



Duke Energy  
410 S. Wilmington Street  
Raleigh, NC 27601

October 12, 2017

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Water Quality  
Permitting Section

Bob Sledge  
NC Division of Water Resources  
1617 Mail Service Center  
Raleigh, NC 27699-1617

Subject: Submittal of engineering reports  
SOC application  
Duke Energy Facilities

Dear Mr. Sledge,

Attached please find the third party engineering reports referenced in Duke Energy's application for Special Order by Consent dated September 28, 2017.

If there are any questions about this matter please feel free to contact me at (919) 546-2439 or [shannon.langle@duke-energy.com](mailto:shannon.langle@duke-energy.com).

Sincerely,

A handwritten signature in blue ink that reads "Shannon Langle".

E. Shannon Langle  
Lead Environmental Specialist

Enclosures

**COAL COMBUSTION RESIDUALS (CCR) ANNUAL SURFACE IMPOUNDMENT REPORT  
JUNE 2017 INSPECTION**

**HF LEE STEAM STATION**  
1677 Old Smithfield Road  
Goldsboro, North Carolina

**Prepared For:**

**Duke Energy Carolinas, LLC**  
400 South Tryon Street  
Charlotte, North Carolina 28202

**Prepared By:**

**Amec Foster Wheeler  
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Registered in North Carolina  
Engineering and Land Surveying License No. F-1253

**July 19, 2017**

**Amec Foster Wheeler Project No.: 7810-17-0839**

**COAL COMBUSTION RESIDUALS (CCR)  
ANNUAL SURFACE IMPOUNDMENT REPORT  
APRIL 2016 INSPECTION**



**H.F. LEE STEAM STATION**

Retired Ash Basin (1982 Ash Pond Dam) (State ID No. WAYNE-022)  
Retired Ash Basin No. 1 (State ID No. WAYNE-031)  
Retired Ash Basin No. 2 (State ID No. WAYNE-032)  
Retired Ash Basin No. 3 (State ID No. WAYNE-033)

Duke Energy Carolinas LLC  
1677 Old Smithfield Road  
Goldsboro, Wayne County, North Carolina

**Inspection Date:** 06/06/2017  
**Report Date:** 07/19/2017

**Amec Foster Wheeler Project No.:** 7810-17-0839

**Inspection Team:** William A. Williams, PE, PG Senior Engineer, Amec Foster Wheeler  
Nick Parks, PE Senior Engineer, Amec Foster Wheeler  
Austin Mack, PE Duke Energy CCP Engineer

**Summary**

Amec Foster Wheeler has been retained to conduct the 2017 Annual Inspection (under the reporting requirements of 40 C.F.R. §257.83(b)) for the coal combustion residuals (CCR) surface impoundments at H.F. Lee Steam Station. This annual dam/CCR Surface Impoundment Inspection Report meets the requirements of 40 C.F.R. § 257.83 (b)(1) and (2) and to meet the requirements of the North Carolina Coal Ash Management Act (Session Law 2014-122) Part V, Section 10 (amending G.S. 143-215.32 (inspection of dams). This annual inspection focused primarily on (i) the structural stability of the CCR surface impoundment; (ii) the integrity of any hydraulic structures passing underneath the CCR surface impoundment or through the dike of the unit; and (iii) ensuring that the construction, design, operation, and maintenance of the CCR surface impoundment is in accordance with recognized and generally accepted good engineering standards. Per Duke Energy, only the 1982 Ash Basin (WAYNE-022) is required to have an annual inspection under the CCR Rules.

The purpose of this inspection and report is to provide an engineering opinion as to whether the impoundment is structurally sound and that the design, operation, and maintenance of the impoundment are in accordance with generally accepted engineering standards.

In summary, no conditions were observed during this field inspection nor identified by existing engineering analyses that represent an unsafe structural stability concern requiring immediate attention. Amec Foster Wheeler concludes that the construction, design, operation, and maintenance of the CCR surface impoundments have been sufficiently consistent with recognized and generally accepted engineering standards for protection of public safety. Issues concerning the hydraulic structures (risers, pipes, spillways) have been addressed by repairs or replacements recently completed. Design and construction issues that have been identified for some of the dams have been addressed.



Sincerely,

Amec Foster Wheeler Environment & Infrastructure, Inc.



William A. Williams, PE, PG  
Senior Engineer  
Registered, North Carolina PE 22943

A handwritten signature in black ink, appearing to read "G. David Garrett".

G. David Garrett, PG, PE (Reviewer)  
Senior Engineer

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**1. Design / Geometry of the Impounding Structure**

Based on the data reviewed and the visual inspection, minor modifications to the basic geometry of the 1982 Ash Basin dike have been made in the last year. The exterior slopes of the embankment were re-graded to decrease the slope to approximately 3:1 along the north and east sides of the basin, and much of the southern exterior slope has been armored with riprap (Work Order 5622837). A trench drain system to capture seepage water along the eastern side of the basin has been installed (Work Order 8409620). The following geometry data were provided by Duke Energy:

**a. Retired 1982 Ash Basin and Secondary Ash Basin Dam (State ID No. WAYNE-022):**

	1982 Ash Basin Dam	1982 Secondary Basin Dam
Dam Length, ft	Approx. 10,200 (Perimeter Dam, Including Secondary Basin)	Approx. 629 (Separator [common] Dam Only with Primary Basin)
Maximum Dam Height, ft	20	20
Crest Elevation, ft MSL (NAVD88)	88.3-90.0	90
Crest Width, ft	12	12
Basin Area, acres	Approx. 120.8	Approx. 2.1

**b. Retired Ash Basin No. 1 Dam (State ID No. WAYNE-031):**

	Ash Basin No. 1 Dam
Dam Length, ft	Approx. 4,320 (Including Separator [Common] Dam with Ash Basin No. 2)
Maximum Dam Height, ft	7
Crest Elevation, ft MSL (NAVD88)	78.7-82.0
Crest Width, ft	14-20
Pond Area, acres	Approx. 24

**c. Retired Ash Basin No. 2 Dam (State ID No. WAYNE-032)**

	Ash Basin No. 2 Dam
Dam Length, ft	Approx. 5,000 (Not Including Separator [Common] Dam with Ash Basin No. 1)
Maximum Dam Height, ft	15
Crest Elevation, ft MSL (NAVD88)	78.7-82.0
Crest Width, ft	14-20
Pond Area, acres	Approx. 50

**d. Retired Ash Basin No. 3 Dam (State ID No. WAYNE-033)**

	Ash Basin No. 3 Dam
Dam Length, ft	Approx. 7,650
Maximum Dam Height, ft	10
Crest Elevation, ft MSL (NAVD88)	78.5-81.0
Crest Width, ft	2*-12
Pond Area, acres	Approx. 86

\*Note: Two feet refers to the crest width achieved for a relatively small berm constructed to provide additional capacity just before closing the basin to further sluicing.

**2. Existing Instrumentation and Maximum Readings**

Monitoring instrumentation at H.F. Lee includes existing piezometers and new basin water level gauges installed at the Retired 1982 Ash Basin, as listed in Table 1 below. Tables 2, 3, and 4 list the instrumentation for the Retired Ash Basins Nos. 1, 2, and 3, respectively. These four tables present the location, number designation, and the highest (maximum) elevation that the water has reached from January 2016 through February 2017 for the 26 piezometers at the H.F. Lee Steam Station ash basins. Slope indicators, settlement monuments, weirs or flumes to measure seepage, discharge flow gauges, or seismic instrumentation are not located at this site. Station

personnel take monthly water level readings and report the readings to Duke Energy CCP Engineering. The data collected are analyzed by CCP Engineering for any changes or anomalies. The following information was provided by Duke Energy:

a. Retired 1982 Ash Basin and Secondary Basin Dam (State ID No. WAYNE-022):

Table 1: Maximum Water Level Recorded Between January 2016 and June 2017

Location		Piezometers	Maximum Recorded Reading Water Elevation (ft MSL, NAVD88)
Latitude (N)	Longitude (E)		
35.38398°	-78.0781°	PZ-3	81.26
35.38262°	-78.08484°	PZ-9	66.33
35.38262°	-78.08484°	PZ-10	66.16
35.38031°	-78.06854°	P-1 <sup>2</sup>	68.33
35.38033°	-78.06848°	P-2 <sup>1</sup>	78.57 <sup>1</sup>
35.38033°	-78.06839°	P-3 <sup>1</sup>	70.57 <sup>1</sup>
35.38066°	-78.06837°	P-4 <sup>1</sup>	72.76 <sup>1</sup>
35.37961°	-78.06832°	P-5 <sup>1</sup>	78.68 <sup>1</sup>
35.37960°	-78.06825°	P-6 <sup>1</sup>	67.42 <sup>1</sup>
35.383855°	-78.081167°	P100	71.59
35.386547°	-78.073721°	P101	74.69
35.384600°	-78.070855°	P102	72.56
35.381421°	-78.069151°	P103 <sup>3</sup>	81.13 <sup>2</sup>
35.381293°	-78.076013°	P104 <sup>3</sup>	83.13 <sup>2</sup>
35.382590°	-78.080142°	P105 <sup>3</sup>	68.49 <sup>2</sup>
TBD	TBD	Water Level Gauges <sup>4</sup>	Variable – Pumping operation in progress to de-water the pond.

<sup>1</sup> No readings recorded after September 2016 due to slope armoring at piezometer locations.

<sup>2</sup> No readings recorded between September 2016 and March 2017 due to slope armoring at piezometer locations.

<sup>3</sup> No readings recorded after February 2017 due to dirt and grit preventing removal of cap

<sup>4</sup> Water Level Gauges became operational on April 20, 2016

**b. Retired Ash Basin No. 1 Dam (State ID No. WAYNE-031)**

Table 2: Maximum Water Level Recorded Between January 2016 and June 2017

<b>Location</b>		<b>Piezometers</b>	<b>Maximum Recorded Reading Water Elevation (ft MSL NAVD88)</b>
<b>Latitude (N)</b>	<b>Longitude (E)</b>		
35.38134°	-78.10611°	PZ-8 <sup>1</sup>	78.22 <sup>1</sup>
35.379582°	-78.107665°	P100	75.00
35.381656°	-78.10872°	P101	74.92

<sup>1</sup> No readings recorded after September 2016 due to flooding in the basin

**c. Retired Ash Basin No. 2 Dam (State ID No. WAYNE-032)**

Table 3: Maximum Water Level Recorded Between January 2016 and June 2017

<b>Location</b>		<b>Piezometers</b>	<b>Maximum Recorded Reading Water Elevation (ft MSL NAVD88)</b>
<b>Latitude (N)</b>	<b>Longitude (E)</b>		
35.37957°	-78.1054°	PZ-4 <sup>1</sup>	75.62 <sup>1</sup>
35.38148°	-78.1018°	PZ-5 <sup>1</sup>	76.48 <sup>1</sup>
35.381169°	-78.100603°	P100 <sup>2</sup>	74.64
35.378130°	-78.104725°	P101	74.30

<sup>1</sup> No readings recorded after September 2016 due to flooding in the basin

<sup>2</sup> No readings recorded after August 2016 due to flush mount piezometer cover buried beneath roadway gravel

**d. Retired Ash Basin No. 3 Dam (State ID No. WAYNE-033)**

Table 4: Maximum Water Level Recorded Between January 2016 and June 2017

<b>Location</b>		<b>Piezometers</b>	<b>Maximum Recorded Reading Water Elevation (ft MSL NAVD88)</b>
<b>Latitude (N)</b>	<b>Longitude (E)</b>		
35.37331°	-78.10660°	PZ-6	74.42
35.37752°	-78.10742°	PZ-7 <sup>1</sup>	72.66 <sup>1</sup>
35.375094°	-78.103921°	P100	69.71
35.373458°	-78.110245°	P101 <sup>2</sup>	71.35 <sup>2</sup>

<sup>1</sup> No readings recorded after September 2016 due to flooding in the basin

<sup>2</sup> P101 was under ponded stormwater for all readings except from June through November 2016

**3. Approximate Depth & Elevation of the Impounded Water and CCR**

Tables 5, 6, 7, and 8 below present the presently known information on the depths and elevations of impounded surface water and CCR for the four ash basins at the H.F. Lee Steam Station. The impounded surface water from only stormwater runoff (no other water enters or collects in the basins) varies daily, including dry/wet conditions in Basins 1, 2, and 3. Because the H.F. Lee Steam Station is retired and decommissioned, no new CCR enters the basins. No ash removal has taken place, thus the CCR in place within each of the basins remains the same as when each basin was retired from service. Duke Energy provided the following information:



a. Retired 1982 Ash Basin and Secondary Ash Basin (State ID No. WAYNE-022):

Table 5: Retired 1982 Main Ash and Secondary Basins (State ID No. WAYNE-022) Impounded Surface Water and CCR Depth and Elevation Information.

	<i>Impounded Surface Water</i>		<i>CCR</i>	
	<i>Surface Elevation (ft)</i>	<i>Measurement Date</i>	<i>Depth (ft)</i>	<i>Measurement Date</i>
Minimum Depth (ft)	Fluctuates throughout year based on seasonal changes and dewatering operations. Active pumping on-going to dewater the pond.	N/A	Zero depth of water; CCR exposed at surface at a highest elevation of approximately 100 feet at top of interior ash stack area	Throughout 2016/2017
Maximum Depth (ft) – Main Basin	14-foot depth, based on a general bottom elevation of approximately 70 feet and a water surface elevation of 84 feet; but fluctuates throughout year. Active pumping on-going to dewater the pond. The peak stage elevation is approximately 87.35 feet.	May 2017	18 feet in depth at an estimated bottom elevation of 70 feet, for areas outside of ash stacking	Throughout 2016/2017
Present Depth (ft)	Surface Water Elevation 83.5 feet (Main Basin)	May 2017	Unchanged from above	May 2017
Maximum Depth (ft) – Secondary Basin	6.6-foot depth, based on a general bottom elevation of approximately 68 feet and a water surface elevation of 74.6 feet, but fluctuates throughout year. Active pumping on-going to dewater the pond. The peak stage elevation is approximately 84 feet.	May 2017	2.25 feet in depth at an estimated bottom elevation of 68 feet	Throughout 2016/2017
Present Depth (ft)	Surface Water Elevation 74.6 feet (Secondary Basin)	May 2017	Unchanged from above	May 2017

**b. Retired Ash Basin No. 1 (State ID No. WAYNE-031):**

Table 6: Retired Ash Basin No. 1 (State ID No. WAYNE-031) Impounded Surface Water and CCR Depth and Elevation Information.

	<i>Impounded Surface Water</i>		<i>CCR</i>	
	<i>Surface Elevation (ft)</i>	<i>Measurement Date</i>	<i>Depth (ft)</i>	<i>Measurement Date</i>
Minimum Depth (ft)	Dry	Throughout 2016/2017	Zero Depth – Exposed at surface, highest elevation of approximately 78.5 feet	Throughout 2016/2017
Maximum Depth (ft)	Approximate elevation 79 (crest of dike)	Throughout 2016/2017	9-foot depth, lowest elevation of approximately 69.5 feet	Throughout 2016/2017
May 2017 Depth (ft)	Approximately 6 inches in southeast corner	May 2017	Unchanged from above	May 2017

**c. Retired Ash Basin No. 2 (State ID No. WAYNE-032):**

Table 7: Retired Ash Basin No. 2 (State ID No. WAYNE-032) Impounded Surface Water and CCR Depth and Elevation Information.

	<i>Impounded Surface Water</i>		<i>CCR</i>	
	<i>Surface Elevation (ft)</i>	<i>Measurement Date</i>	<i>Depth (ft)</i>	<i>Measurement Date</i>
Minimum Depth (ft)	Dry	Throughout 2016/2017	Zero Depth – Exposed at surface, highest elevation of approximately 77.5 feet	Throughout 2016/2017
Maximum Depth (ft)	Approximate elevation 79 (crest of dike)	Throughout 2016/2017	7-foot depth, lowest elevation at approximately 70.5 feet	Throughout 2016/2017
May 2017 Depth (ft)	Approximately 6-9 inches in south and east sides	May 2017	Unchanged from above	May 2017

d. **Retired Ash Basin No. 3 (State ID No. WAYNE-033):**

Table 8: Retired Ash Basin No. 3 (State ID No. WAYNE-033) Impounded Surface Water and CCR Depth and Elevation Information.

	<i>Impounded Surface Water</i>		<i>CCR</i>	
	<i>Surface Elevation (ft)</i>	<i>Measurement Date</i>	<i>Depth (ft)</i>	<i>Measurement Date</i>
Minimum Depth (ft)	Dry	Throughout 2016/2017	Zero Depth – Exposed at surface, highest elevation of approximately 80.0 feet	Throughout 2016/2017
Maximum Depth (ft)	Approximate elevation 78.5 (crest of dike)	Throughout 2016/2017	8.5-foot depth, lowest elevation at approximately 71.5 feet	Throughout 2016/2017
May 2017 Depth (ft)	Approximately 12 inches in southwest corner	May 2017	Unchanged from above	May 2017

4. **Storage Capacity of Impounding Structure at the Time of the Inspection**

a. **Storage Capacity for CCR**

Because the HF Lee Steam Station has been retired and demolished, and there is not active ash management; the storage capacity and remaining life are not applicable to this report. Ash sluicing ceased in October 2012. See Section 5 of this report for approximate volume of impounded water and CCR at the time of the inspection.

b. **Storage Capacity for Water**

i. **Retired 1982 Ash Basin (State ID No. WAYNE-022):**

Approximately 1,980 acre-feet to the peak pool elevation of 87.35 feet for the design storm event (1/2 PMP).

ii. **Retired Ash Basin No. 1 (State ID No. WAYNE-031):**

Approximately 165 acre-feet to the peak pool elevation of 78.38 feet for a 50-year storm event.

iii. **Retired Ash Basin No. 2 (State ID No. WAYNE-032):**

Approximately 630 acre-feet to the peak pool elevation of 78.08 feet for a 50-year storm event.

iv. **Retired Ash Basin No. 3 (State ID No. WAYNE-033):**

Approximately 680 acre-feet to the peak pool elevation of 77.53 feet for a 100-year storm event.

5. **Approximate Volume of the Impounded Water and CCR at the Time of the Inspection**

Volume information presented is based on information provided by Duke Energy per CCR Inventory report dated March 2, 2017.

a. **Retired 1982 Ash Basin and Secondary Ash Basin (State ID No. WAYNE-022):**

- 1) Main Basin
  - Impounded Surface Water: 52.5 million gallons
  - CCR: 4,515,600 tons
- 2) Secondary Basin
  - Impounded Surface Water: 1 million gallons
  - CCR: 9,100 tons

3) Total Basin  
Impounded Surface Water: 53.5 million gallons  
CCR: 4,524,700 tons

**b. Retired Ash Basin No. 1 (State ID No. WAYNE-031):**

Impounded Surface Water: Zero (Dry)  
CCR: 268,800 tons

**c. Retired Ash Basin No 2 (State ID No. WAYNE-032):**

Impounded Surface Water: Zero (Dry)  
CCR: 529,200 tons

**d. Retired Ash Basin No. 3 (State ID No. WAYNE-033):**

Impounded Surface Water: Zero (Dry)  
CCR: 910,800 tons

**6. Existing Conditions That Are Disrupting or Have Potential to Disrupt the Operation and Safety of the CCR Unit and Appurtenant Structures Based Inspections**

**Field Inspection**

The field inspection was performed on June 6, 2017, by Bill Williams and Nick Parks of Amec Foster Wheeler. They were accompanied by Austin Mack of Duke Energy. The weather during the inspection was partly cloudy with an air temperature of approximately 80°F. Based on rainfall data collected at the nearby Seymour Johnson Air Force Base, approximately 1 inch of rainfall occurred the day prior to the inspection. The 1982 ash pond had water present in the southeastern corner of the ash pond and in the secondary settling basin. Slight ponded water was observed in the southeast corner of Pond 1 (less than 6 inches), the south and east sides of Pond 2 (approximately 6-9 inches) and the southwest corner of Pond 3 (approximately 12 inches) at the time of our inspection.

**a. Retired 1982 Ash Basin and Secondary Ash Basin (State ID No. WAYNE-022):**

Small quantities of ponded stormwater were observed in several areas on the south dike toe. The standing water appeared to be the result of the rainfall event occurring on the day prior to the inspection, and did not show any signs of flow. There were no signs of slope instability or progressive undermining associated with the standing water. No areas of active seepage were noted during the inspection. Beyond the toe of the south dike is a low, flat area that holds water between the river and the ash pond.

A CCTV inspection of the discharge pipe was conducted on February 7, 2017. The inspection found some deposits in the pipe. Duke Energy concluded that the pipe was in good to excellent condition, with no repairs or modifications required. The discharge pipe will be inspected by CCTV annually.

The observations made during the June 6, 2017 annual inspection indicate that the dam/dike structures for the 1982 Ash Basin and Secondary Basin are generally well maintained and appear to comply with regulatory standards and requirements.

**b. Retired Ash Basins 1 and 2 (State ID Nos. WAYNE-031 and WAYNE-032):**

The perimeter dam/dikes of Retired Ash Basins 1 and 2 were generally in similar conditions as past inspections, and no observed signs of actual or potential structural weakness were observed, except for areas along the exterior of the south dike of Basin 2 adjacent to Half-Mile Branch, as discussed further below.

Several areas of slope damage along the streambanks of Half-Mile Branch show signs of recent and historical sloughing of the banks. Two of the sloughed areas have progressed to the outside edge of the crest. Repair plans have been completed and are pending approval by the US Corps of Engineers and the North Carolina Department of Environmental Quality (Work Order 11461041).

There is no known outlet structure for Pond 1. Stormwater evaporates, infiltrates, or overflows the separator dike between Pond 1 and Pond 2. The discharge outlet structures for Pond 2 were formerly located in the southeast corner and have been removed (Work Order 5633907). The dike was reconstructed in the area where the discharge piping was removed. The former discharge outlet pipe beyond the exterior toe of the dike remains in-place. Water was present at the pipe outlet, but no flow was observed.

c. **Retired Ash Basin 3 (State ID No. WAYNE-033)**

The south and west dikes are generally uneven and thickly overgrown. Scarps and narrow containment berms were observed along the interior crest. These containment berms were formed when soil was excavated adjacent to the exterior slope toe and placed on the top of the inside crest for raising the dike before it became inactive. This process has created a relatively narrow berm about two feet high for additional containment. Gravel berms were observed on the interior side of the roadway to re-establish the narrow containment berm (Work Order 20041803-24). One area that has previously been regraded was showing signs of erosion and is schedule for repair (Work Order 20044803-24). Animal erosion trails and burrows were observed at several locations along the south dike of the basin and are scheduled for repair (Work Order 20044803-24).

7. **Maintenance**

Duke Energy has developed an Operations and Maintenance (O&M) Manual to instruct internal operation and engineering personnel on the proper procedures for operating and maintaining the Ash Basin System. Review of the facility indicates that the Station System Owners and Station Environmental Coordinators operate and maintain the impoundment facility in a safe and regulatory-compliant manner such as meeting State and Federal laws along with company guidelines. The O&M manual provides the necessary information in a concise and comprehensive manner and assists those responsible for operating and maintaining the ash impoundment facility and associated support features.

Observations during this 2017 inspection indicate that Duke Energy is adequately maintaining the facility.