INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
PLANT BARRY ASH POND
ALABAMA POWER COMPANY

Section 257.82 of EPA's regulations requires the owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment to design, construct, operate and maintain an inflow design flood control system capable of safely managing flow during and following the peak discharge of the specified inflow design flood. The owner or operator also has to prepare a written plan documenting how the inflow flood control system has been designed and constructed to meet the requirements of this section of the rule.

The existing CCR surface impoundment referred to as the Plant Barry Ash Pond is located at Alabama Power Company's Plant Barry. The facility consists of a CCR storage area. The inflow design flood consists primarily of the rainfall that falls within the limits of the surface impoundment, along with a nominal amount (relative to the rainfall) of process flows. Stormwater is temporarily stored within the limits of the surface impoundment and discharged through a 54-inch CMP outlet pipe that is accessed via a four sided concrete outfall structure. The CMP pipe has been lined to yield an effective inner diameter of 51-inches.

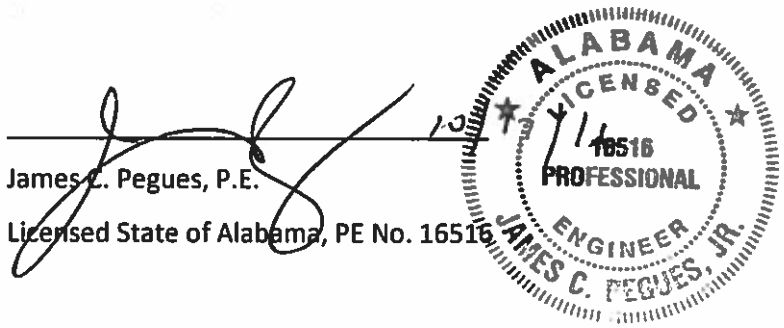
The inflow design flood has been calculated using the Natural Resources Conservation Service method (also known as the Soil Conservation Service (SCS) method) using the 1000-yr storm event required for a Significant hazard potential facility. Runoff curve number data was determined using Table 2-2A from the Urban Hydrology for Small Watersheds (TR-55). Appendix A and B from the TR-55 were used to determine the rainfall distribution methodology. Precipitation values were determined from NOAA's Precipitation Frequency Data Server (Atlas-14).

The NRCS provided information on the soil characteristics and hydrologic groups present at the site. It was determined that the hydrological group "C" and "D" should be used to best reflect the characteristics of the soils on site. This information was placed into Hydraflow Hydrographs 2013 and used to generate appropriate precipitation curves, storm basin routing information, and resulting rating curves to evaluate surface impoundment capacity.

Calculations indicate the unit indicates a risk of overtopping a portion of the embankment located on the south end of the surface impoundment during the inflow design storm. As addressed in the Structural Stability Assessment for the unit, plans are being prepared to raise the south embankment crest back to the design elevation, which will provide the needed storage capacity without overtopping.

The facility is operated subject to and in accordance with § 257.3-3 of EPA's regulations.

I hereby certify that the inflow design flood control system plan meets the requirements of 40 C.F.R. Part 257.82.



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Licensed State of Alabama, PE No. 16516

Inflow Design Control System Plan:
Hydrologic and Hydraulic Calculation Summary

for

Plant Barry Ash Pond

Prepared by:

Southern Company Services
Technical Services

Originator: _____ 10/6/16
Jeff Harper Date

Reviewer: _____ 10/11/16
Jason S. Wilson Date

Approval: _____ 10/12/16
James C. Pegues Date

1.0 Purpose of Calculation

The purpose of this report is to demonstrate the hydraulic capacity of the subject CCR impoundment in order to prepare an inflow design flood control plan as required by the United States Environmental Protection Agency's (EPA) final rule for Disposal of CCR from Electric Utilities (EPA 40 CFR 257).

2.0 Summary of Conclusions

A hydrologic and hydraulic model was developed for the Plant Barry Ash Pond to determine the hydraulic capacity of the impoundment. The design storm for the Plant Barry Ash Pond is a 1000-year rainfall event. Southern Company has selected a storm length of 24-hours for all inflow design flood control plans. The results of routing a 1000-year, 24-hour rainfall event through the impoundment are presented in Table 1 below:

Table 1-Flood Routing Results for Plant Barry Ash Pond

Plant Barry	Normal Pool El (ft)	Top of embankment El (ft)	Emergency Spillway Crest El (ft)	Peak Water Surface Elevation (ft	Freeboard* (ft)	Peak Inflow (cfs)	Peak Outflow (cfs)
Ash Pond	14.7	20.29	N/A	20.26	.03	5407	223

*Freeboard is measured from the top of embankment to the peak water surface elevation

3.0 Methodology

3.1 HYDROLOGIC ANALYSES

The Plant Barry Ash Pond is classified as a significant hazard structure. The design storm for a significant hazard structure is a 1000-year rainfall event. A summary of the design storm parameters and rainfall distribution methodology for these calculations is summarized below in Table 2.

Table 2. Plant Barry Ash Pond Storm Distribution

Hazard Classification	Return Frequency (years)	Storm Duration (hours)	Rainfall Total (Inches)	Rainfall Source	Storm Distribution
Significant	1000	24	21.7	NOAA Atlas 14	SCS Type III

The drainage area for the Plant Barry Ash Pond was delineated based on LiDAR data acquired for the Plant in 2016. Runoff characteristics were developed based on the Soil Conservation Service (SCS) methodologies as outlined in TR-55. An SCS curve number of 70 was used for areas above the water surface as they are mostly flat with vegetation and a curve number of 95 was used for water surface areas. The areas were

delineated based on aerial photography and LiDAR topo. The time of concentration used for this calculation was 48 minutes. The calculated Tc using TR-55 was 24 minutes, Lag method was 196 minutes, Kirpich was 47.7 minutes.

A table of the pertinent basin characteristics of the Ash Pond is provided below in Table 3.

Table 3—Ash Pond Hydrologic Information

Drainage Basin Area (acres)	575
Hydrologic Curve Number, CN	78
Hydrologic Methodology	SCS Method
Time of Concentration (minutes)	48
Hydrologic Software	Hydraflow Hydrographs

Runoff values were determined by importing the characteristics developed above into a hydrologic model using Hydraflow Hydrographs for Civil 3D.

Process flows from Plant Barry were considered in this analysis. Based on normal plant operations, the Ash Pond receives an additional 27.1 MGD (42 cfs) of inflow from the Plant.

3.2 HYDRAULIC ANALYSES

Storage values for the Ash Pond were determined by developing a stage-storage relationship utilizing contour data. The spillway system at the Plant Barry Ash Pond consists of a concrete overflow structure. This overflow structure is square with consists of openings on 4 sides, each opening is 1' x 8'. The invert elevation of the openings coincides with normal pool elevation. The top of the structure is open to allow greater flow as the water level in the pond rises.

Table 4—Spillway Attribute Table

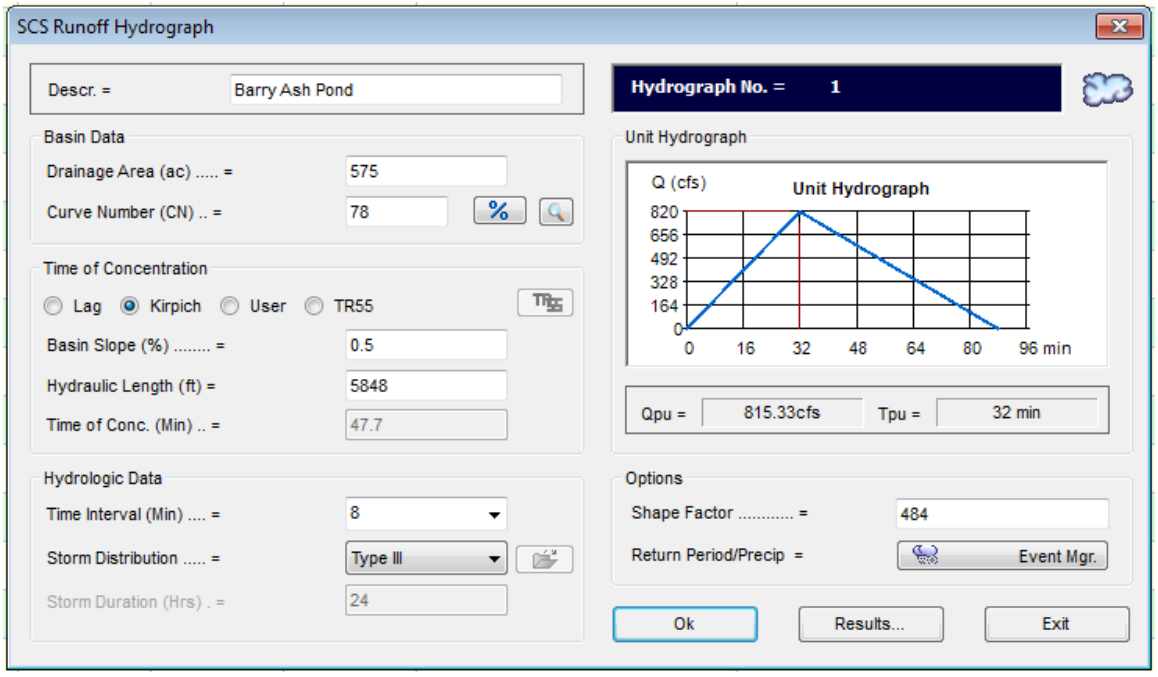
Spillway Component	US Invert El (feet)	DS Invert El (feet)	Dimension	Slope (ft/ft)	Length (ft)	Capacity (cfs)
12" Rectangular Orifice	14.7	N/A	32' (4 – 1'X8' openings)	N/A	N/A	83
Open top Riser	17.90	N/A	32'	N/A	N/A	235
Discharge Pipe	6.11	5.56	51" Diameter	0.5%	110	225

4.0 SUPPORTING INFORMATION

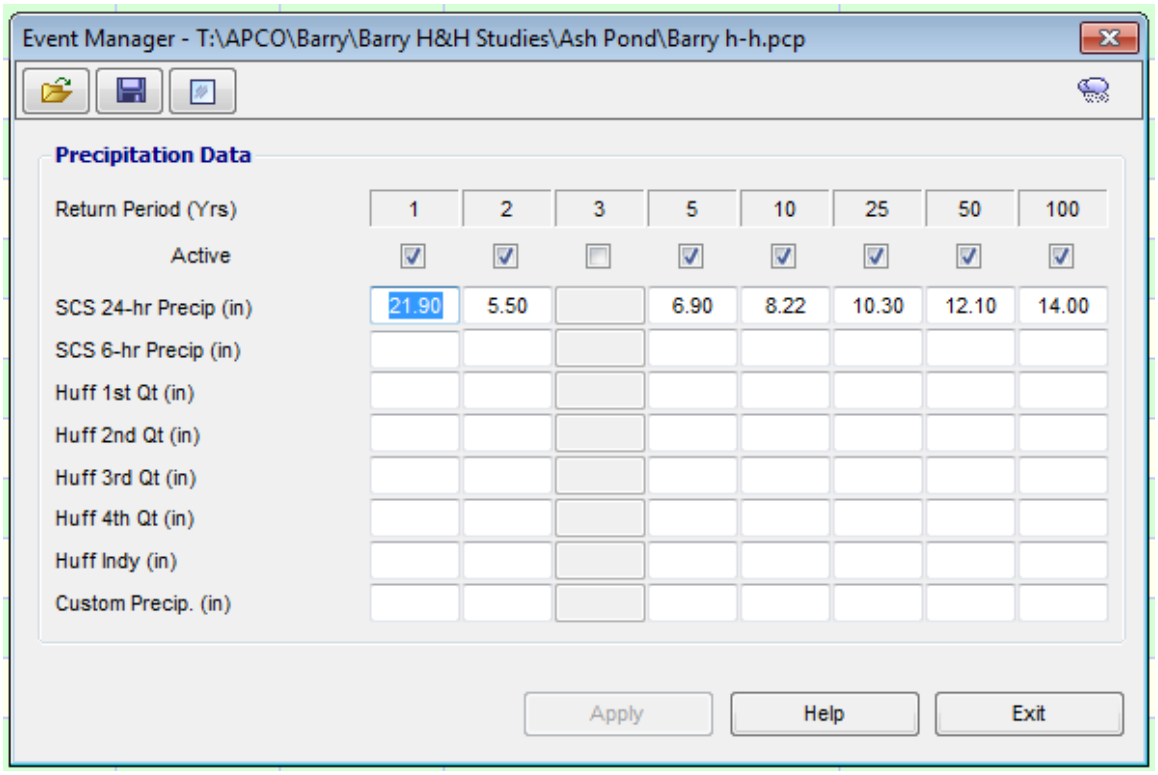
4.1 HYDROGRAPH INPUT

DRAINAGE BASIN

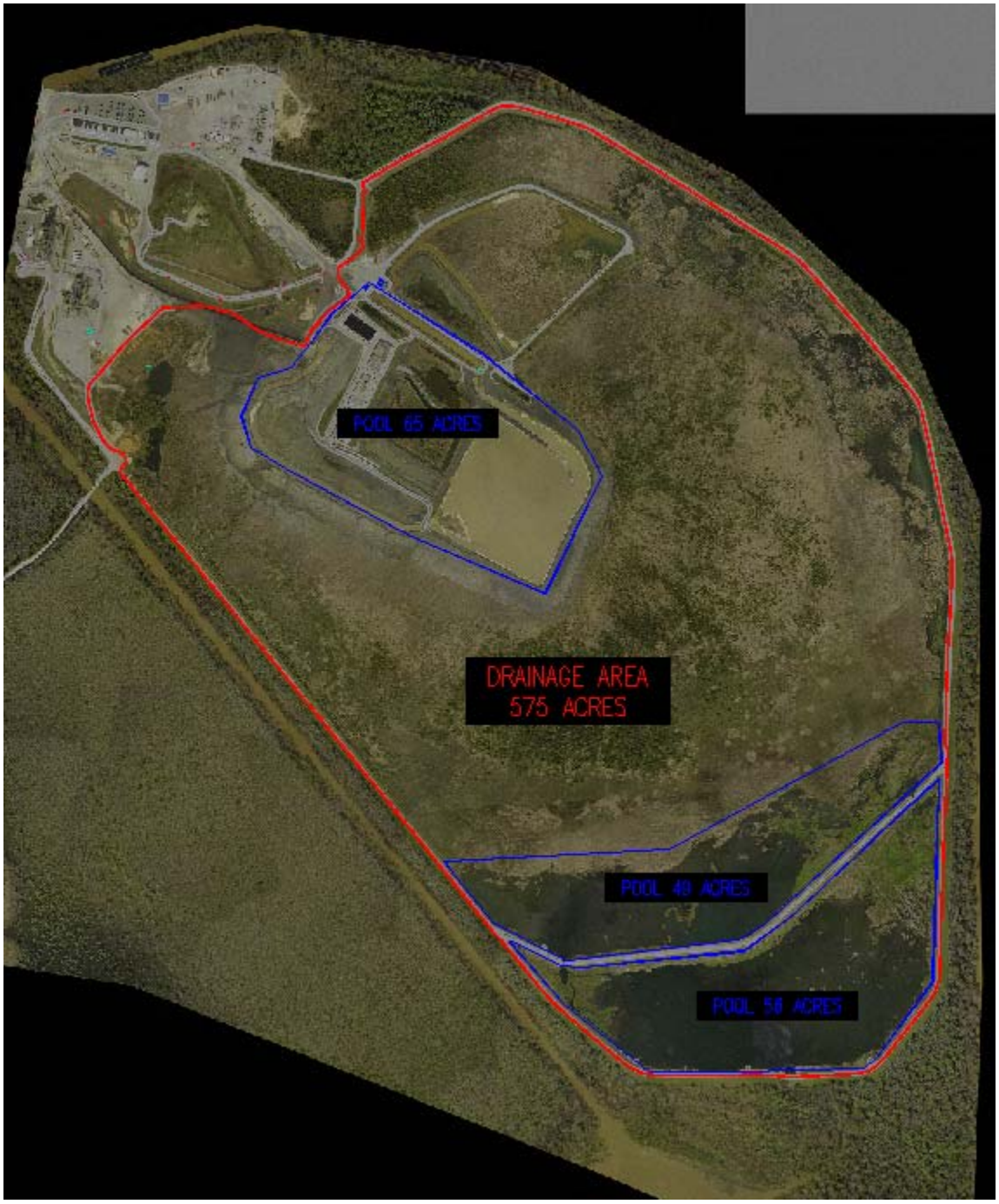
TIME OF CONCENTRATION

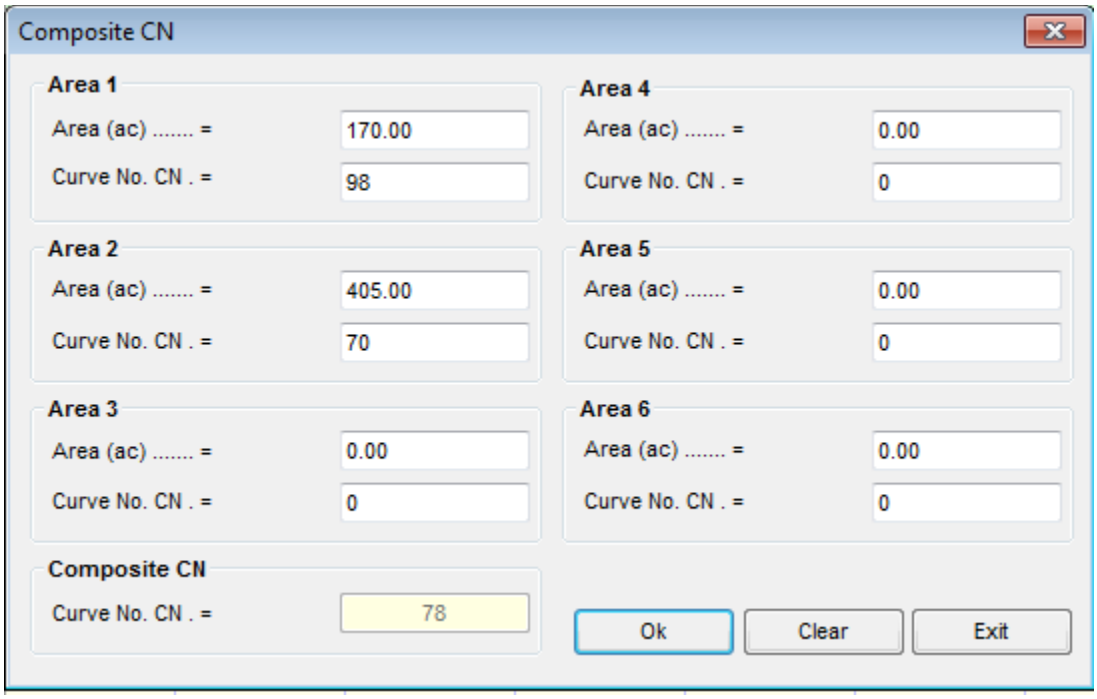


RAINFALL DATA



CURVE NUMBER




Composite CN
Area 1
Area (ac) ..... =
170.00
Curve No. CN . =
98
Area 2
Area (ac) ..... =
405.00
Curve No. CN . =
70
Area 3
Area (ac) ..... =
0.00
Curve No. CN . =
0
Composite CN
Curve No. CN . =
78
Area 4
Area (ac) ..... =
0.00
Curve No. CN . =
0
Area 5
Area (ac) ..... =
0.00
Curve No. CN . =
0
Area 6
Area (ac) ..... =
0.00
Curve No. CN . =
0
Ok
Clear
Exit

4.2 POND PERFORMANCE

STAGE/STORAGE/DISCHARGE

Stage	Elevation	Contour Area	Incremental Storage	Total Storage	Total Discharge
(ft)	(ft)	(sqft)	(cuft)	(cuft)	(cfs)
0.00	5.00	166,883	0.000	0.000	0.000
5.00	10.00	617,753	1,961,590	1,961,590	0.000
8.00	13.00	1,087,031	2,557,176	4,518,766	0.000
9.00	14.00	1,432,096	1,259,564	5,778,330	0.000
10.00	15.00	2,578,080	2,005,088	7,783,418	17.90
11.00	16.00	3,234,068	2,906,072	10,689,490	137.81
12.00	17.00	3,939,637	3,586,850	14,276,340	170.01
13.00	18.00	5,018,770	4,479,210	18,755,550	182.02
14.00	19.00	6,669,461	5,844,110	24,599,660	205.36
15.00	20.00	8,953,451	7,811,460	32,411,120	219.90
15.50	20.50	10,085,240	4,759,672	37,170,792	225.93

ELEVATION/TIME