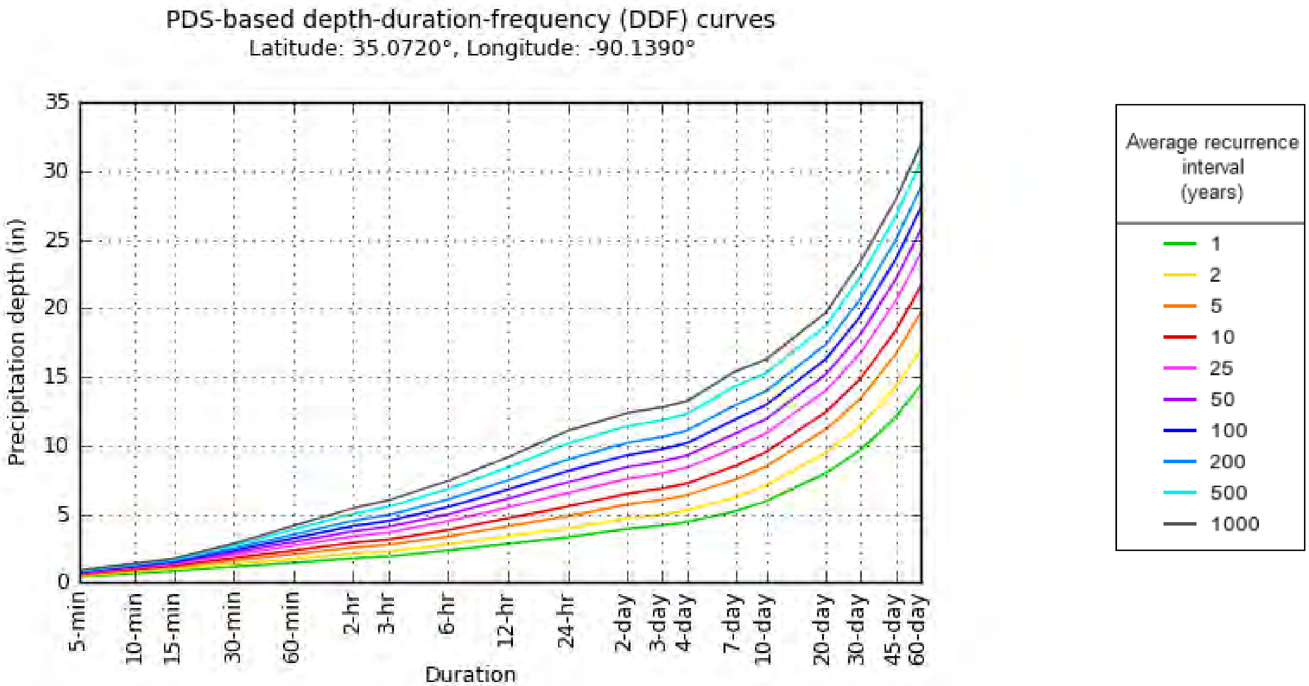
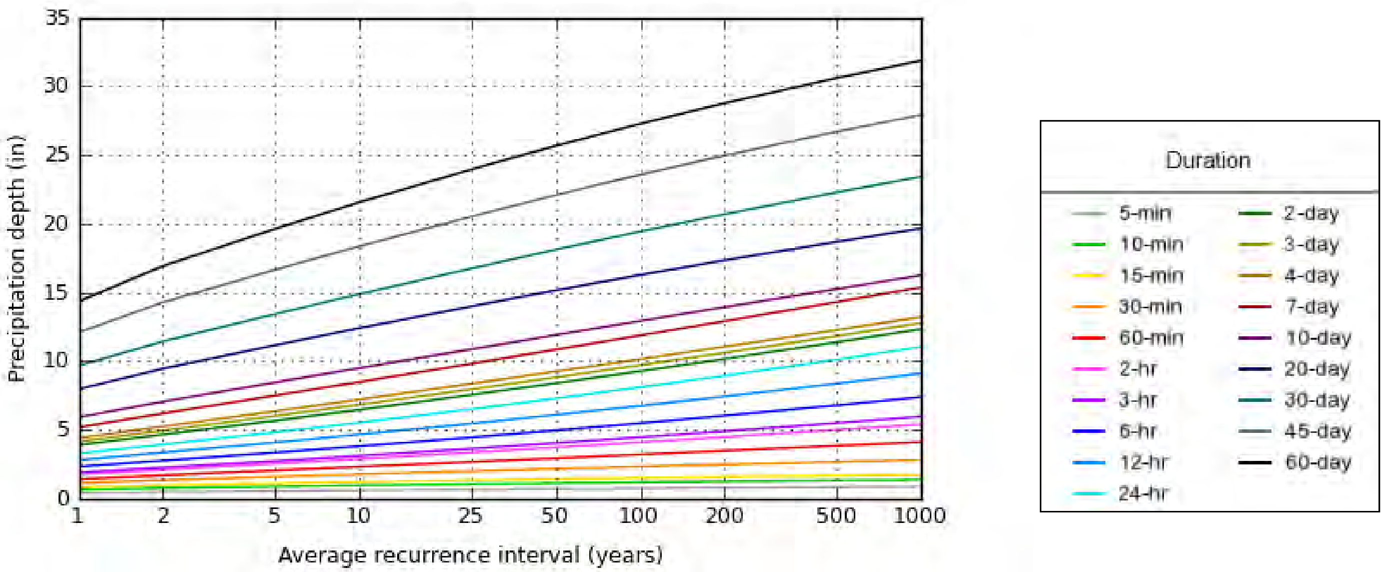
PF graphical





NOAA Atlas 14, Volume 2, Version 3 Created (GMT): Tue Oct 4 15:23:52 2016

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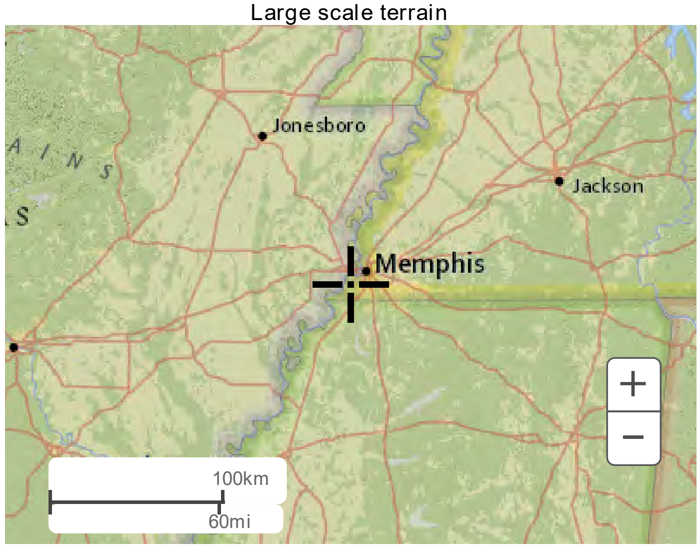
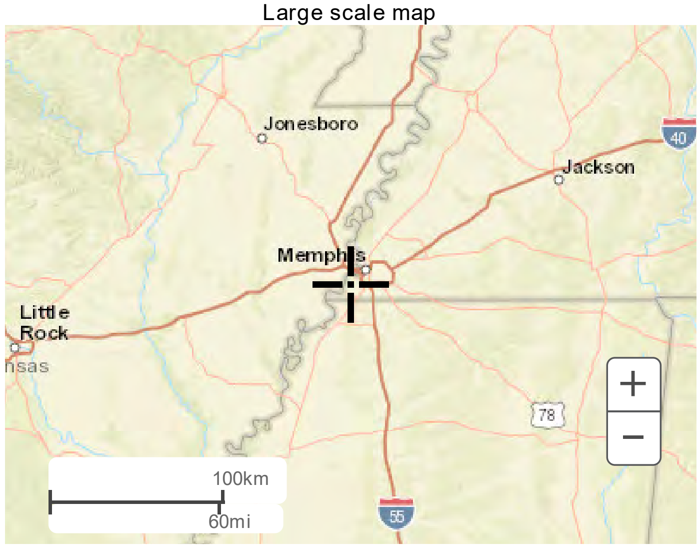
Maps & aerials

Small scale terrain

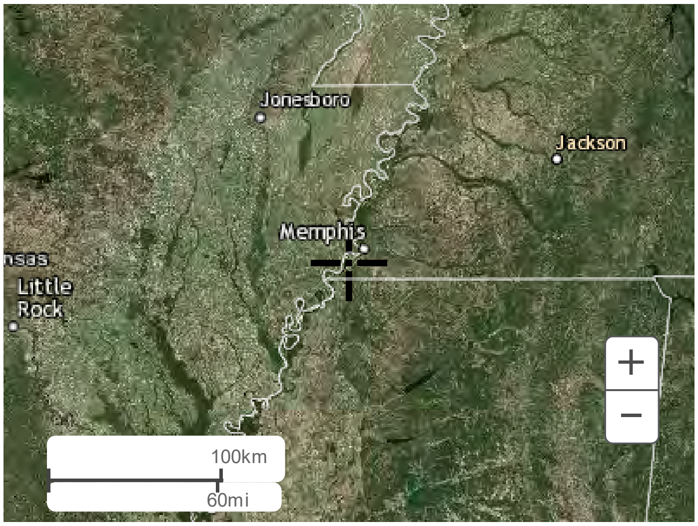
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
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Disclaimer

APPENDIX H
STAGE-STORAGE DATA

Stage -Storage Data
Inflow Design Flow Control System Plan
Stilling Pond, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/23/2015
Checked by: JJR Checked By Date: 9/25/2015

Stilling Pond Stage-Storage

Item No.	Basin Elevation (ft) (1)	Height (ft)	Cumulative Storage (ac-ft)	Cumulative Storage (cu. yds)	Cumulative Storage (cu. ft)
1	213.5	0.0	0.00	0.00	0
2	214.0	0.5	0.00	7.69	208
3	215.0	1.5	0.32	523.71	14,140
4	216.0	2.5	1.33	2138.23	57,732
5	217.0	3.5	3.17	5118.83	138,208
6	218.0	4.5	6.45	10405.76	280,956
7	219.0	5.5	10.72	17294.61	466,954
8	220.0	6.5	15.55	25084.29	677,276
9	221.0	7.5	20.77	33503.06	904,583
10	222.0	8.5	26.27	42384.37	1,144,378
11	223.0	9.5	32.00	51627.16	1,393,933
12	224.0	10.5	37.90	61141.04	1,650,808
13	225.0	11.5	43.93	70879.05	1,913,734
14	226.0	12.5	50.11	80842.65	2,182,752
15	227.0	13.5	56.43	91039.82	2,458,075
16	228.0	14.5	63.02	101678.21	2,745,312
17	229.0	15.5	69.85	112689.52	3,042,617
18	230.0	16.5	76.99	124214.77	3,353,799
19	231.0	17.5	84.39	136150.56	3,676,065
20	232.0	18.5	91.99	148403.45	4,006,893
21	233.0	19.5	99.76	160951.22	4,345,683
22	234.0	20.5	107.74	173822.03	4,693,195
23	235.0	21.5	115.94	187045.86	5,050,238
24	236.0	22.5	124.36	200631.22	5,417,043
25	237.0	23.5	133.08	214702.46	5,796,966

ft = feet; sf = square feet; ac = acre, ac-ft = acre feet; CB = calculation brief.

Stantec

Stage -Storage Data
Inflow Design Flow Control System Plan
Stilling Pond, Allen Fossil Plant
Project Number: 172675014
Calculation Performed by: TGC Calculation Date: 9/23/2015
Checked by: JJR Checked By Date: 9/25/2015

East Ash Pond Stage-Storage

Item No.	Basin Elevation (ft) (1)	Height (ft)	Cumulative Storage (ac-ft)	Cumulative Storage (cu. yds)	Cumulative Storage (cu. ft)
1	218.6	0.0	0.00	0	0
2	219.0	0.4	0.00	2	58
3	220.0	1.4	0.11	185	5,000
4	221.0	2.4	0.78	1,250	33,763
5	222.0	3.4	2.39	3,852	104,008
6	223.0	4.4	5.35	8,637	233,203
7	224.0	5.4	9.57	15,441	416,895
8	225.0	6.4	14.77	23,835	643,543
9	226.0	7.4	20.78	33,527	905,228
10	227.0	8.4	27.53	44,417	1,199,263
11	228.0	9.4	36.47	58,840	1,588,681
12	229.0	10.4	47.45	76,549	2,066,823
13	230.0	11.4	59.61	96,167	2,596,499
14	231.0	12.4	75.31	121,495	3,280,359
15	232.0	13.4	104.52	168,621	4,552,776
16	233.0	14.4	141.64	228,519	6,170,006
17	234.0	15.4	182.64	294,663	7,955,905
18	235.0	16.4	225.98	364,581	9,843,675
19	236.0	17.4	270.33	436,140	11,775,789
20	237.0	18.4	315.51	509,020	13,743,528

ft = feet; sf = square feet; ac = acre, ac-ft = acre feet; CB = calculation brief.