PERIODIC INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
PLANT GORGAS GYPSUM POND
ALABAMA POWER COMPANY

EPA's "Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (40 C.F.R. Part 257 and Part 261) and the State of Alabama's ADEM Admin. Code Chapter 335-13-15 establish certain hydrologic and hydraulic capacity requirements for CCR surface impoundments. Per §257.82 and ADEM Admin. Code r. 335-13-15-.05(3), the owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment is required 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 must prepare a written plan documenting how the inflow flood control system has been designed and constructed to meet the requirements of the referenced sections of the rules. In addition, §257.82(f)(4) and ADEM Admin. Code r. 335-13-15-.05(3)(c)4. require a revision to the inflow design flood control system plan be prepared every 5 years.

The existing CCR surface impoundment referred to as the Plant Gorgas Gypsum Pond is located at Alabama Power Company's Plant Gorgas. The facility consists of an 18-acre CCR storage area, two sedimentation ponds, and a recycle pond. The facility is currently undergoing closure by removal of the gypsum for beneficial use purposes. A substantial portion of the gypsum has been removed. The inflow design flood consists of the rainfall that falls within the limits of the surface impoundment as well as runoff from approximately 12 acres of adjoining watershed. Stormwater is temporarily stored within the limits of the surface impoundment and discharged through spillway structures that consist of a 48-inch HDPE riser structure and a 36" HDPE pipe that serves to dewater the perimeter ditches. These two structures combine into a 36" outlet pipe that serves to discharge water to the sedimentation ponds. There are no other spillways or discharge structures serving the Plant Gorgas Gypsum Pond.

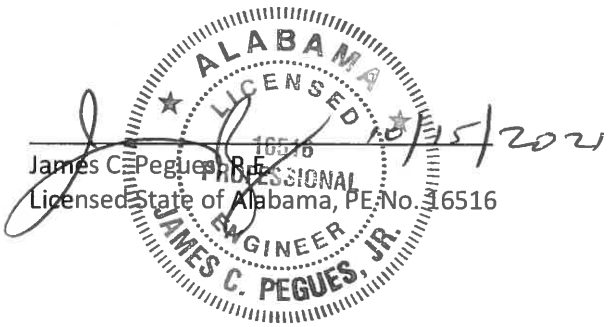
The inflow design flood has been calculated using the Natural Resources Conservation Service method (also known as the Soil Conservation Service (SCS) method) using the 1000-yr storm event required for a Significant hazard potential facility. Runoff curve number data was determined using Table 2-2A from 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 groups A and D should be used to best reflect the characteristics of the soils on site. Curve numbers values for each land use (determined from aerial photography) and soil combination were taken from the National Engineering Handbook Part 630, Chapter 9. This information was placed into Autodesk Storm and Sanitary Analysis, 2019 and used to generate appropriate precipitation curves, storm basin routing information, and rating curves to evaluate surface impoundment capacity.

Calculations indicate the unit can safely store and pass the inflow design storm without overtopping the cross-valley embankment. Supporting calculations are attached for reference.

The facility is operated subject to and in accordance with §257.3-3 of EPA's regulations and ADEM Admin. Code r. 335-13-4-.01(2)(a) and (b).

I hereby certify that the inflow design flood control system plan meets the requirements of 40 C.F.R. §257.82 and ADEM Admin. Code r. 335-13-15-.05(3).



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Inflow Design Control System Plan:
Hydrologic and Hydraulic Calculation Summary

for

Plant Gorgas Gypsum Pond

Prepared by:

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Originator: _____ 9/29/21
Andrew E. Stricklin Date

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1.0 Purpose of Calculation

The purpose of this calculation is to evaluate the Gypsum Pond for compliance to EPA's Title 40 CFR Part 257.81 and ADEM's Admin. Code r. 335-13-15-.05(3). In accordance with this regulation, the pond and all outlet structures must meet capacity requirements for a significant hazard impoundment [CCR §257.82(a)(3)(ii) and ADEM 335-13-15-.05(3)(a)3.(ii)].

2.0 Summary of Conclusions

A hydrologic and hydraulic model was developed for the Plant Gorgas Gypsum Pond to determine the hydraulic capacity of the impoundment. The design storm for the Plant Gorgas Gypsum 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 Gorgas Gypsum Pond

Plant Gorgas	Normal Pool El (ft)	Top of embankment El (ft)	Auxiliary Spillway Crest El (ft)	Peak Water Surface Elevation (ft	Freeboard* (ft)	Peak Inflow (cfs)	Peak Outflow (cfs)
Gypsum Pond	422.0	440.0	N/A	424.6	15.4	232.2	126.7

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

3.0 Methodology

3.1 HYDROLOGIC ANALYSES

The Plant Gorgas Gypsum 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 Gorgas Gypsum Pond Storm Distribution

Hazard Classification	Return Frequency (years)	Storm Duration (hours)	Rainfall Total (Inches)	Rainfall Source	Storm Distribution
Significant	1000	24	14.3	NOAA Atlas 14	SCS Type III

The drainage area for the Plant Gorgas Gypsum Pond was delineated based on topographical information obtained from a drone flight done by Civil Field Services in May 2021. Run-off characteristics were developed based on the Soil Conservation Service (SCS) methodologies as outlined in TR-55. An overall SCS curve number for the drainage area was developed based on methods prescribed in TR-55. Soil types were obtained from the USGS online soils database. Land use areas were delineated based on aerial photography. Times of Concentration were also developed based on methodologies prescribed in TR-55.

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

Table 3—Gypsum Pond Hydrologic Information

Drainage Basin Area (acres)	19.6
Hydrologic Curve Number, CN	93
Hydrologic Methodology	SCS Method
Time of Concentration (minutes)	6
Hydrologic Software	Autodesk Storm and Sanitary Analysis

Run-off values were determined by importing the characteristics developed above into a hydrologic model with Autodesk Storm and Sanitary Analysis, 2019.

3.2 HYDRAULIC ANALYSES

Storage values for the Gypsum Pond were determined by developing a stage-storage relationship utilizing contour data. The spillway system at the Plant Gorgas Gypsum Pond consists of a primary spillway that discharges to a sedimentation pond. A 54” dia. decant riser (called structure A in these calcs) is located approximately 500 feet north of the southern dam. The 54” riser connects to a 36” culvert, which drains to Structure B (another inlet) and out through a 48” culvert. For the purposes of these calculations, it was conservatively assumed all flow will be routed through Structure A, since flow through the 36” culvert will be the limiting factor regarding the discharge rate. Structure B also receives four 8” dia. underdrains. The dam at the south end of the storage cell/pond is at elevation 440. A summary of spillway information is presented below in Table 4.

Table 4—Spillway Attribute Table

Spillway Component	US Invert El (feet)	DS Invert El (feet)	Dimension (ft)	Slope (ft/ft)	Peak Flow (cfs)
Pipe 1	400.0	394.0	3	17.3%	126.7
Pipe 2	391.5	378.0	4	4.2%	126.7

4.0 SUPPORTING INFORMATION

4.1 STAGE-STORAGE TABLE

Storage Node : Gypsum Pond

Input Data

Invert Elevation (ft)	422.00
Max (Rim) Elevation (ft)	440.00
Max (Rim) Offset (ft)	18.00
Initial Water Elevation (ft)	422.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	468192.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Gypsum Pond

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	6525	0.000
2	71867	78392.00
4	148514	298773.00
6	201482	648769.00
8	239366	1089617.00
10	269831	1598814.00
12	301182	2169827.00
14	384048	2855057.00
16	437977	3677082.00
18	468192	4583251.00

4.2 TIME OF CONCENTRATION

Note: Time of concentration (Tc) conservatively assumed to be the minimum allowable value with SSA = 6 minutes due to lack of contributing run-on from surrounding drainage basins. 19 acres or the total 19.6 will be direct rainfall into the Gypsum Pond.

4.3 DRAINAGE BASIN