2018 COAL COMBUSTION RESIDUALS (CCR) ANNUAL SURFACE IMPOUNDMENT INSPECTION REPORT

2018 INSPECTION

CAPE FEAR STEAM STATION
500 CP&L Road
Moncure, North Carolina

Prepared For:
Duke Energy Carolinas, LLC
400 South Tryon Street
Charlotte, North Carolina 28202

Prepared By:
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Registered in North Carolina
Engineering and Land Surveying License No. F-1253

May 16, 2018

Amec Foster Wheeler Project No.: 7810-18-1037
2018 COAL COMBUSTION RESIDUALS (CCR)
SURFACE IMPOUNDMENT INSPECTION REPORT

CAPE FEAR STEAM STATION
1956 Retired Ash Basin Dam (State ID No. CHATH-075)
1963/1970 Retired Ash Basin Dam (State ID No. CHATH-076/077)
1978 Retired Ash Basin Dam (State ID No. CHATH-078)
1985 Retired Ash Basin Dam (State ID No. CHATH-079)

Duke Energy Carolinas LLC
500 CP&L Road
Moncure, Chatham, North Carolina

Inspection Date: 04/04/2018

Summary

Amec Foster Wheeler has been retained to conduct the 2018 Annual Inspection for the coal combustion residuals (CCR) surface impoundments at Cape Fear Steam Station. This annual dam/CCR Surface Impoundment Inspection Report meets 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 an assessment of (i) the structural stability of the CCR surface impoundment; (ii) the integrity of any hydraulic structures passing underneath the CCR surface impoundments or through the dikes of the units; and (iii) verifying that the construction, design, operation, and maintenance of the CCR surface impoundments appear to be in accordance with recognized and generally accepted good engineering standards.

In summary, no conditions were observed during the 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 and the environment.

Sincerely,

Amec Foster Wheeler Environment & Infrastructure, Inc.

[Signature]

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

For J Allen Rice, PE (Technical Reviewer)
Principal Engineer
W/ permission
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1. **Design / Geometry of the Impounding Structure**

   Based on the data reviewed and the visual inspection, no modifications to the geometry of impounding structures have been made since the 2017 annual inspection. The following geometry data was obtained from Duke Energy. Values given in the tabulations below should be considered approximate.

   a. **Retired 1956 Ash Basin Dam (State ID No. CHATH-075):**

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Length, ft</td>
</tr>
<tr>
<td>Maximum Dam Height, ft</td>
</tr>
<tr>
<td>Crest Elevation, ft</td>
</tr>
<tr>
<td>Crest Width, ft</td>
</tr>
<tr>
<td>Pond Area, acres</td>
</tr>
</tbody>
</table>

   b. **Retired 1963/1970 Ash Basin Dam (State ID No. CHATH-076/077):**

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Length, ft</td>
</tr>
<tr>
<td>Maximum Dam Height, ft</td>
</tr>
<tr>
<td>Crest Elevation, ft</td>
</tr>
<tr>
<td>Crest Width, ft</td>
</tr>
<tr>
<td>Pond Area, acres</td>
</tr>
</tbody>
</table>

   c. **Retired 1978 Ash Basin Dam (State ID No. CHATH-078):**

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Length, ft</td>
</tr>
<tr>
<td>Maximum Dam Height, ft</td>
</tr>
<tr>
<td>Crest Elevation, ft</td>
</tr>
<tr>
<td>Crest Width, ft</td>
</tr>
<tr>
<td>Pond Area, acres</td>
</tr>
</tbody>
</table>

   d. **Retired 1985 Ash Basin Dam (State ID No. CHATH-079):**

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Length, ft</td>
</tr>
<tr>
<td>Maximum Dam Height, ft</td>
</tr>
<tr>
<td>Crest Elevation, ft</td>
</tr>
<tr>
<td>Crest Width, ft</td>
</tr>
<tr>
<td>Pond Area, acres</td>
</tr>
</tbody>
</table>

2. **Existing Instrumentation and Maximum Readings**

   Monitoring equipment/devices observed at Cape Fear Steam Station include piezometers at all basins and basin water level gauges in Retired Ash Basins CHATH-078 and CHATH-079. Duke Energy personnel take monthly piezometer readings and daily basin water level readings and report the readings to CCP Engineering. Dewatering pumping data is also recorded daily and reported to CCP Engineering. The data collected is analyzed by CCP Engineering for any changes or anomalies.
a. **Retired 1956 Ash Basin Dam (State ID No. CHATH-075):**

Table 1: Maximum Water Levels for the piezometers associated with the 1956 Ash Basin Recorded Between January 2017 and March 2018

<table>
<thead>
<tr>
<th>Location (Latitude, Longitude)</th>
<th>Piezometers</th>
<th>Maximum Recorded Elevation Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.597354°, -79.050530°</td>
<td>PZ-10</td>
<td>166.72 ft (Dry)</td>
</tr>
<tr>
<td>35.59841°, -79.049351°</td>
<td>CHATH-075- P100 ¹</td>
<td>159.71 ft</td>
</tr>
<tr>
<td>35.597238°, -79.048607°</td>
<td>CHATH-075-P101</td>
<td>162.86 ft</td>
</tr>
<tr>
<td>35.598306°, -79.049419°</td>
<td>CHATH-075-P102</td>
<td>162.06 ft</td>
</tr>
<tr>
<td>35.597275°, -79.048393°</td>
<td>CHATH-075-P103 ²</td>
<td>158.03 ft</td>
</tr>
</tbody>
</table>

¹ No readings recorded between June 2016 and November 2017. Reading above based on December 2017 to March 2018.
² Piezometer was damaged in December 2015, and repaired in December 2017. No water levels recorded between January 2016 and January 2018. Reading above based on February 2018 to March 2018.


Table 2: Maximum Water Levels for the piezometers associated with the 1963/1970 Ash Basin Recorded Between January 2017 and March 2018

<table>
<thead>
<tr>
<th>Location (Latitude, Longitude)</th>
<th>Piezometers</th>
<th>Maximum Recorded Elevation Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.589401°, -79.049627°</td>
<td>PZ-8</td>
<td>179.00 ft</td>
</tr>
<tr>
<td>35.588757°, -79.051349°</td>
<td>CHATH-076- P100</td>
<td>167.15 ft</td>
</tr>
<tr>
<td>35.588810°, -79.051129°</td>
<td>CHATH-076-P101</td>
<td>170.96 ft</td>
</tr>
<tr>
<td>35.587333°, -79.051096°</td>
<td>CHATH-076-P102</td>
<td>168.74 ft</td>
</tr>
<tr>
<td>35.587333°, -79.051256°</td>
<td>CHATH-076-P103</td>
<td>165.62 ft</td>
</tr>
<tr>
<td>35.586398°, -79.048342°</td>
<td>PZ-7</td>
<td>178.16 ft</td>
</tr>
<tr>
<td>35.585300°, -79.050811°</td>
<td>CHATH-077- P100</td>
<td>169.73 ft</td>
</tr>
<tr>
<td>35.582678°, -79.047750°</td>
<td>CHATH-077-P102</td>
<td>169.12 ft</td>
</tr>
<tr>
<td>35.582578°, -79.047802°</td>
<td>CHATH-077-P103</td>
<td>168.01 ft</td>
</tr>
</tbody>
</table>

There were no recordings of the existing staff gauge within the referenced time frame. Reading of approximately 1 foot water depth at the time of the inspection on April 4, 2018.
Table 3: Maximum Water Levels for the piezometers associated with the 1978 Ash Basin Recorded Between January 2017 and March 2018

<table>
<thead>
<tr>
<th>Location (Latitude, Longitude)</th>
<th>Piezometers</th>
<th>Maximum Recorded Elevation Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.587904°, -79.047993°</td>
<td>PZ-9</td>
<td>187.02 ft</td>
</tr>
<tr>
<td>35.587705°, -79.045477°</td>
<td>78-1</td>
<td>180.30 ft</td>
</tr>
<tr>
<td>35.588163°, -79.044671°</td>
<td>78-3</td>
<td>183.90 ft</td>
</tr>
<tr>
<td>Basin Discharge Structure</td>
<td>Water Level Instrumentation ¹</td>
<td>184.3 ft</td>
</tr>
</tbody>
</table>

Table 4: Maximum Water Levels for the piezometers associated with the 1985 Ash Basin Recorded Between January 2017 and March 2018

<table>
<thead>
<tr>
<th>Location (Latitude, Longitude)</th>
<th>Piezometers</th>
<th>Maximum Recorded Elevation Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.593019°, -79.045191°</td>
<td>PZ-1</td>
<td>166.43 ft</td>
</tr>
<tr>
<td>35.592838°, -79.042392°</td>
<td>PZ-2</td>
<td>169.90 ft</td>
</tr>
<tr>
<td>35.588979°, -79.037737°</td>
<td>PZ-3S</td>
<td>169.40 ft</td>
</tr>
<tr>
<td>35.588956°, -79.037742°</td>
<td>PZ-3D</td>
<td>169.28 ft</td>
</tr>
<tr>
<td>35.585846°, -79.038852°</td>
<td>PZ-4 ¹</td>
<td>164.60 ft</td>
</tr>
<tr>
<td>35.588862°, -79.041906°</td>
<td>PZ-5</td>
<td>167.77 ft</td>
</tr>
<tr>
<td>35.589894°, -79.039690°</td>
<td>PZ-6</td>
<td>180.91 ft</td>
</tr>
<tr>
<td>35.589028°, -79.041609°</td>
<td>CHATH-079-P100</td>
<td>180.93 ft</td>
</tr>
<tr>
<td>35.586507°, -79.039622°</td>
<td>CHATH-079-P101</td>
<td>171.49 ft</td>
</tr>
<tr>
<td>35.586371°, -79.039723°</td>
<td>CHATH-079-P102</td>
<td>166.03 ft</td>
</tr>
<tr>
<td>35.588938°, -79.037961°</td>
<td>CHATH-079-P103 ²</td>
<td>171.85 ft</td>
</tr>
<tr>
<td>35.592140°, -79.041466°</td>
<td>CHATH-079-P104 ³</td>
<td>175.97 ft</td>
</tr>
<tr>
<td>35.592344°, -79.041386°</td>
<td>CHATH-079-P105</td>
<td>171.03 ft</td>
</tr>
<tr>
<td>Basin Discharge Structure</td>
<td>Water Level Instrumentation ⁴</td>
<td>177.3 ft</td>
</tr>
</tbody>
</table>

¹ Water Level Instrumentation is located near the former riser structure.


³ Became infested with ants. No readings from October 2016 to April 2017. Infested area treated with non-chemical element to eliminate ants. Readings resumed in April 2017.

⁴ Piezometer became buried under gravel in the roadway. No water levels recorded between August 2015 and December 2017. Readings resumed in January 2018.

Water Level Instrumentation located near the riser structure.
3. **Approximate Depth & Elevation of the Impounded Water and CCR**

   The data presented is based on dewatering information obtained from Duke Energy on April 5, 2018. We assume that depths are from normal pool elevation.

   a. **Retired 1956 Ash Basin Dam (State ID No. CHATH-075):**
      - Minimum Depth of Water: 0 ft
      - Maximum Depth of Water: 0 ft
      - Present Depth of Water: 0 ft

   b. **Retired 1963/1970 Ash Basin Dam (State ID No. CHATH-076/077):**
      - Minimum Depth of Water: 0 ft
      - Maximum Depth of Water: unknown (not read by site personnel)
      - Present Depth of Water: Approximately 1 foot on April 4, 2018 (staff gauge reading)

   c. **Retired 1978 Ash Basin Dam (State ID No. CHATH-078):**
      - Minimum Elevation of Water: 173.66 ft., December 1-5, 2017 (water level instrumentation)
      - Maximum Elevation of Water: 184.3 ft., January 1, 2017 (water level instrumentation)
      - Present Elevation of Water: 175.41 ft. as recorded on April 4, 2018 (water level instrumentation)

   d. **Retired 1985 Ash Basin Dam (State ID No. CHATH-079):**
      - Minimum Elevation of Water: 163.6 ft., December 4-8, 2017 (water level instrumentation)
      - Maximum Elevation of Water: 177.3 ft., January 30 to February 13, 2017 (water level instrumentation)
      - Present Elevation of Water: 164.91 ft. as recorded on April 4, 2018 (water level instrumentation)

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

   Since the Cape Fear Steam Station has been retired and demolished, and there is no active ash management; storage capacity and remaining life is not applicable to this report. See Section 5 of this report for approximate volume of impounded water at the time of the inspection and CCR as of last inventory.

   a. **Retired 1956 Ash Basin Dam (State ID No. CHATH-075):**
      - Ash Basin has been retired.

   b. **Retired 1963/1970 Ash Basin Dam (State ID No. CHATH-076/077):**
      - Ash Basin has been retired.

   c. **Retired 1978 Ash Basin Dam (State ID No. CHATH-078):**
      - Ash Basin has been retired.

   d. **Retired 1985 Ash Basin Dam (State ID No. CHATH-079):**
      - Ash Basin has been retired.

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

   Basin volumes of ash presented are based on the data summary sheet provided by Duke Energy dated March 2, 2017. Plant operations ceased in 2012, and there has been no additional inclusion of ash into any of the basins within the last year.
a. **Retired 1956 Ash Basin (State ID No. CHATH-075):**
   - Approximate Weight: 422,400 tons
   - Approximate Volume: Dry

b. **Retired 1963/1970 Ash Basin (State ID No. CHATH-076/077):**
   - Approximate Weight: 1,598,400 tons
   - Approximate Volume: 0.66 million gallons of water

c. **Retired 1978 Ash Basin (State ID No. CHATH-078):**
   - Approximate Weight: 896,400 tons
   - Approximate Volume¹: 2.08 million gallons of water
   ¹As reported by dewatering level data provided by Duke Energy on April 5, 2018

d. **Retired 1985 Ash Basin (State ID No. CHATH-079):**
   - Approximate Weight: 2,823,600 tons
   - Approximate Volume¹: 3.75 million gallons of water
   ¹As reported by dewatering level data provided by Duke Energy on April 5, 2018

6. **Appearances of an Actual or Potential Structural Weakness, as well as Existing Conditions That Are Disrupting or Have Potential to Disrupt the Operation and Safety of the CCR Unit and Appurtenant Structures**

The observations made during the April 4, 2018 annual inspection indicate that the dam structures are generally well maintained and appear to comply with regulatory standards and requirements. Based upon data from the WeatherUnderground.com, no significant rainfall occurred within the week prior to the inspection.

a. **Retired 1956 Ash Basin (State ID No. CHATH-075):**
   - At the time of our inspection, Amec Foster Wheeler did not observe items that indicate a potential structural weakness of the ash pond dam. The ash pond dam appears to be in the same general condition as in the 2017 inspection. The western interior portion of the ash pond dam is cleared and graded as a retention basin. No water was observed in the retention basin at the time of the inspection.

b. **Retired 1963/1970 Ash Basin (State ID No. CHATH-076/077):**
   - At the time of our inspection, Amec Foster Wheeler did not observe items that indicate a potential structural weakness of the ash pond dam. The ash pond dam appears to be in the same general condition as in the 2017 inspection, except that water level within the ponded area of the basin was lower (approximately 1-foot depth). A CCTV inspection of the drainage pipe was completed on January 30-31, 2018. The pipe was found to be in excellent condition, with no repairs or modifications warranted.

c. **Retired 1978 Ash Basin (State ID No: CHATH-078):**
   - At the time of our inspection, Amec Foster Wheeler did not observe items that indicate a potential structural weakness of the ash pond dam. The ash pond dam appears to be in the same general condition as in the 2017 inspection, except that water level within the ponded area of the basin was lower (approximately 3-foot depth). The water level in the basin had been pumped to the permissible limit at the time of the inspection (3 feet above the ash).

d. **Retired 1985 Ash Basin (State ID No: CHATH-079):**
   - At the time of our inspection, Amec Foster Wheeler did not observe items that indicate a potential structural weakness of the ash pond dam. The ash pond dam appears to be in the same general condition as in the 2017 inspection, except that water level within the ponded area of the basin was lower (approximately 3-foot depth). A CCTV inspection of the outlet pipe and riser was completed on January 30-31-2018. No modifications or repairs were recommended. The water level in the
basin had been pumped to the permissible limit at the time of the inspection (3 feet above the ash).

7. **Changes Since the Previous Annual Inspection**
   
a. **Retired 1956 Ash Basin (State ID No. CHATH-075):**
   
   Small trees (<6” diameter) and underbrush have been removed from the dike (Work Order 20047025-7), and downed trees with associated rootballs have been removed from the crest and downstream slope, and repaired (Work Order 21718224).

b. **Retired 1963/1970 Ash Basin (State ID No. CHATH-076/077):**
   
   Small trees (<6” diameter), underbrush, and rotten rootballs have been removed from the downstream slope of the dike (Work Order 20047025-13). A seep collection system was installed during 2017 in the area of AOW S-16 (WO 10465974), and a riprap drainage channel and v-notch weir was installed during 2017 in the area of AOW S-15 (WO 10465974).

c. **Retired 1978 Ash Basin (State ID No: CHATH-078):**
   
   A dewatering/pumping plan has been implemented, and basin water is pumped to an on-site water treatment system. Following treatment, the water is discharged into the canal. An emergency bypass pumping line has been installed to allow stormwater to discharge through the permitted discharge point during severe flooding conditions. The water level in the basin had been pumped to the permissible limit at the time of the inspection (3 feet above the ash).

d. **Retired 1985 Ash Basin (State ID No: CHATH-079):**
   
   A dewatering/pumping plan has been implemented, and basin water is pumped to an on-site water treatment system. Following treatment, the water is discharged into the canal. An emergency bypass pumping line has been installed to allow stormwater to discharge through the permitted discharge point during severe flooding conditions. The water level in the basin had been pumped to the permissible limit at the time of the inspection (3 feet above the ash).

8. **Maintenance**

   Duke Energy has developed an Operations and Maintenance (O&M) Manual to instruct operation and engineering personnel the proper procedures for operating and maintaining the Ash Basin System. The Station 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 without interruption to the station’s generation of electricity. 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 2018 inspection indicate that Duke is properly maintaining the facility.