**PERIODIC INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN**
**PLANT GORGAS ASH 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(c)(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 Ash Pond is located at Alabama Power Company's Plant Gorgas. The facility consists of an approximate 420-acre CCR storage area. The inflow design flood consists of the rainfall that falls within the limits of the surface impoundment and runoff from adjoining watershed acreage, resulting in a total of approximately 1,300 acres of drainage basin. The impoundment is currently undergoing closure and the water level within the impoundment periodically drops several feet below the principal spillway since the facility no longer receives sluice water or other wastewaters. Stormwater is temporarily stored within the limits of the surface impoundment and then pumped to a temporary water treatment system before being discharged through a permitted NPDES discharge point. A two-bay concrete spillway structure serves as an auxiliary spillway.

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 Probable Maximum Flood (PMF) storm event required for a High hazard potential facility. Runoff curve number data was determined using Table 2-2A from the Urban Hydrology for Small Watersheds (TR-55). The U.S. Department of Commerce's Hydro Meteorological Report 51 was used to determine the storm depth for a 6-hr PMF

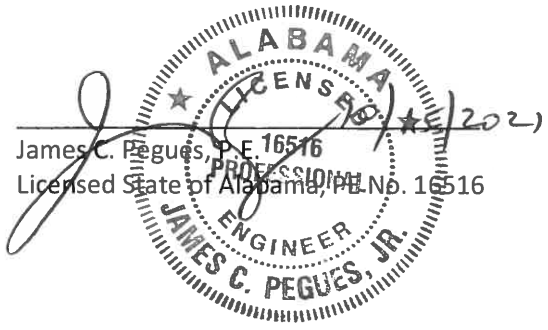
storm event, taken as 30.1 inches. Autodesk Storm and Sanitary Analysis, 2019 was used to model the 6-hr PMF storm.

The NRCS provided information on the soil characteristics and hydrologic groups present at the site. It was determined that the hydrological groups A, B, and D should be used to best reflect the characteristics of the soils on site. Curve number values for each land use (determined from aerial photography) and soil combination were taken from the National Engineering Handbook Part 630, Chapter 9. Rating curves were generated from the dynamic wave in PCSWMM and imported into Hydrologic Engineering Center - Hydrologic Modeling System and used to generate appropriate precipitation curves and storm basin routing information to evaluate surface impoundment capacity.

Calculations indicate the unit can safely store and pass the inflow design storm without overtopping the cross-valley embankment.

The facility is operated subject to and in accordance with § 257.3-3 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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**Updated Inflow Design Control System Plan:**
**Hydrologic and Hydraulic Calculation Summary**

for

***Plant Gorgas Ash Pond***

Prepared by:

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Approval: _____ 10/7/21
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## 1.0 Purpose of Calculation

The purpose of this calculation is to evaluate the Ash Pond for compliance with EPA's Title 40 CFR Part 257.82 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 the design storm (the PMF flood) as required for a high 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 Ash Pond to determine the hydraulic capacity of the impoundment. The design storm for the Plant Gorgas Ash Pond is a Probable Maximum Flood (PMF) rainfall event. Southern Company has selected a storm length of 6-hours for the inflow design flood control plan. The results of routing a PMF, 6-hour rainfall event through the impoundment are presented in Table 1 below:

Table 1-Flood Routing Results for Plant Gorgas Ash Pond

| Plant Gorgas | 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 | 383.0 | 395.0 | 385.0 | 389.84 | 5.16 | 24,948 | 601 |

*Normal Pool elevation varies with rainfall and is controlled by weir structure

## 3.0 Methodology

### 3.1 HYDROLOGIC ANALYSES

The Plant Gorgas Ash Pond is classified as a High hazard structure. The design storm for a High hazard structure is a PMF 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 Ash Pond Storm Distribution

| Hazard Classification | Return Frequency (years) | Storm Duration (hours) | Rainfall Total (Inches) | Rainfall Source | Storm Distribution |
|---|---|---|---|---|---|
| High | PMF | 6 | 31.0 | HMR 51 | SCS Type III |

The drainage area for the Plant Gorgas Ash Pond was delineated based on LiDAR data acquired for the Plant in 2016. 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 obtained from drone flight performed by Southern Company – System Air on 5/5/21. Times of Concentration were also developed based on methodologies prescribed in TR-55.

Table 3—Ash Pond Hydrologic Information

| | |
|---|---|
| Drainage Basin Area (acres) | 1,301 |
| Hydrologic Curve Number, CN | 78 |
| Hydrologic Methodology | SCS Method |
| Time of Concentration (minutes) | 24.8 to water surface |
| 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.

There are no longer any process flows from Plant Gorgas being received by the Ash Pond.

## 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 Gorgas Ash Pond consists of a primary spillway and an auxiliary spillway. The primary spillway consists of a sharp crested riser weir of 12-foot length which conveys flow to a corrugated metal conduit. The top of the weir box is at an elevation of 382.0 feet. The conduit is 48-inches in diameter and has a length of approximately 1600 feet divided into six segments. The auxiliary spillway consists of two 7’ x 5’ box culverts with a 1% slope. The receiving spillway is a 15’ x 5’ rectangular flume on a 55% slope. 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) | Length (ft) | Spillway Capacity* (cfs) |
|---|---|---|---|---|---|---|
| Primary segment 1 | 371.0 | 362.7 | 4 dia. | 7.1% | 116.8 | 216 |
| Primary segment 2 | 362.2 | 349.2 | 4 dia. | 23.5% | 55.3 | 394 |
| Primary segment 3 | 348.7 | 348.6 | 4 dia. | 0.5% | 16.6 | 57 |
| Primary segment 4 | 348.6 | 312 | 4 dia. | 8.3% | 441 | 234 |
| Primary segment 5 | 312 | 310 | 4 dia. | 0.03% | 574 | 48 |
| Primary segment 6 | 310 | 247 | 4 dia. | 15.9% | 396 | 324 |
| Auxiliary | 385.0 | 384.5 | 7-foot span 5-foot rise | 0.10 | 49.6 | 1,013 |

*Some spillway segments are operating in a greater than capacity (surcharged) condition.

## 4.0 SUPPORTING INFORMATION

### 4.1 CURVE NUMBER

| SOILS DATA TABLE | | | | |
|---|---|---|---|---|
| | Soil Rating | Area (Ac) | Curve Number | Weighted CN |
| Forest | A | 58 | 45 | 2.01 |
| | B | 486 | 66 | 24.65 |
| | D | 101 | 83 | 6.44 |
| Grass | B | 27.2 | 58 | 1.21 |
| | D | 16.2 | 78 | 0.97 |
| Gravel | B | 21 | 85 | 1.37 |
| | D | 42.8 | 91 | 2.99 |
| Ash | | 60 | 90 | 4.15 |
| Bare Soil | B | 82 | 82 | 5.17 |
| | D | 56 | 89 | 3.83 |
| Transmission | A | 4 | 60 | 0.18 |
| | B | 34.3 | 65 | 1.71 |
| | D | 15 | 82 | 0.95 |
| Direct rainfall | | 297.5 | 98 | 22.41 |
| | **TOTAL** | **1301** | | **78** |

## 4.2 STAGE-STORAGE TABLE

| Elevation | Area (acres) | Volume (acre-ft.) |
|---|---|---|
| 320 | 1.6 | 0 |
| 325 | 5.3 | 17.4 |
| 330 | 10.6 | 57.3 |
| 335 | 14.3 | 119.6 |
| 340 | 20.0 | 205.3 |
| 345 | 32.5 | 336.5 |
| 350 | 45.5 | 531.6 |
| 355 | 62.7 | 802.0 |
| 360 | 85.5 | 1172.3 |
| 365 | 197.0 | 1878.4 |
| 370 | 261.9 | 3025.7 |
| 375 | 286.7 | 4397.3 |
| 380 | 308.3 | 5885.0 |
| 385 | 361.2 | 7558.9 |
| 390 | 394.6 | 9448.6 |
| 395 | 427.8 | 11504.7 |

## 4.3 TIME OF CONCENTRATION

| Sheet Flow Computations | Subarea A | Subarea B | Subarea C |
|---|---|---|---|
| Manning's Roughness : | .4 | 0.00 | 0.00 |
| Flow Length (ft) : | 130 | 0.00 | 0.00 |
| Slope (%) : | 4 | 0.00 | 0.00 |
| 2 yr, 24 hr Rainfall (in) : | 4.13 | 0.00 | 0.00 |
| Velocity (ft/sec) : | 0.12 | 0.00 | 0.00 |
| Computed Flow Time (min) : | 17.67 | 0.00 | 0.00 |

| Shallow Concentrated Flow Computations | Subarea A | Subarea B | Subarea C |
|---|---|---|---|
| Flow Length (ft) : | 1387 | 0.00 | 0.00 |
| Slope (%) : | 6.3 | 0.00 | 0.00 |
| Surface Type : | Unpaved | Unpaved | Unpaved |
| Velocity (ft/sec) : | 4.05 | 0.00 | 0.00 |
| Computed Flow Time (min) : | 5.71 | 0.00 | 0.00 |

| Channel Flow Computations | Subarea A | Subarea B | Subarea C |
|---|---|---|---|
| Manning's Roughness : | .04 | 0.00 | 0.00 |
| Flow Length (ft) : | 1100 | 0.00 | 0.00 |
| Channel Slope (%) : | 11.8 | 0.00 | 0.00 |
| Cross Section Area ($ft^2$) : | 10 | 0.00 | 0.00 |
| Wetted Perimeter (ft) : | 10 | 0.00 | 0.00 |
| Velocity (ft/sec) : | 12.80 | 0.00 | 0.00 |
| Computed Flow Time (min) : | 1.43 | 0.00 | 0.00 |

Total TOC (min) .....24.81

## 4.4 DRAINAGE BASIN