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RUN-ON AND RUN-OFF CONTROL PLAN

40 C.F.R. PART 257.81

PLANT MCINTOSH COAL COMBUSTION BY-PRODUCT LANDFILL NO. 4

(LANDFILL 4)

GEORGIA POWER COMPANY

EPA's "Disposal of Coal Combustion Residuals from Electric Utilities Final Rule" (40 C.F.R. Part 257 and Part 261), §257.81, requires the owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill to prepare a run-on and run-off control system plan to document how these control systems have been designed and constructed to meet the applicable requirements of this section of the rule.

The Plant McIntosh Landfill 4 is located in Effingham County, east of Rincon, Georgia on Plant McIntosh property. Landfill 4 is comprised of Cell 1, Cell 2A and future Cells 2B, 3 and 4. Cell 1 closure is essentially complete with final cover in place. Cell 2A is constructed and projected to be approved and operational in 2016. Cell 2A consists of a storage cell, a leachate pond, a sedimentation pond, and a clear pool. Future development of Landfill 4 includes Cells 2B, 3, and 4. These cells will be designed and constructed in the same manner as Cell 2A.

The storm water flows have been calculated using the Natural Resources Conservation Service (NRCS) method, also known as the Soil Conservation Service (SCS method), using 24 hour storm events. The storm water detention system has been designed in accordance with the Georgia Soil and Water Conservation Commission requirements as well as other local, city, and government codes.

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 Technical Paper No. 40, Rainfall Frequency Atlas of the United States. The NRCS provides information on soil characteristics and hydrologic groups. The soil types found on the site are Fuquay loamy sand, Leefield loamy sand, Mascotte sand, Meldrim sand, Pelham loamy sand, Pickney mucky sand, Rigdon sand, Surrency mucky sand and Udorthents. It was determined that the hydrological group "B" should be used to best reflect the characteristics of

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the soils on site. This information was placed into Hydraflow Hydrographs 2013 and used to generate appropriate precipitation curves, runoff curve numbers and storm basin runoff values.

Landfill 4 is designed and constructed with perimeter berms and drainage ditches surrounding the cell that prevent storm water run-on during the peak discharge of a 24-hr, 25-yr storm from flowing onto the active portion of the landfill, Cell 2A. Within Cell 2A, the leachate pond collects and controls the anticipated amount of leachate generated from the leachate collection system over a period of 7 to 10 days as well as the quantity of rainfall from a 24-hr, 100-yr storm event that falls directly into the leachate pond. For the purposes of the run-off calculations, the drainage area for the leachate pond is not included. Storm water run-off from Cell 2A is routed through a sedimentation pond designed to handle the run-off from a 24-hr, 25-yr storm. This plan is supported by appropriate engineering calculations which are attached.

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

I hereby certify that the run-on and run-off control system plan meets the requirements of 40 C.F.R. Part 257.81.


James C. Pegues, P.E.

Licensed State of Georgia, PE No. 17419



**Run-on and Run-off Control System Plan for Landfills:
Calculation Summary**


for

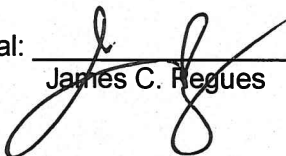
Plant McIntosh Landfill 4

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Reviewer:  10/11/16
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Approval:  10/12/16
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1.0 Purpose of Calculation

The purpose of this report is to demonstrate the run-on and run-off controls of the Plant McIntosh landfill 4 in order to prepare a run-on and run-off control system plan as required by the United States Environmental Protection Agency's (EPA) final rule for Disposal of Coal Combustion Residuals (CCR) from Electric Utilities (EPA 40 CFR 257).

2.0 Summary of Conclusions

2.1 Site Overview

The Plant McIntosh Landfill 4 is located on Plant McIntosh property approximately 9 miles east of Rincon, Georgia and 27 miles north of Savannah, Georgia. The total area occupied by the Landfill 4 is 18.84 acres. The active drainage area for run-off purposes is 16.03 acres which does not include the area for the leachate pond. Run-off from this area is directed through perimeter ditches that are inside the cell's perimeter dike. Flow from the perimeter ditches discharge into a sedimentation pond via three 30" diameter pipes. The sedimentation pond is connected to a clear pool via two 60" diameter risers and two 42" diameter pipes. Storm water from the clear pool is discharged through a 60" diameter riser and 42" diameter pipe. Discharge from the clear pool goes into a ditch that flows to the east towards a tributary stream of Lockner Creek.

An overview of Landfill 4 Cell 2A is provided in Table 1 below.

Table 1 - Landfill 4 Cell 2A Site Characteristics

Description	Storage Cell	Sedimentation Pond	Clear Pool
Size (Acres)	12.18	2.57	1.28
Outlet Type	Three 30" pipes	Two 60" Risers connected to two 42" pipes	60" Riser connected to a 42" pipe
Outlets To	Sedimentation Pond	Clear Pool	Ditch

2.2 Run-on Control System Plan

There is no stormwater run-on into the facility because it is contained within earthen berms that prevent stormwater from the surrounding area to enter the landfill.

2.3 Run-off Control System Plan

A hydrologic and hydraulic model was developed for the Plant McIntosh Landfill 4 to determine the hydraulic capacity of Landfill No. 4. The design storm for the purposes of run-off control system plans is the 24-hour, 25-year rainfall event. The results of routing the design storm event through the landfill are presented in Table 2 below:

Table 2 - Flood Routing Results for Plant McIntosh Landfill 4 Cell 2A

Plant McIntosh	Normal Pool EI (ft)	Top of Embankment EI (ft)	Peak Water Surface EI (ft)	Freeboard* (ft)	Peak Inflow (cfs)	Peak Outflow (cfs)
Cell 2A	36.00	45.0	40.31	4.69	122.65	0.00**

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

**The peak outflow is negligible because the riser is perforated with 0.5" holes that are covered by filter stone which drains the clear pool slowly. The elevation of the clear pool does not reach the elevation of the primary spillway during the design storm.

3.0 Methodology

3.1 HYDROLOGIC ANALYSES

The design storm for all run-on/run-off analyses is a 24-hour, 25-year rainfall event. A summary of the design storm parameters and rainfall distribution methodology for these calculations is summarized below in Table 3.

Table 3 - Plant McIntosh Landfill 4 Cell 2A Design Storm Distribution

Return Frequency (years)	Storm Duration (hours)	Rainfall Total (Inches)	Rainfall Source	Storm Distribution
25	24	8.10	NOAA Atlas 14	SCS Type II

The drainage area for the Plant McIntosh Landfill 4 was delineated based on LiDAR data acquired for the Plant in 2013. 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 Natural Resources Conservation Service. Land use areas were delineated based on aerial photography. Time of Concentration and Lag Time calculations were also developed based on methodologies prescribed in TR-55.

A table of the pertinent basin characteristics of the landfill is provided below in Table 4.

Table 4 - Landfill Hydrologic Information (Cell 2A)

Drainage Basin Area (acres)	16.03
Hydrologic Curve Number, CN	85
Hydrologic Methodology	SCS Method
Time of Concentration (minutes)	15.20
Hydrologic Software	Hydroflow Hydrographs

Run-off values were determined by importing the characteristics developed above into a hydrologic model with the Hydroflow Hydrographs Extension for AutoCAD Civil 3D 2013.

3.2 HYDRAULIC ANALYSES

Storage values for the landfill were determined by developing a stage-storage relationship utilizing contour data. The spillway system at the Plant McIntosh Landfill 4 consists of a primary spillway and an auxiliary spillway. The primary spillway consists of a sharp crested riser weir of 15.71 foot length which conveys flow to an HDPE pipe. The top of the riser weir is at elevation of 41.00 feet. The pipe is 3.5 feet in diameter and has a length of approximately 80 feet. The auxiliary spillway is a concrete trapezoidal weir that is 20' wide with 6:1 side slopes sloped at 1% with a crest elevation of 42.5. A summary of spillway information is presented below in Table 5.

Table 5 - Spillway Attribute Table

Spillway Component	US Invert El (ft)	DS Invert El (ft)	Dimension (ft)	Slope (ft/ft)	Length (ft)	Spillway Capacity (cfs)
Primary	34.36	33.0	3.5' Diameter	1.7%	80	151.5
Auxiliary	42.5	42.25	20' span 2.5' rise	1.0%	25	541.8

Based on the spillway attributes listed above, the data was inserted into Hydraflow Hydrographs to determine the pond performance during the design storm. Results are shown in Table 2.

4.0 SUPPORTING INFORMATION

4.1 CURVE NUMBER

Terrain Type	Area	Curve Number
Grass	5.37	61
Gravel	0.89	85
HDPE	9.77	98

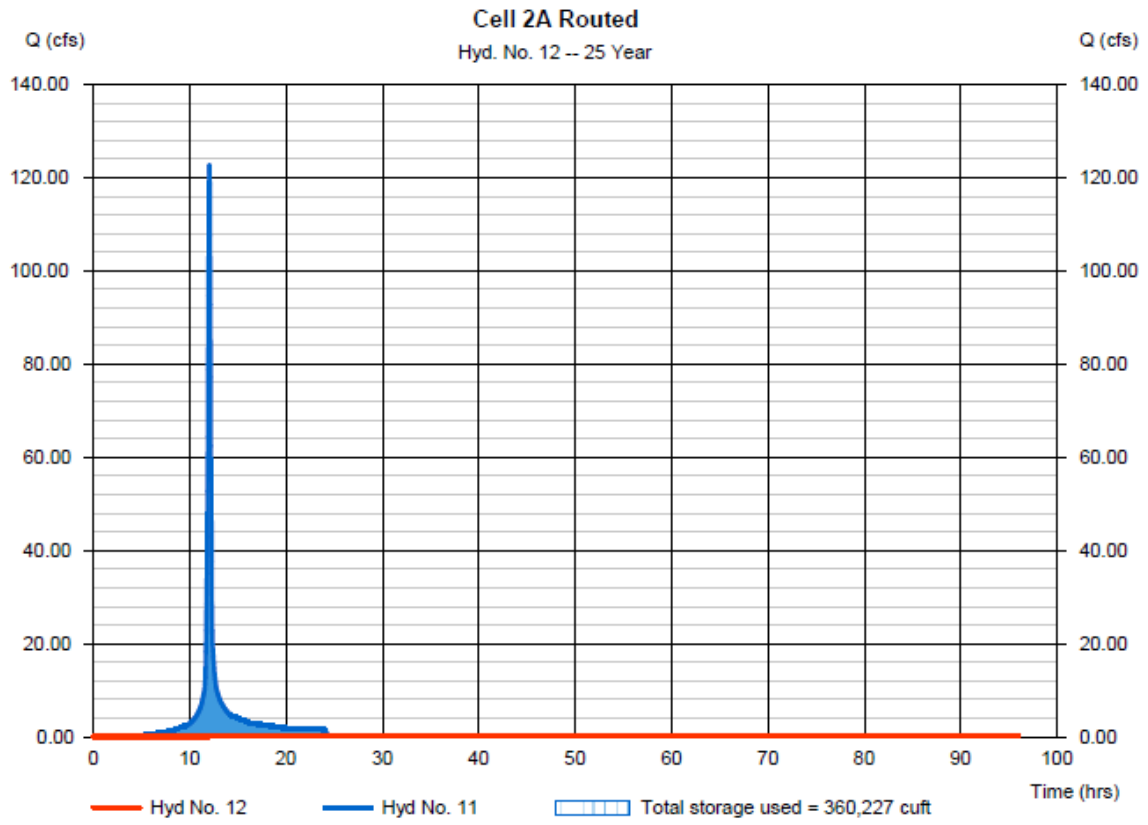
4.2 STAGE-STORAGE TABLE

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	35.00	16,459	0	0
1.00	36.00	66,066	38,496	38,496
2.00	37.00	69,794	67,915	106,411
3.00	38.00	73,759	71,760	178,171
4.00	39.00	77,815	75,770	253,942
5.00	40.00	82,441	80,109	334,050
6.00	41.00	87,167	84,785	418,835
7.00	42.00	91,957	89,542	508,377
7.50	42.50	94,087	46,505	554,883

4.3 TIME OF CONCENTRATION

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.150	0.011	0.011	
Flow length (ft)	= 256.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 4.34	0.00	0.00	
Land slope (%)	= 10.55	0.00	0.00	
Travel Time (min)	= 9.18	+ 0.00	+ 0.00	= 9.18
Shallow Concentrated Flow				
Flow length (ft)	= 39.00	0.00	0.00	
Watercourse slope (%)	= 12.82	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=5.78	0.00	0.00	
Travel Time (min)	= 0.11	+ 0.00	+ 0.00	= 0.11
Channel Flow				
X sectional flow area (sqft)	= 12.26	2.96	0.00	
Wetted perimeter (ft)	= 11.47	4.34	0.00	
Channel slope (%)	= 0.81	0.52	0.00	
Manning's n-value	= 0.030	0.013	0.015	
Velocity (ft/s)	=4.67	6.40	0.00	
Flow length (ft)	((0))1628.0	44.0	0.0	
Travel Time (min)	= 5.81	+ 0.11	+ 0.00	= 5.92
Total Travel Time, Tc				15.21 min

4.4 RESULTS



4.5 DRAINAGE BASIN

