



October 6, 2016  
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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**

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## 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



October 6, 2016  
Page 2 of 2

**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.  
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(502) 212-5000

ATTACHMENTS:

Initial Inflow Design Flood Control System Plan



## **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

## Table of Contents

<b>1.0</b>	<b>BACKGROUND</b> .....	<b>1</b>
<b>2.0</b>	<b>EXISTING CONDITIONS</b> .....	<b>2</b>
<b>3.0</b>	<b>METHODS / DESIGN CRITERIA</b> .....	<b>4</b>
3.1	MODELING ASSUMPTIONS .....	5
3.2	HYDROLOGY INPUTS.....	5
3.2.1	Watershed Parameters.....	5
3.2.2	Spillway Data .....	7
3.2.3	Precipitation Data .....	9
3.2.4	Stage-Storage Data.....	9
3.2.5	Plant Process Flow .....	9
3.2.6	Starting Water Surface Elevations .....	9
3.3	HYDROLOGIC AND HYDRAULIC MODELING.....	10
<b>4.0</b>	<b>CALCULATION RESULTS</b> .....	<b>12</b>
4.1	CAPACITY AND FREEBOARD RESULTS.....	12
<b>5.0</b>	<b>CONCLUSIONS</b> .....	<b>14</b>
<b>6.0</b>	<b>REFERENCES</b> .....	<b>15</b>

### LIST OF TABLES

Table 1	Watershed Parameters .....	6
Table 2	Stilling Pond Spillway Data.....	7
Table 3	Summary of Hydrologic/Hydraulic Modeling Scenarios .....	11
Table 4	Hydrologic and Hydraulic Modeling Results for Normal Operations.....	12
Table 5	Hydrologic and Hydraulic Modeling Results for Gate Closure Scenario .....	13

### LIST OF FIGURES

Figure 1	Allen Fossil Plant Map .....	1
Figure 2	Map of Hydraulic Structures.....	2
Figure 3	HEC-HMS Model Schematic.....	10

# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

## LIST OF APPENDICES

APPENDIX A	HYDROLOGIC OVERVIEW MAP
APPENDIX B	WATERSHED MAP
APPENDIX C	CURVE NUMBER MAP AND COMPUTATIONS
APPENDIX D	LAG TIME COMPUTATIONS
APPENDIX E	REFERENCE DRAWINGS
APPENDIX F	RATING CURVES
APPENDIX G	PRECIPITATION DATA
APPENDIX H	STAGE-STORAGE DATA

# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Background  
October 6, 2016

## 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

# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Existing Conditions  
October 6, 2016

## 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-foot 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

## **INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN**

Existing Conditions  
October 6, 2016

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).

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
October 6, 2016

### 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.

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
October 6, 2016

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 runoff 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.

# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
October 6, 2016

**Table 1 Watershed Parameters**

<b>Watershed</b>	<b>Drainage Area (acres)</b>	<b>Composite Curve Number</b>	<b>Estimated Lag Time (min)</b>
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:

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
October 6, 2016

- **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

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
October 6, 2016

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:

$$Q = C_w LH^{\frac{3}{2}} \quad \text{Eqn. 1}$$

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:

$$Q = C_0 A(2gH)^{0.5} \quad \text{Eqn. 2}$$

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.

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
October 6, 2016

### Outlet Pipe – Orifice flow

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

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

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

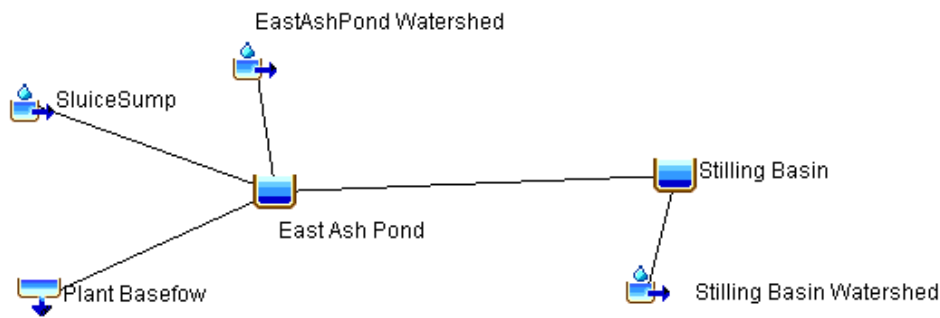
The starting water surface elevations for the East Ash Pond and Stilling Pond were set to the water surface elevation at which the outflow structures would pass the plant process flow.

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
October 6, 2016

### 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.

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
October 6, 2016

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 <sup>1</sup>
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'

<sup>1</sup> 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.

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Calculation Results  
October 6, 2016

### 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

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Calculation Results  
October 6, 2016

**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

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Conclusions  
October 6, 2016

### 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.

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

References  
October 6, 2016

### 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.
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3. Brater, E.F. and H.W. King (1976), "Handbook of Hydraulics", McGraw-Hill, New York.
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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**

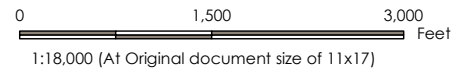
Title  
**HYDROLOGIC OVERVIEW MAP  
EAST ASH POND DISPOSAL AREA**

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

Project Location: Memphis, TN

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

172675014



**Legend**

 Flow Arrows

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



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, SCS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

\\us1229-01\work\_group\17267501\AO3\_data\ALF\_CCR\_R\in\EA\EA\_CCR\_R\in\Demom\inflow\Report\CCF\_Rule\inflow\Design\Plan\ALF\_Submittal\_Jan\_2014\_Report\Appendices\Appendix\_A\_Hydrologic\_Overview\_Map\inflow\map.mxd  
 Revised: 2016-09-27 By: mmeethan  
 291994  
 295275  
 298556  
 301837

**APPENDIX B  
WATERSHED MAP**

761153



McKellar Lake

Sluice Sump

East Ash Pond

Stilling Pond

Figure No.

2

Title

### WATERSHED MAP EAST ASH POND DISPOSAL AREA

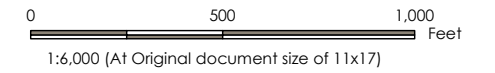
Client/Project

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




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 from LIDAR dated March 11, 2014.
3. TVA Aerial Imagery dated 2015.



275590

\\us1229-01\work\_group\172675014\03\_data\ALF\_CCR\in\EA\A\_CCR\_R\in\Demom\inflow\Report\ALF\Appendix\Appendix\_C\Watershed Map\watershed map.mxd Revised: 2014-09-27 By: mmeahon

272309

272309

761153

**APPENDIX C**  
**CURVE NUMBER MAP AND**  
**COMPUTATIONS**

761153

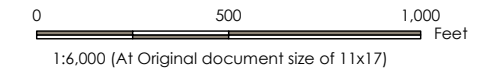


Watershed Name	Area (Acres)	Composite Curve Number	Estimated Lag Time (min)
East Ash Pond	136.0	93	12.2
Stilling Pond	9.7	95	3.5
Sluice Sump	6.3	80	3.5

Figure No. **3**  
**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



### 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 from LIDAR dated March 11, 2014.  
3. TVA Aerial Imagery dated 2015.



\\us1229-01\work\_group\172675014\03\_data\ALF\_CCR\EA\EA\_CCR\_R\in\_Demonstration\Report\_CCR\_Rule\Inflow\_Design\_Plan\ALF\_Submittal\_Jan\_2015\Report\_Appendices\_Appendix\_D\_-\_Curve\_Number\_Map\Curve\_Number\_Map.mxd  
Revised: 2016-09-27 By: mmehon  
275590  
272309  
761153



### 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
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

1. Surface description
2. Manning's roughness coef., n
3. Flow length, L (Total L less than 300/100 ft)
4. Two-year, 24-hour Rainfall, P2
- 5a. Upstream elevation
- 5b. Downstream elevation
5. Land slope, S
6.  $T_t = [0.007(nL)^{0.8}]/[\text{sqrt}(P_2) S^{0.4}]$

Segment ID	3	
Smooth surfaces (concrete, asphalt, gravel, bare soil)		
	0.011	
ft	180	
in	3.72	
ft	240	
ft	238	
ft / ft	0.011	
hr	0.04	

= 0.04 hr

#### Shallow Concentrated Flow

7. Surface description (paved or unpaved)
8. Flow length, L
- 9a. Upstream elevation
- 9b. Downstream elevation
9. Watercourse slope, S
10. Average velocity, V
11.  $T_t = L / 3600V$

Segment ID		
ft		
ft		
ft		
ft / ft		
ft / s		
hr		

= 0.00 hr

#### Open Channel Flow

12. Pipe or Open Channel
13. Diam (pipe) or depth (open)
14. Base width (open)
15. Channel side slope
16. Cross sectional flow area
17. Wetted perimeter, Pw
18. Hydraulic radius,  $r = a/P_w$
- 19a. Upstream elevation
- 19b. Downstream elevation
19. Channel slope, S
20. Runoff surface / pipe material
21. Manning's roughness coef., n
22.  $V = (1.49 r^{2/3} S^{1/2} / n)$
23. Flow length, L
24.  $T_t = L / 3600V$

Segment ID		
ft		
ft		
XH:1V		
ft <sup>2</sup>		
ft		
ft		
ft		
ft		
ft / ft		
	earth, winding, grass weeds	
ft / s		
ft		
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

1. Surface description
2. Manning's roughness coef., n
3. Flow length, L (Total L less than 300/100)
4. Two-year, 24-hour Rainfall, P2
- 5a. Upstream elevation
- 5b. Downstream elevation
5. Land slope, S
6.  $T_t = [0.007(nL)^{0.8}]/[\text{sqrt}(P_2) S^{0.4}]$

Segment ID	1	2
Smooth surfaces (concrete, asphalt)	(concrete, asphalt)	(concrete, asphalt, gravel, bare soil)
	0.011	0.011
ft	100	100
in	3.72	3.72
ft	292	292
ft	270	281
ft / ft	0.220	0.110
hr	0.01	0.01

= 0.01 hr

#### Shallow Concentrated Flow

7. Surface description (paved or unpaved)
8. Flow length, L
- 9a. Upstream elevation
- 9b. Downstream elevation
9. Watercourse slope, S
10. Average velocity, V
11.  $T_t = L / 3600V$

Segment ID	1	2
	Unpaved	Unpaved
ft	2375	2165
ft	270	281
ft	234	234
ft / ft	0.015	0.022
ft / s	2.0	2.4
hr	0.33	0.25

= 0.33 hr

#### Open Channel Flow

12. Pipe or Open Channel
13. Diam (pipe) or depth (open)
14. Base width (open)
15. Channel side slope
16. Cross sectional flow area
17. Wetted perimeter, Pw
18. Hydraulic radius,  $r = a/P_w$
- 19a. Upstream elevation
- 19b. Downstream elevation
19. Channel slope, S
20. Runoff surface / pipe material
21. Manning's roughness coef., n
22.  $V = (1.49 r^{2/3} S^{1/2} / n)$
23. Flow length, L
24.  $T_t = L / 3600V$

Segment ID		
ft		
ft		
XH:1V		
ft <sup>2</sup>		
ft		
ft		
ft		
ft		
ft / ft		
	earth, winding, grass weeds	
ft / s		
ft		
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

1. Surface description
2. Manning's roughness coef., n
3. Flow length, L (Total L less than 300/100 ft)
4. Two-year, 24-hour Rainfall, P2
- 5a. Upstream elevation
- 5b. Downstream elevation
5. Land slope, S
6.  $T_t = [0.007(nL)^{0.8}]/[\text{sqrt}(P_2) S^{0.4}]$

Segment ID	1	
	Grass, short prairie	
	0.15	
ft	40	
in	3.72	
ft	236	
ft	230	
ft / ft	0.150	
hr	0.03	

= 0.03 hr

#### Open Channel Flow

12. Pipe or Open Channel
13. Diam (pipe) or depth (open)
14. Base width (open)
15. Channel side slope
16. Cross sectional flow area
17. Wetted perimeter, Pw
18. Hydraulic radius,  $r = a/P_w$
- 19a. Upstream elevation
- 19b. Downstream elevation
19. Channel slope, S
20. Runoff surface / pipe material
21. Manning's roughness coef., n
22.  $V = (1.49 r^{2/3} S^{1/2} / n)$
23. Flow length, L
24.  $T_t = L / 3600V$

Segment ID	2	
ft		
ft		
XH:1V		
ft <sup>2</sup>		
ft		
ft		
ft		
ft		
ft / ft		
	earth, winding, grass weeds	
ft / s		
ft		
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

PREPARED BY



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

10W507-01	COVER SHEET
10W507-02	GENERAL NOTES
10W507-03	PLAN
10W507-04	SECTIONS
10W507-05	DETAILS
10W507-06	DETAILS
10W507-07	DETAILS

**RECORD DRAWING**



**SITE LOCATION MAP**  
NOT TO SCALE

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESODX00030020110005		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		R 0 05/10/11 RGS PS PVK SFF SEB MST JCK - - -										
REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RWD	APPD	ISSD	PROJECT ID	AS CONST	DATE	
SCALE: NONE EXCEPT AS NOTED												
YARD EAST STILLING POND-EASTERN PERIMETER DIKE REMEDIAL IMPROVEMENTS COVER SHEET WORK PLAN 6 (ALF-110510-WP-06)												
DESIGNED BY: R.G. SCHUFF		DRAWN BY: P. SILPACHARN		CHECKED BY: P.V. KISER		SUPERVISED BY: S.F. FIELD		REVIEWED BY: S.E. BENNETT		APPROVED BY: M.S. TURNBOW		ISSUED BY: J.C. KAMMEYER
 Stantec Consulting Services Inc. 601 Grassmere Park Road Suite 22 Nashville, Tennessee 37211 Tel. 615.885.1144 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		

**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**

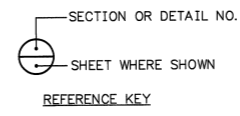
- THE CONTRACTOR SHALL CONFINE ALL SPECIFIC WORK ACTIVITIES TO THE AREA DEFINED BY THE PLANS OR APPROVED BY THE OWNER (TENNESSEE VALLEY AUTHORITY). ACCESS INTO THE WORK AREA FOR DELIVERY OF EQUIPMENT, MATERIALS AND WORKFORCE SHALL BE REVIEWED DAILY BY THE CONTRACTOR, AND CONTROLLED AS NEEDED TO PREVENT ANY DAMAGE TO THE CREST AND SLOPES OF THE DIKES SURROUNDING THE ASH POND.
- 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.
- 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.
- 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.
- UTILITY STAKING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- ACCEPTABLE CONSTRUCTION TOLERANCES FROM PLAN DIMENSIONS, ELEVATIONS, AND GRADES SHALL BE AS FOLLOWS:  
 -EXCAVATIONS AND FINAL GRADES FOR EARTH SURFACES AND SLOPES:  $\pm$  0.25 FEET  
 -RIPRAP: FINAL GRADE +0.5 FEET, THICKNESS ZERO TO +0.5 FEET  
 -OUTLET WEIR:  $\pm$ 0.05 FEET, AND ALL STRUCTURES WITHIN 0.5 INCHES
- 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 INSTALLATIONS 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.
- 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.
- 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.
- THE ENGINEER WILL PROVIDE QUALITY ASSURANCE AND WILL OBSERVE CONSTRUCTION ACTIVITIES.
- 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'  $\pm$ ) RESULTING IN A SURFACE ELEVATION OF ABOUT 229.8'  $\pm$ . SEE SHEET 06 FOR AS-BUILT ELEVATION.
- 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.
- 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 ( $\pm$ 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.
- CONTRACTOR WILL RECALIBRATE ELECTRONIC WATER LEVEL GAUGE FOR NEW OPERATING RANGE.
- 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.

- 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.
- THE OUTFALLS 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.
- 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.
- THE OWNER SHALL BE RESPONSIBLE FOR MITIGATING EFFECTS OF POOL DRAWDOWN ON PH, TOTAL SUSPENDED SOLIDS (TSS), AMMONIA AND DIKE STABILITY.
- CONCRETE FOR STOP LOGS SHALL BE 4,000 PSI MEETING THE REQUIREMENTS FOR PRE-CAST CONCRETE IDENTIFIED IN THE PROJECT SPECIFICATIONS.
- SIPHON CONTROL VALVES AND SIPHON FILL PORT BALL VALVES SHALL BE EQUIPPED WITH A LOCKING MECHANISM TO PREVENT OPERATION OF THE HANDWHEEL.
- 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.
- LOCATION FOR DISPOSAL OF DREDGED MATERIALS IS SHOWN ON SHEET 10W507-03.

**GENERAL PROJECT WORK SEQUENCING**

- CONSTRUCT AND INSTALL PRE-CAST STOP LOG(S) ON THE DIVIDER DIKE WEIR
- INSTALL SEDIMENT CONTROL CURTAIN
- PLACE RIP-RAP ALONG THE EAST TOE OF THE DIVIDER DIKE
- INSTALL SIPHON AND LOWER WATER LEVEL TO 224'. MAINTAIN WITHIN  $\pm$ 0.1' DURING CONSTRUCTION.
- REMOVE SPILLWAY SKIMMERS, INSPECT AND MAKE RECOMMENDED REPAIRS
- INSPECT CONDITION OF RISERS AND CCTV INSPECT OUTLET PIPES.
- INSTALL CIPP LINER IN PRIMARY AND SECONDARY SPILLWAY OUTLET PIPES (4). ENGINEER TO CONFIRM THIS WORK BASED ON TV INSPECTION PRIOR TO PROCEEDING.
- INSTALL PIPE PLUGS
- INSTALL SPECTRASHIELD LINER
- REMOVE SPILLWAY WIERS, INSPECT AND MAKE RECOMMENDED REPAIRS
- CUT OFF RISERS
- DREDGE ASH NEAR SPILLWAYS
- PLACE RIP-RAP AROUND SPILLWAYS
- REMOVE PIPE PLUGS
- REINSTALL SPILLWAY WEIRS
- REINSTALL SKIMMERS.
- REMOVE SEDIMENT CONTROL CURTAIN.
- 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 QUANTITIES ONLY. TABLE NOT UPDATED POST-CONSTRUCTION TO REFLECT ACTUAL QUANTITIES INSTALLED.

\*\*INCLUDES INSTALLATION, MAINTENANCE AND REMOVAL

\*\*\*SIPHON SYSTEM INCLUDES 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 REPLACEMENT 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.

**RECORD DRAWING**

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFSCDX00030020110005

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	INVD	APPR	ISSD	PROJECT	AS CONST

SCALE: NONE EXCEPT AS NOTED

**YARD EAST STILLING POND - EASTERN PERIMETER DIKE**

**REMEDIAL IMPROVEMENTS**

**GENERAL NOTES**

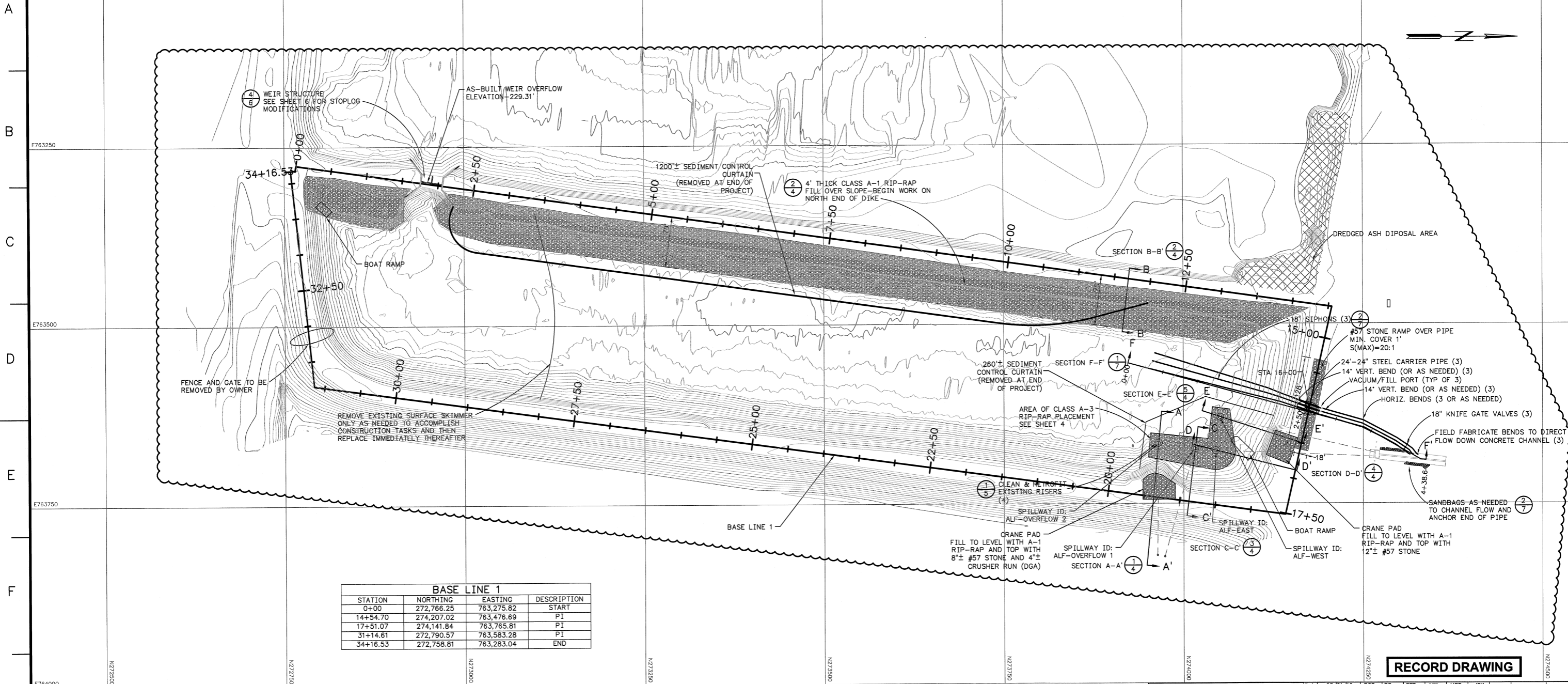
**WORK PLAN 6 (ALF-110510-WP-06)**

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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ALLEN FOSSIL PLANT  
 TENNESSEE VALLEY AUTHORITY  
 FOSSIL AND HYDRO ENGINEERING

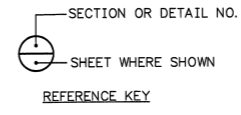
AUTOCAD R 2000 DATE 05/10/11 38 C 10W507-02 R 1



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

**PLAN VIEW**  
SCALE: 1"=50'  
GRAPHIC SCALE: 1"=50'  
CONTOUR INTERVAL = 1'

**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.



FOR SUPPORTING DESIGN CALCULATIONS  
SEE FPGALFFESCDX00030020110005

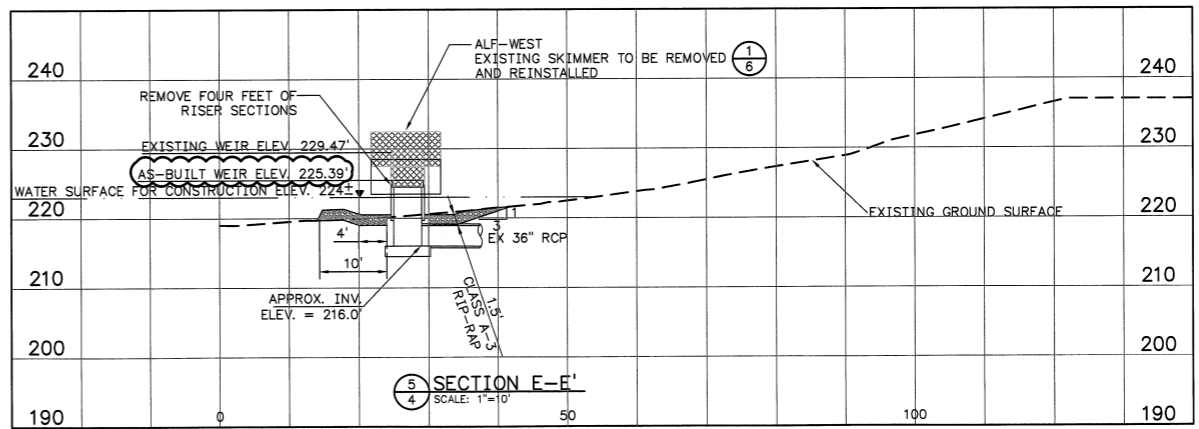
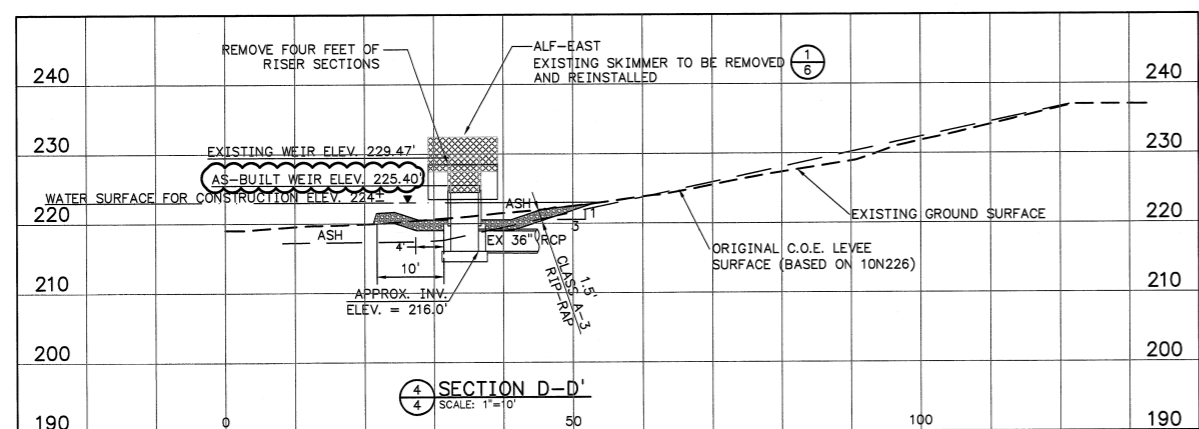
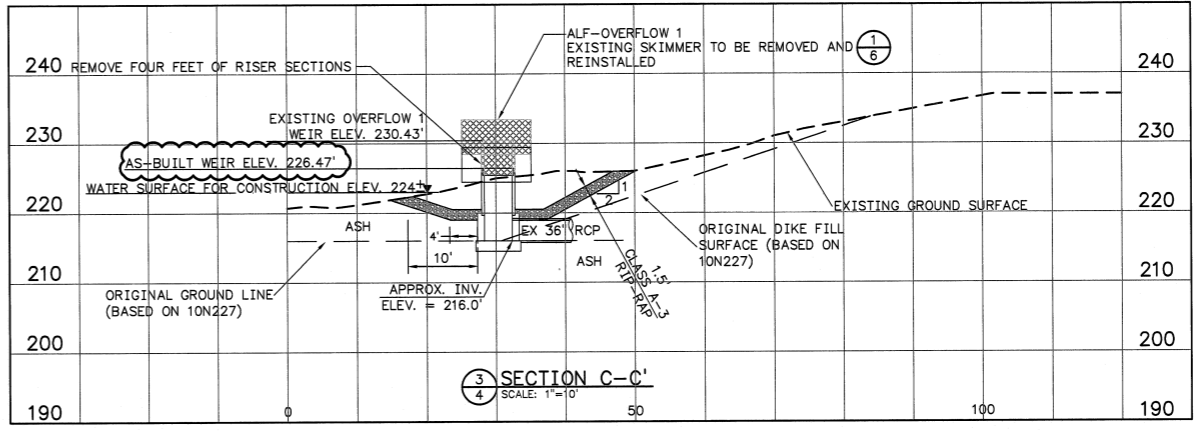
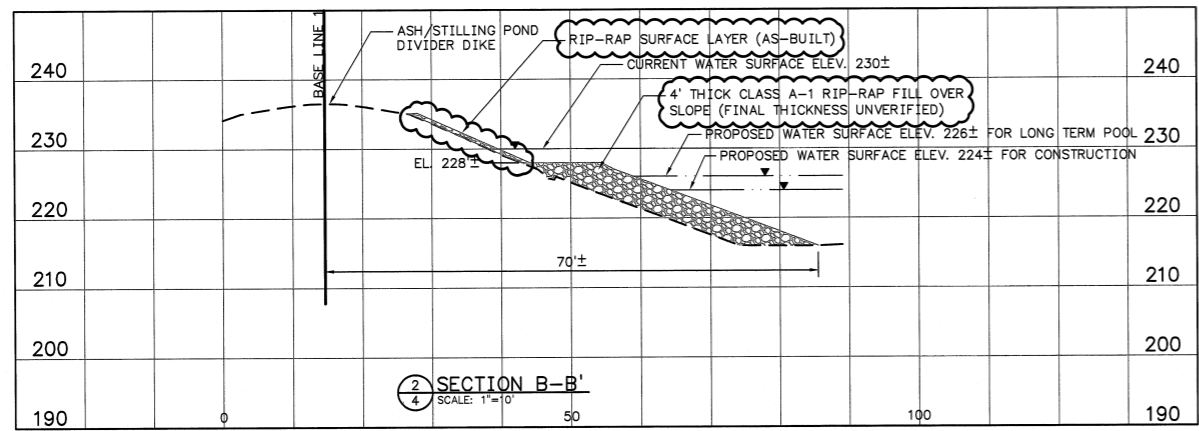
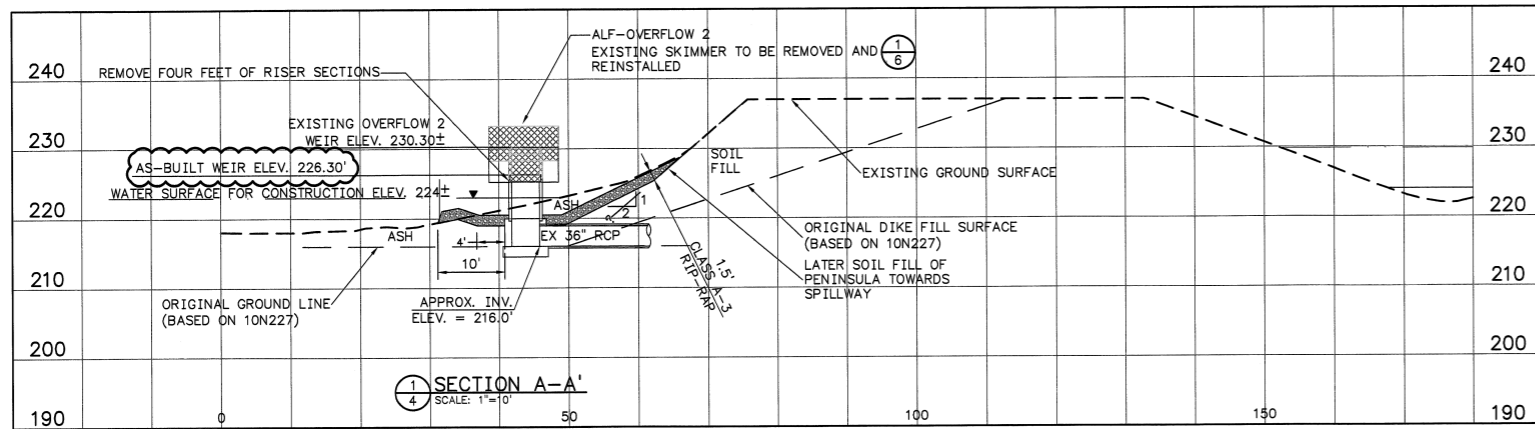


R 1	03/01/12	RGS	PS	SFF	SFF	MST	JCK	-	-	-	-	-	-
R 0	05/10/11	RGS	PS	PKV	SFF	SEB	MST	JCK	-	-	-	-	-

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:	R.G. SCHUFF	DRAWN BY:	P.V. SILPACHARN	CHECKED BY:	P.V. KISER	SUPERVISED BY:	S.F. FIELD	REVIEWED BY:	S.E. BENNETT	APPROVED BY:	M.S. TURNBOW	ISSUED BY:	J.C. KAMMEYER
ALLEN FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING													
AUTOCAD R 2000	DATE	05/10/11	38	C	10W507-03	R 1							

**RECORD DRAWING**

A  
B  
C  
D  
E  
F  
G  
H



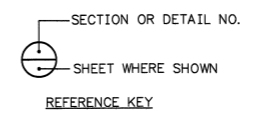
RECORD DRAWING

DREDGING AND STONE PLACEMENT (TYP OF 4):

- 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.
- SLOPE DREDGED ASH SURFACE AT 3:1 OR 2:1 TO DAYLIGHT AS INDICATED IN DRAWING.
- PLACE 18" OF TDOT CLASS A-3 RIP-RAP OVER CUT ASH SURFACE FROM RISER TO AT LEAST 10' FROM RISER.
- 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

- CONTRACTOR SHALL PLACE RIP-RAP ON THE DIVIDER DIKE FROM NORTH TO SOUTH AND FROM THE BOTTOM OF THE SLOPE UPWARDS
- 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.
- RIP-RAP SHALL NOT BE STOCKPILED ON THE DIVIDER DIKE EXCEPT IN AREAS ABOVE WHICH THE RIP-RAP FILL HAS BEEN COMPLETED.



FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX00030020110005

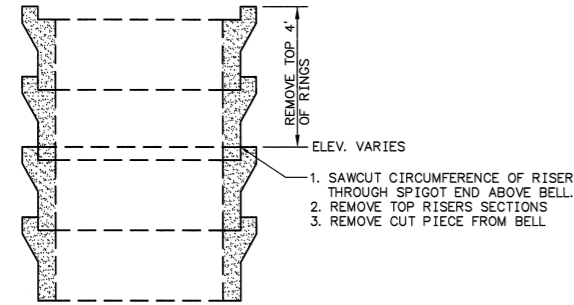
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www.stantec.com

REV. NO.	DATE	DRGN	DRWN	CHKD	SUPV	RVDG	APPD	ISSD	PROJECT	AS CONST.
R 1	03/01/12	RGS	IPS	SFF	SFF	SEB	MST	JCK		
R 0	05/10/11	RGS	IPS	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:	DRWN BY:	CHKD BY:	SUPVISED 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				
ALLEN FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING										
AUTOCAD R 2000	DATE 05/10/11	38	C	10W507-04	R 1					

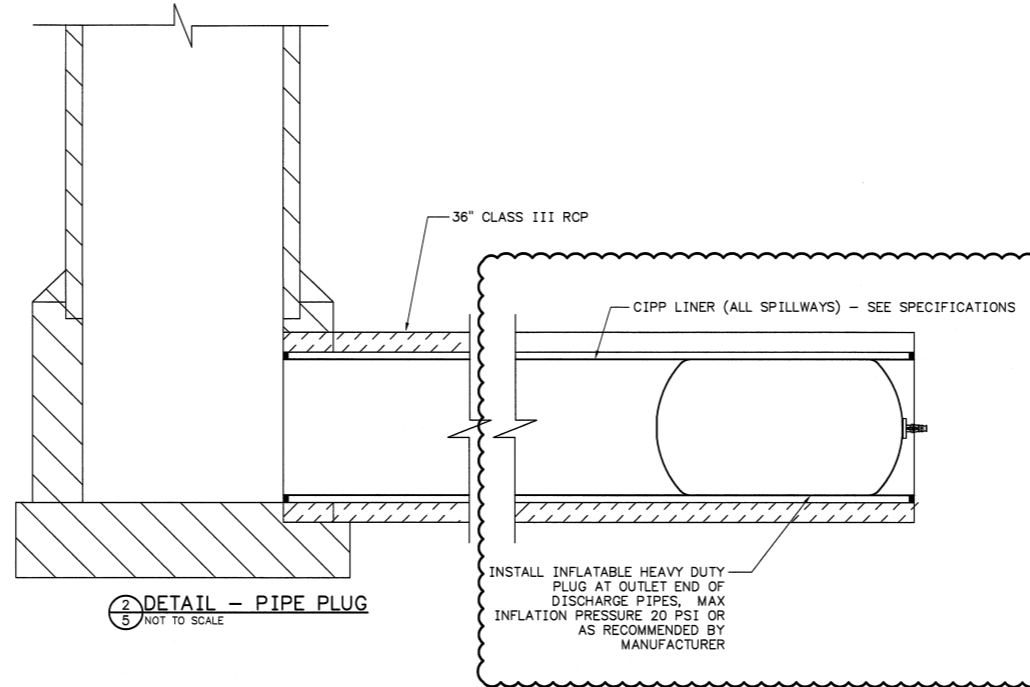
**WEIR ELEVATIONS:**

SPILLWAY ID	EXISTING ELEV. (FT)
ALF-EAST	229.47
ALF-WEST	229.47
ALF-OVERFLOW 1	230.43
ALF-OVERFLOW 2	230.30

AS-BUILT ELEV. (FT)
225.40
225.39
226.47
226.30



1  
5  
**DETAIL - EXISTING RISER RETROFITS**  
NOT TO SCALE



2  
5  
**DETAIL - PIPE PLUG**  
NOT TO SCALE

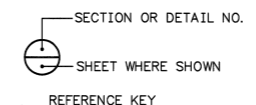
**INFLATABLE PLUG NOTES:**

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

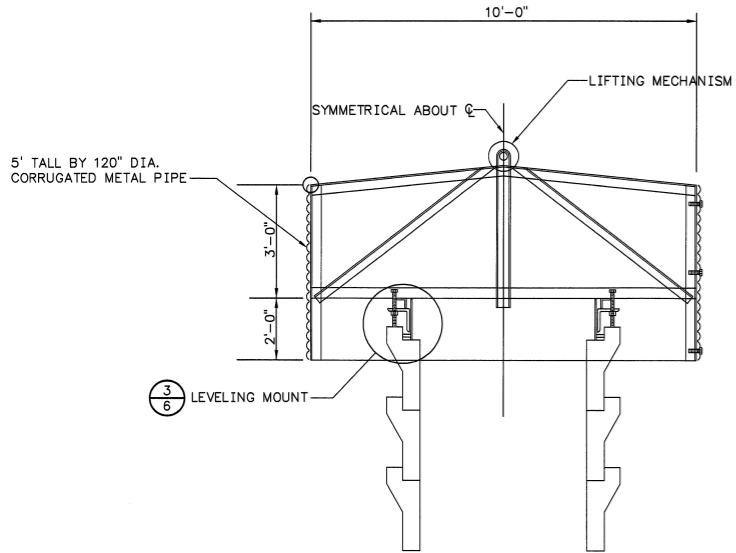
**SPILLWAY RETROFIT SEQUENCING:**

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

**RECORD DRAWING**



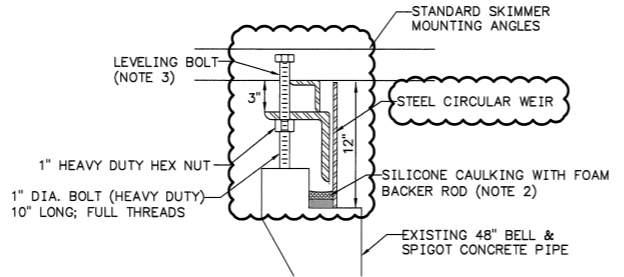
FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX00030020110005		R 1 03/01/12 RGS PS SFF SFF MST JCK - - - -	
ISSUED AS-BUILT AS PER WORK PLAN 6 (ALF-110510-WP-06)		R 0 05/10/11 RGS PS PVK SFF SEB MST JCK - - - -	
ISSUED FOR CONSTRUCTION		REV. NO. DATE DSN DRN DRD SUPV RYWD APPD ISSD PROJECT AS CONST	
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: R.G. SCHUFF DRAWN BY: P. SILPACHARN CHECKED BY: P.V. KISER SUPERVISED BY: S.F. FIELD REVIEWED BY: S.E. BENNETT APPROVED BY: M.S. TURNBOW ISSUED BY: J.C. KAMMEYER		RICHARD G. SCHUFF REGISTERED PROFESSIONAL ENGINEER STATE OF TENNESSEE No. 00105 03/01/2012	
ALLEN FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING			
AUTOCAD R 2000		DATE 05/10/11 38 C 10W507-05 R 1	



1 DETAIL - EXISTING SKIMMER  
6 NOT TO SCALE

NOTES:

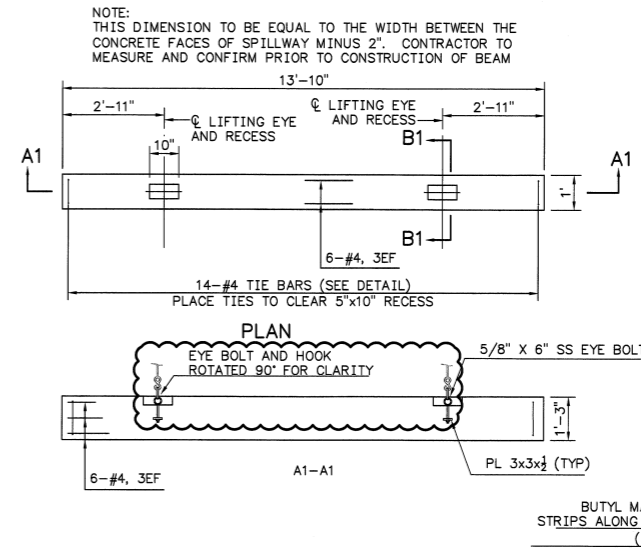
- SKIMMER SHALL BE CAREFULLY REMOVED BY CONTRACTOR, PRESSURE WASHED AND STORED FOR REINSTALLATION UPON COMPLETION OF RISER MODIFICATIONS.
- CONTRACTOR SHALL USE CLEAN WATER ONLY FOR SKIMMER WASHING AND DISCHARGE WATER TO STILLING POND.
- DETAILS SHOWN ON THESE PLANS ARE FOR CONTRACTOR GENERAL REFERENCE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



3 DETAIL - LEVELING MOUNT  
6 NOT TO SCALE

NOTES:

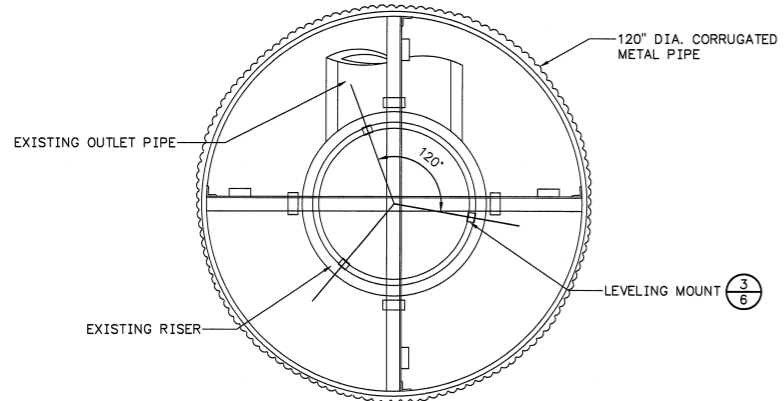
- FOR SKIMMER AND SPILLWAY DETAILS, REFER TO TVA DRAWING 10N229-2.
- CAULKING SHALL EXTEND COMPLETELY AROUND THE WEIR AND FORM A WATER TIGHT SEAL.
- WHEN THE WEIR IS REINSTALLED, THE TOP SHALL BE LEVELED WITH THE USE OF LEVELING BOLTS.



4 DETAIL - PRE-CAST STOP LOG  
6 SCALE: 1"=1'-0"

NOTES:

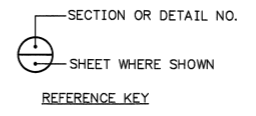
- CONTRACTOR TO FABRICATE TWO PRE-CAST CONCRETE STOP LOGS AS DETAILED.
- ONE NEW STOP LOG TO BE INSTALLED IN SOUTH SPILLWAY CHANNEL. SECOND STOP LOG TO BE STORED ON SITE AS PER OWNER DIRECTION.
- TOP OF EXISTING STOP LOG IN SOUTH CHANNEL - 228.05' (PER SURVEY DATA PROVIDED BY TRANSASH 5-6-11)
- HEIGHT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



2 DETAIL - TOP VIEW OF SKIMMER  
6 NOT TO SCALE

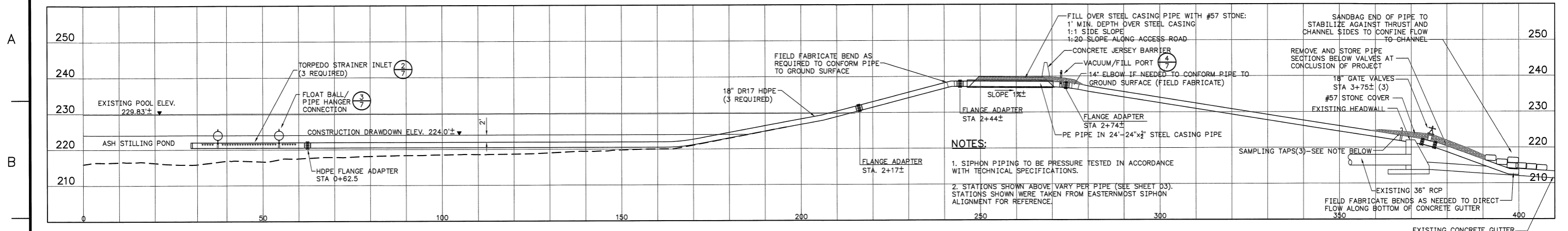
RECORD DRAWING

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX00030020110005		R 1	03/01/12	RGS	IPS	SFF	SFF	SEB	MST	JCK	-	-	-	-
		R 0	05/10/11	RGS	IPS	PWK	SFF	SEB	MST	JCK	-	-	-	-
		ISSUED FOR CONSTRUCTION												
		REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVND	APPD	ISSD	PROJECT ID	AS CONST	REV	DATE
		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	M.S. TURNBOW	J.C. KAMMEYER						
		ALLEN FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING												
		AUTOCAD R 2000	DATE	05/15/11	38	C	10W507-06	R 1						



SECTION OR DETAIL NO.  
SHEET WHERE SHOWN  
REFERENCE KEY



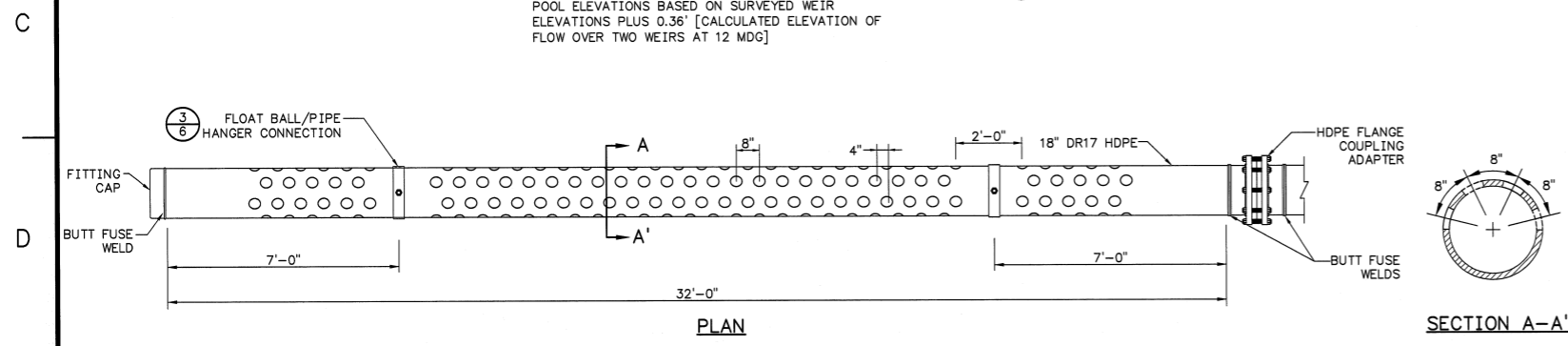


- NOTES:**
- SIPHON PIPING TO BE PRESSURE TESTED IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.
  - STATIONS SHOWN ABOVE VARY PER PIPE (SEE SHEET D3). STATIONS SHOWN WERE TAKEN FROM EASTERNMOST SIPHON ALIGNMENT FOR REFERENCE.

- SAMPLING TAP NOTES:**
- SAMPLING TAP ASSEMBLY TO INCLUDE:
- 18"x3/4" STAINLESS STEEL, CAST IRON OR BRASS SERVICE SADDLE
  - CORPORATION STOP
  - 3/4" GALV. IPS PIPE AND FITTINGS
  - 3/4" BRONZE BALL VALVE
  - 3' - RUBBER HOSE

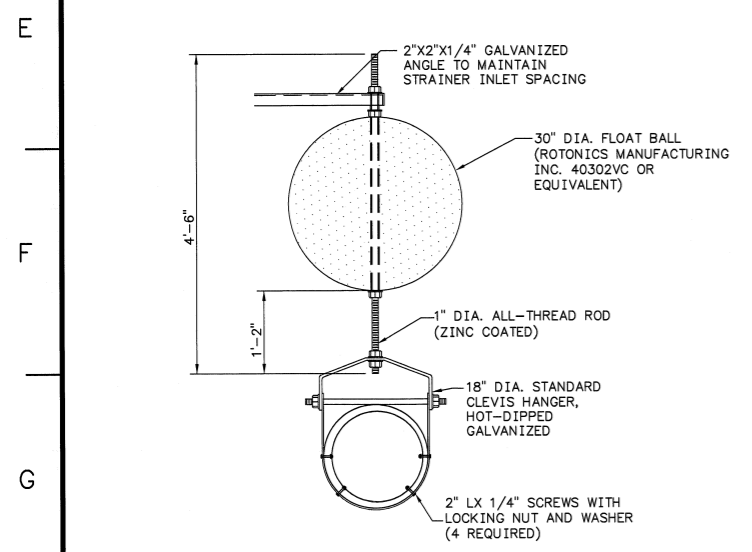
**NOTE:**  
POOL ELEVATIONS BASED ON SURVEYED WEIR ELEVATIONS PLUS 0.36' [CALCULATED ELEVATION OF FLOW OVER TWO WEIRS AT 12 MDG]

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



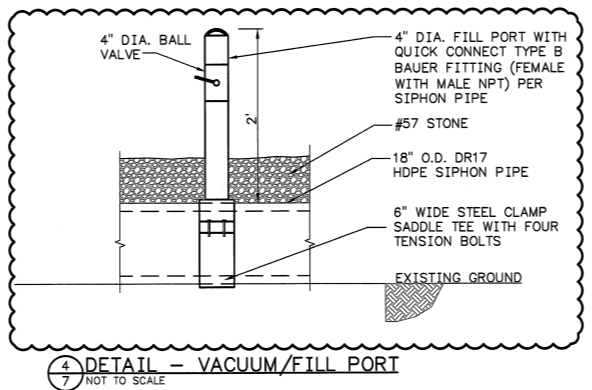
- NOTES:**
- HOLES WILL BE ON TOP HALF OF PIPE ONLY.
  - 4" DIA. HOLES (±1/8") AT 8" CENTER TO CENTER (±0.5").
  - 140 HOLES PER STRAINER (4 ROWS WITH 35 HOLES EACH).
  - ROWS ARE TO BE 8"(±0.5") APART CENTER TO CENTER, AND THE HOLES WILL BE OFFSET BY 4"(±0.5").
  - PROVIDE 2 FOOT LENGTH WITHOUT HOLES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

DETAIL - TORPEDO STRAINER INLET  
SCALE: 1/2"=1'-0"

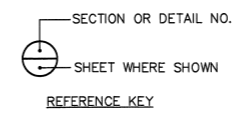


**NOTE:**  
ADJUST POSITION OF FLOAT BALL ON ALL TREAD ROD TO PLACE TOP OF TORPEDO STRAINER 2' BELOW WATER SURFACE ±1"

DETAIL - FLOAT BALL/PIPE HANGER CONNECTION  
SCALE: 1"=1'-0"



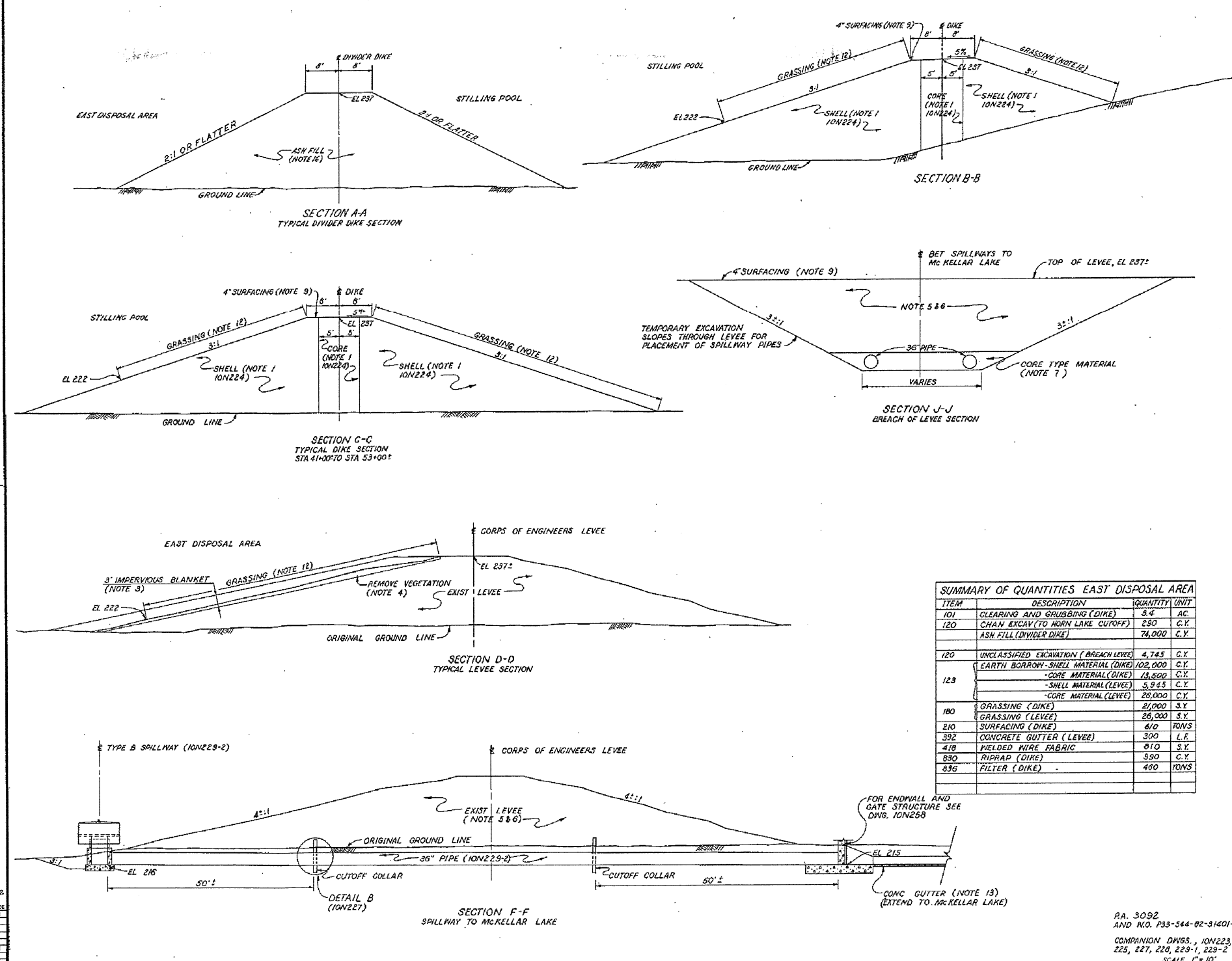
DETAIL - VACUUM/FILL PORT  
NOT TO SCALE



**RECORD DRAWING**

FOR SUPPORTING DESIGN CALCULATIONS SEE FPGALFFESCDX00030020110005	R 1 03/01/12 RGS PS SFF SFF SEB MST JCK - - -	DISCIPLINE
ISSUED AS-BUILT AS PER WORK PLAN 6 (ALF-110510-WP-06)	R 0 05/10/11 RGS PS PVK SFF SEB MST JCK - - -	INTERFACE
ISSUED FOR CONSTRUCTION	REV. NO. DATE DESN DRWN CWD SUPV RWD APPD ISSD	AS CONST. REV. NO.
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: R.G. SCHUFF	DRAWN BY: P. SILPACHARN	CHECKED BY: P.V. KISER
SUPERVISED BY: S.F. FIELD	REVIEWED BY: S.E. BENNETT	APPROVED BY: M.S. TURNBOW
ISSUED BY: J.C. KAMMEYER		
ALLEN FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING		
AUTOCAD R 2000	DATE 05/10/11	38 C 10W507-07 R 1





- NOTES:
- FOR GENERAL NOTES SEE DRAWING 10N224.
  - FIELD SHALL USE EXTREME CAUTION TO AVOID DAMAGE TO THE 60" RAW SEWER LINE LYING OUTSIDE AND SOUTH OF THE DISPOSAL AREA.
  - 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.
  - 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 1, DRAWING 10N224.
  - 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.
  - 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 SLUDGE PIPES ARE LOCATED SHALL BE FILLED WITH SHELL TYPE MATERIAL (NOTE 1, 10N224). THE LANDSIDE LEVEE SLOPE AT BOTH BREAKS 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.
  - 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 0-9 SPECIFICATIONS.
  - 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.
  - CRUSHED STONE OR GRAVEL SURFACING, 4" THICK SHALL BE APPLIED FOR THE FILL 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.
  - 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.
  - FILTER SHALL CONFORM TO SECTION 838.
  - ALL CUT AND FILL SLOPES AND OTHER DISTURBED AREAS SHALL BE SEEDED WITH TYPE G, MIXTURE B OR TYPE T, 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 B) ON THE DIKE AND LEVEE SLOPES. ALL GRASSED AREAS SHALL BE FERTILIZED AND MULCHED IN ACCORDANCE WITH SECTIONS 180 AND 182 RESPECTIVELY.
  - CONCRETE CUTTER SHALL CONFORM TO SECTION 390. INTERMEDIATE ANCHORS AND 3/4" EXPANSION JOINTS SHALL BE PLACED AT INTERVALS NOT TO EXCEED 50'.
  - WELDED WIRE FABRIC SHALL CONFORM TO ASTM SPECIFICATION A101. FINISH AND SHALL HAVE A MINIMUM LAP DISTANCE OF 6 INCHES.
  - 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.
  - 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.

ITEM	DESCRIPTION	QUANTITY	UNIT
101	CLEARING AND GRUBBING (DIKE)	3.4	AC.
120	CHAN EXCAV (TO HORN LAKE CUTOFF)	230	C.Y.
	ASH FILL (DIVIDER DIKE)	26,000	C.Y.
120	UNCLASSIFIED EXCAVATION (BREACH LEVEE)	4,745	C.Y.
	EARTH BORROW-SHELL MATERIAL (DIKE)	102,000	C.Y.
	-CORE MATERIAL (DIKE)	13,600	C.Y.
123	-SHELL MATERIAL (LEVEE)	5,945	C.Y.
	-CORE MATERIAL (LEVEE)	20,000	C.Y.
180	GRASSING (DIKE)	21,000	S.Y.
	GRASSING (LEVEE)	26,000	S.Y.
210	SURFACING (DIKE)	610	TONS
392	CONCRETE CUTTER (LEVEE)	300	L.F.
418	WELDED WIRE FABRIC	810	S.Y.
830	RIPRAP (DIKE)	590	C.Y.
836	FILTER (DIKE)	400	TONS

PRINTS RECORD

ME	
CE	
AD	
CD	
ED	
FD	
GD	
HD	
SD	
TD	
UD	
VD	
WD	
XD	
YD	
ZD	

P.A. 3092  
AND K.O. 733-544-02-31401-J5  
COMPANION DWGS., 10N223, 224,  
225, 227, 228, 229-1, 229-2  
SCALE 1"=10'

DESIGNED BY	J. GLOVER	CHECKED BY	J. S. BERRY
DRAWN BY	J. S. BERRY	ENGINEER	P. W. Burnatt
DATE	9-5-75	SCALE	1"=10'

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

INSPECTED AND APPROVED FOR ISSUE  
P. H. Montgomery

SUBMITTED	RECOMMENDED	APPROVED
Robert A. Bowman	P. H. Montgomery	P. W. Burnatt
KNOXVILLE	9-5-75	38 c 10N226 R2



# **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**

<u>East Ash Pond -Weir 1</u>	<u>Data Source</u>
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**

<u>ALF Overflow 1 - Concrete Riser Structure</u>	<u>ALF Overflow 2 - Concrete Riser Structure</u>	<u>ALF East - Concrete Riser Structure</u>	<u>ALF West - Concrete Riser Structure</u>	<u>Data Source</u>
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 <sub>0</sub> = 0.6	C <sub>0</sub> = 0.6	C <sub>0</sub> = 0.6	C <sub>0</sub> = 0.6	1 (Based on Brater and King 1976)

<u>Computed Values</u>	<u>Computed Values</u>	<u>Computed Values</u>	<u>Computed Values</u>	<u>Equation</u>
L <sub>weir</sub> = 12.56637 ft	L <sub>weir</sub> = 12.56637 ft	L <sub>weir</sub> = 12.56637 ft	L <sub>weir</sub> = 12.56637 ft	Circumference=PI()*D
A <sub>riser</sub> = 12.56637 sq. ft.	A <sub>riser</sub> = 12.56637 sq. ft.	A <sub>riser</sub> = 12.56637 sq. ft.	A <sub>riser</sub> = 12.56637 sq. ft.	Area = PI*D <sup>2</sup> /4
A <sub>pipe</sub> = 7.068583 sq. ft.	A <sub>pipe</sub> = 7.068583 sq. ft.	A <sub>pipe</sub> = 7.068583 sq. ft.	A <sub>pipe</sub> = 7.068583 sq. ft.	Area = PI*D <sup>2</sup> /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:**

- "Spillway Rating Curve Development" [V:\1755\active\175565240\geotechnical\analysis\H&H\rating\\_curve\\_methodology.docx](V:\1755\active\175565240\geotechnical\analysis\H&H\rating_curve_methodology.docx)
- Remedial Improvements Work Plan 6 <\\us1243-f01\workgroup\1755\active\175565240\geotechnical\analysis\H&H\H&H Data\ALF\Spillway Information & Elevations>
- 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
- 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

ALF Overflow 1										
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)	$Q=C_oA(2gH)^{0.5}$ (cfs)	$H_c$ (ft) <sup>1</sup>	$Q=C_oA(2gH_c)^{0.5}$ (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

<sup>1</sup> 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										
Elevation	Weir Flow		Orifice Flow		Pipe Orifice Flow		Outlet Pipe Flow (from HY-8)		Rating Curve for HEC-HMS	
	H (ft)	Q=CLH <sup>1.5</sup> (cfs)	H (ft)	Q=C <sub>o</sub> A(2gH) <sup>0.5</sup> (cfs)	H <sub>c</sub> (ft) <sup>1</sup>	Q=C <sub>o</sub> A(2gH <sub>c</sub> ) <sup>0.5</sup> (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	1,241.41	9.7	188.45	18.50	146.39	225	116.62	236.00	116.62
237.00	10.70	1,438.25	10.7	197.92	19.50	150.29	225	121.98	237.00	121.98

<sup>1</sup> Pipe Orifice flow computed without consideration of tailwater. Tailwater was considered in "Outlet Pipe Flow" computation.



**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										
Elevation	Weir Flow		Orifice Flow		Pipe Orifice Flow		Outlet Pipe Flow (from HY-8)		Rating Curve for HEC-HMS	
	H (ft)	Q=CLH <sup>1.5</sup> (cfs)	H (ft)	Q=C <sub>o</sub> A(2gH) <sup>0.5</sup> (cfs)	H <sub>c</sub> (ft) <sup>1</sup>	Q=C <sub>o</sub> A(2gH <sub>c</sub> ) <sup>0.5</sup> (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	225	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

<sup>1</sup> 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 <sup>1.5</sup> (cfs)	H (ft)	Q=C <sub>o</sub> A(2gH) <sup>0.5</sup> (cfs)	H <sub>c</sub> (ft) <sup>1</sup>	Q=C <sub>o</sub> A(2gH <sub>c</sub> ) <sup>0.5</sup> (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

<sup>1</sup> 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  
 From NOAA Atlas 14

7.40 inches

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



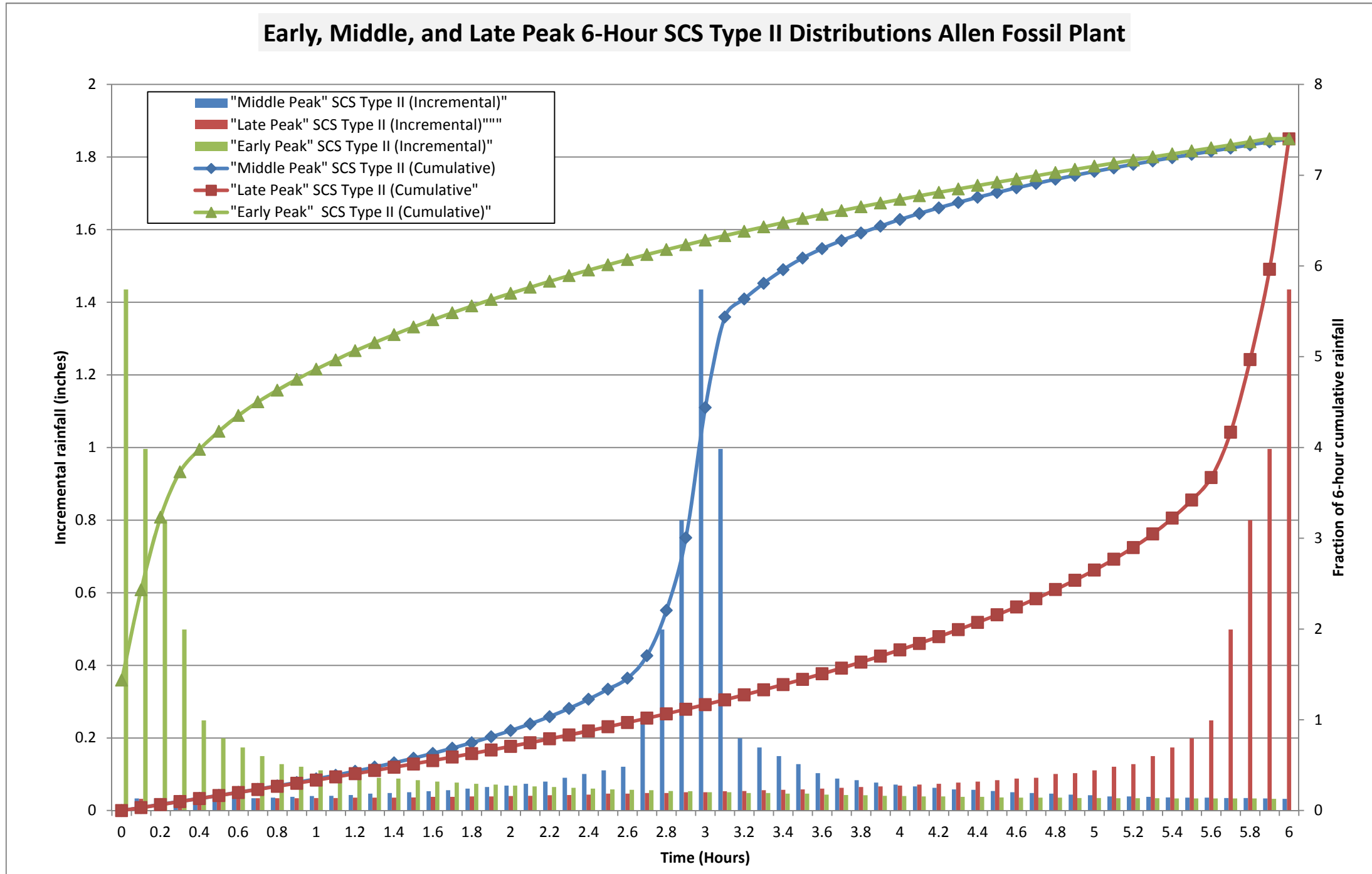
### Rainfall Distribution - Hydrograph

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

### Early, Middle, and Late Peak 6-Hour SCS Type II Distributions Allen Fossil Plant





**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**

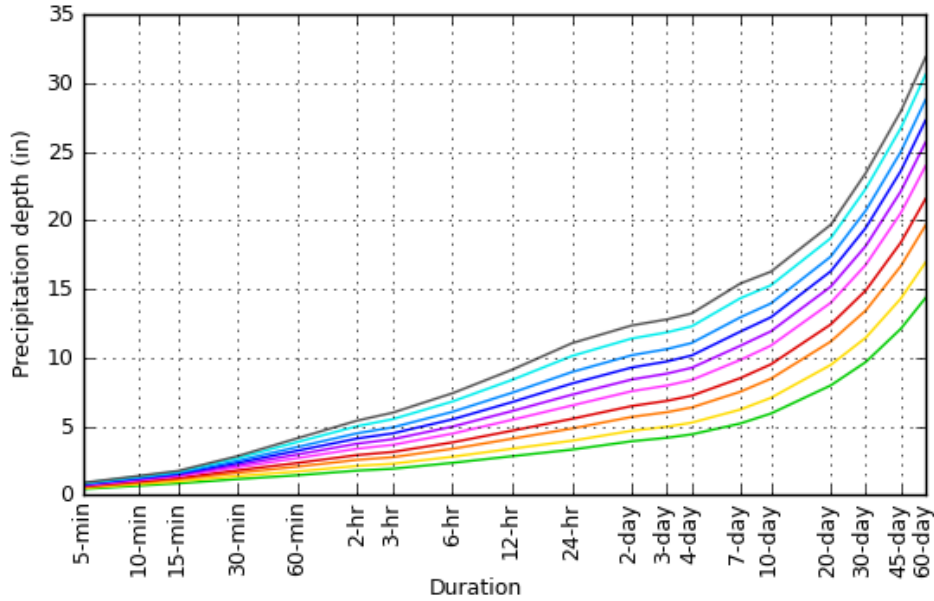
<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
<b>5-min</b>	<b>0.419</b> (0.391-0.452)	<b>0.490</b> (0.457-0.528)	<b>0.558</b> (0.519-0.599)	<b>0.610</b> (0.566-0.656)	<b>0.672</b> (0.623-0.722)	<b>0.716</b> (0.661-0.769)	<b>0.760</b> (0.699-0.816)	<b>0.799</b> (0.731-0.858)	<b>0.847</b> (0.771-0.910)	<b>0.883</b> (0.798-0.950)
<b>10-min</b>	<b>0.670</b> (0.624-0.722)	<b>0.784</b> (0.732-0.845)	<b>0.893</b> (0.832-0.960)	<b>0.975</b> (0.906-1.05)	<b>1.07</b> (0.992-1.15)	<b>1.14</b> (1.05-1.22)	<b>1.21</b> (1.11-1.30)	<b>1.27</b> (1.16-1.36)	<b>1.34</b> (1.22-1.44)	<b>1.39</b> (1.26-1.50)
<b>15-min</b>	<b>0.837</b> (0.780-0.902)	<b>0.986</b> (0.920-1.06)	<b>1.13</b> (1.05-1.21)	<b>1.23</b> (1.15-1.33)	<b>1.36</b> (1.26-1.46)	<b>1.45</b> (1.33-1.55)	<b>1.53</b> (1.40-1.64)	<b>1.60</b> (1.46-1.72)	<b>1.69</b> (1.53-1.81)	<b>1.75</b> (1.58-1.88)
<b>30-min</b>	<b>1.15</b> (1.07-1.24)	<b>1.36</b> (1.27-1.47)	<b>1.60</b> (1.49-1.73)	<b>1.79</b> (1.66-1.92)	<b>2.01</b> (1.86-2.16)	<b>2.18</b> (2.01-2.33)	<b>2.34</b> (2.15-2.51)	<b>2.49</b> (2.28-2.67)	<b>2.69</b> (2.44-2.88)	<b>2.83</b> (2.56-3.04)
<b>60-min</b>	<b>1.43</b> (1.33-1.54)	<b>1.71</b> (1.59-1.84)	<b>2.06</b> (1.92-2.21)	<b>2.33</b> (2.16-2.50)	<b>2.68</b> (2.48-2.88)	<b>2.95</b> (2.72-3.16)	<b>3.22</b> (2.96-3.46)	<b>3.49</b> (3.19-3.75)	<b>3.85</b> (3.50-4.14)	<b>4.13</b> (3.73-4.44)
<b>2-hr</b>	<b>1.77</b> (1.65-1.90)	<b>2.11</b> (1.97-2.27)	<b>2.55</b> (2.38-2.75)	<b>2.90</b> (2.69-3.12)	<b>3.37</b> (3.11-3.61)	<b>3.73</b> (3.44-4.00)	<b>4.11</b> (3.77-4.41)	<b>4.49</b> (4.10-4.81)	<b>5.01</b> (4.54-5.38)	<b>5.41</b> (4.87-5.82)
<b>3-hr</b>	<b>1.90</b> (1.76-2.05)	<b>2.27</b> (2.11-2.45)	<b>2.74</b> (2.55-2.96)	<b>3.13</b> (2.90-3.37)	<b>3.64</b> (3.36-3.92)	<b>4.05</b> (3.73-4.36)	<b>4.47</b> (4.10-4.82)	<b>4.91</b> (4.46-5.28)	<b>5.51</b> (4.97-5.93)	<b>5.98</b> (5.36-6.44)
<b>6-hr</b>	<b>2.33</b> (2.17-2.52)	<b>2.78</b> (2.58-3.01)	<b>3.35</b> (3.11-3.63)	<b>3.82</b> (3.54-4.13)	<b>4.46</b> (4.12-4.81)	<b>4.97</b> (4.57-5.36)	<b>5.50</b> (5.03-5.92)	<b>6.04</b> (5.49-6.51)	<b>6.79</b> (6.12-7.32)	<b>7.40</b> (6.60-7.97)
<b>12-hr</b>	<b>2.82</b> (2.61-3.05)	<b>3.36</b> (3.12-3.65)	<b>4.09</b> (3.79-4.43)	<b>4.67</b> (4.32-5.05)	<b>5.47</b> (5.04-5.90)	<b>6.10</b> (5.60-6.58)	<b>6.76</b> (6.16-7.29)	<b>7.44</b> (6.74-8.02)	<b>8.37</b> (7.52-9.04)	<b>9.12</b> (8.13-9.86)
<b>24-hr</b>	<b>3.30</b> (3.07-3.54)	<b>3.94</b> (3.68-4.25)	<b>4.83</b> (4.50-5.19)	<b>5.54</b> (5.15-5.95)	<b>6.51</b> (6.03-6.99)	<b>7.30</b> (6.73-7.83)	<b>8.11</b> (7.44-8.70)	<b>8.95</b> (8.18-9.62)	<b>10.1</b> (9.15-10.9)	<b>11.0</b> (9.93-11.9)
<b>2-day</b>	<b>3.91</b> (3.66-4.17)	<b>4.67</b> (4.37-4.99)	<b>5.68</b> (5.31-6.07)	<b>6.47</b> (6.04-6.90)	<b>7.55</b> (7.03-8.05)	<b>8.40</b> (7.79-8.97)	<b>9.28</b> (8.56-9.91)	<b>10.2</b> (9.33-10.9)	<b>11.4</b> (10.4-12.2)	<b>12.3</b> (11.1-13.3)
<b>3-day</b>	<b>4.16</b> (3.89-4.45)	<b>4.96</b> (4.64-5.32)	<b>6.02</b> (5.63-6.45)	<b>6.85</b> (6.39-7.33)	<b>7.96</b> (7.40-8.51)	<b>8.83</b> (8.18-9.46)	<b>9.71</b> (8.96-10.4)	<b>10.6</b> (9.74-11.4)	<b>11.8</b> (10.8-12.8)	<b>12.8</b> (11.5-13.8)
<b>4-day</b>	<b>4.41</b> (4.12-4.73)	<b>5.26</b> (4.92-5.65)	<b>6.37</b> (5.94-6.83)	<b>7.22</b> (6.73-7.75)	<b>8.37</b> (7.77-8.98)	<b>9.26</b> (8.57-9.95)	<b>10.2</b> (9.36-10.9)	<b>11.1</b> (10.1-11.9)	<b>12.3</b> (11.2-13.3)	<b>13.2</b> (11.9-14.4)
<b>7-day</b>	<b>5.19</b> (4.86-5.56)	<b>6.21</b> (5.82-6.64)	<b>7.50</b> (7.02-8.03)	<b>8.50</b> (7.93-9.09)	<b>9.82</b> (9.13-10.5)	<b>10.8</b> (10.1-11.6)	<b>11.9</b> (11.0-12.7)	<b>12.9</b> (11.9-13.9)	<b>14.3</b> (13.0-15.4)	<b>15.4</b> (13.9-16.6)
<b>10-day</b>	<b>5.92</b> (5.55-6.32)	<b>7.07</b> (6.62-7.54)	<b>8.46</b> (7.92-9.03)	<b>9.50</b> (8.89-10.1)	<b>10.9</b> (10.1-11.6)	<b>11.9</b> (11.1-12.7)	<b>12.9</b> (12.0-13.8)	<b>13.9</b> (12.9-14.9)	<b>15.3</b> (14.0-16.4)	<b>16.3</b> (14.8-17.5)
<b>20-day</b>	<b>7.97</b> (7.48-8.49)	<b>9.46</b> (8.88-10.1)	<b>11.2</b> (10.5-11.9)	<b>12.4</b> (11.6-13.2)	<b>14.0</b> (13.1-14.9)	<b>15.2</b> (14.2-16.2)	<b>16.3</b> (15.2-17.4)	<b>17.3</b> (16.1-18.5)	<b>18.7</b> (17.3-20.0)	<b>19.7</b> (18.1-21.1)
<b>30-day</b>	<b>9.67</b> (9.09-10.3)	<b>11.4</b> (10.8-12.2)	<b>13.4</b> (12.6-14.3)	<b>14.9</b> (14.0-15.8)	<b>16.7</b> (15.7-17.8)	<b>18.1</b> (16.9-19.3)	<b>19.4</b> (18.1-20.7)	<b>20.7</b> (19.2-22.1)	<b>22.3</b> (20.6-23.8)	<b>23.4</b> (21.6-25.1)
<b>45-day</b>	<b>12.1</b> (11.4-12.8)	<b>14.3</b> (13.4-15.2)	<b>16.7</b> (15.6-17.7)	<b>18.4</b> (17.2-19.5)	<b>20.5</b> (19.2-21.8)	<b>22.1</b> (20.7-23.5)	<b>23.6</b> (22.0-25.1)	<b>25.0</b> (23.3-26.6)	<b>26.7</b> (24.8-28.5)	<b>27.9</b> (25.8-29.9)
<b>60-day</b>	<b>14.3</b> (13.5-15.2)	<b>16.9</b> (15.9-18.0)	<b>19.6</b> (18.4-20.9)	<b>21.6</b> (20.2-22.9)	<b>24.0</b> (22.4-25.5)	<b>25.7</b> (24.0-27.3)	<b>27.3</b> (25.5-29.0)	<b>28.8</b> (26.8-30.7)	<b>30.6</b> (28.4-32.6)	<b>31.9</b> (29.5-34.1)

<sup>1</sup> 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.

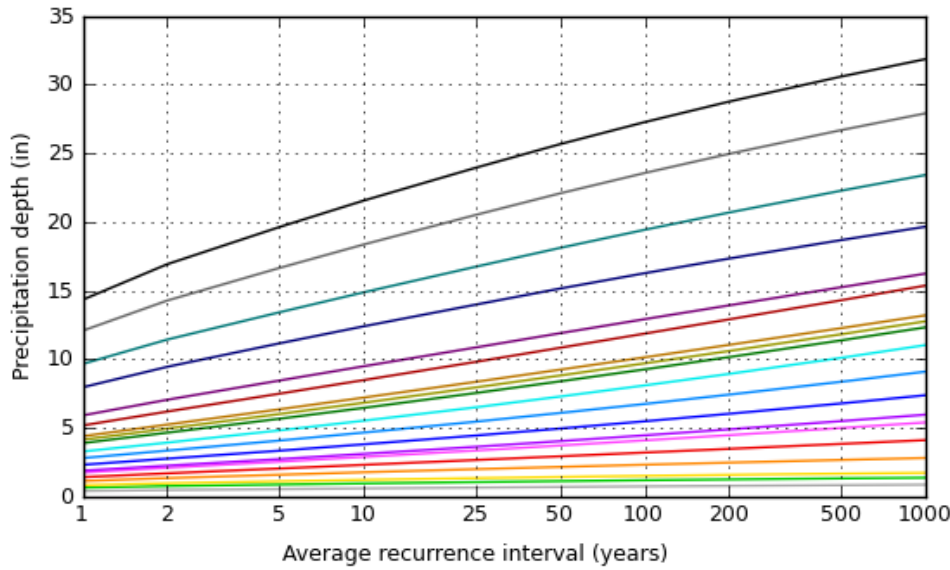
[Back to Top](#)

### PF graphical

PDS-based depth-duration-frequency (DDF) curves  
 Latitude: 35.0720°, Longitude: -90.1390°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000

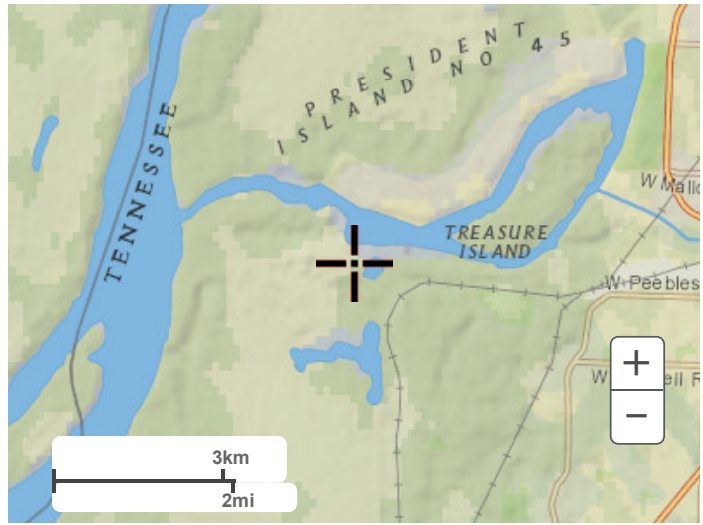


Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

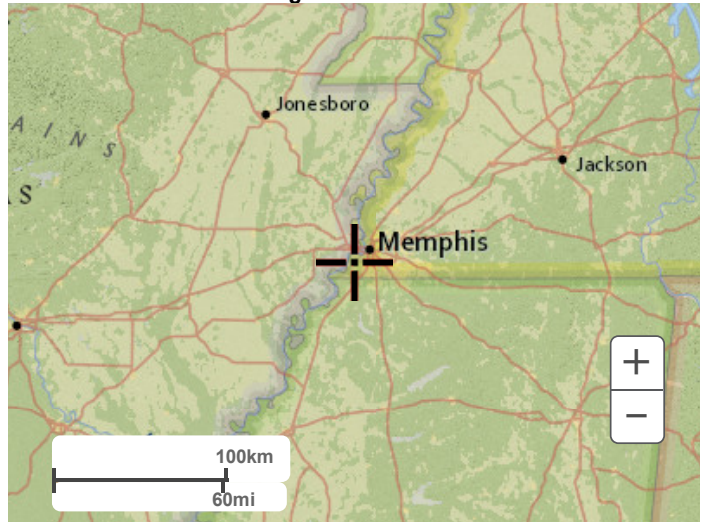
[Back to Top](#)

### Maps & aerials

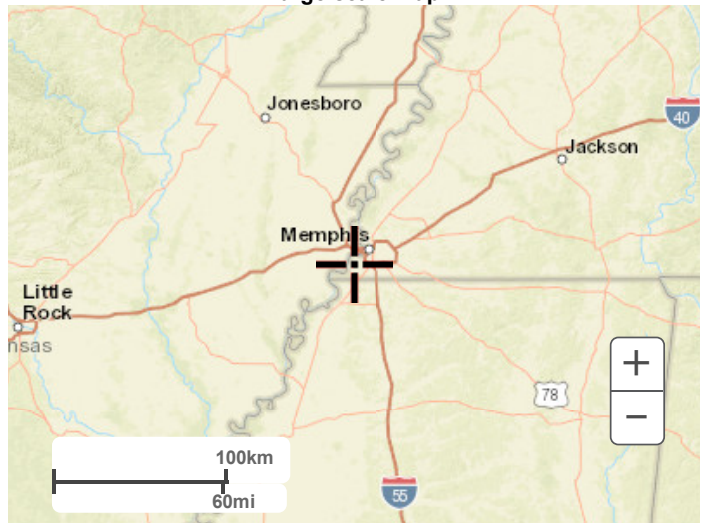
Small scale terrain



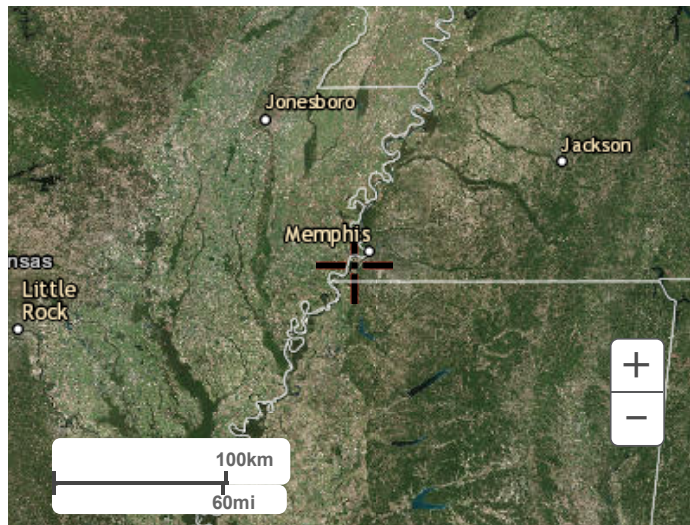
Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

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# **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.



**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.