Sutton Energy Complex Ash Basin

Topographic Map and Discharge Assessment Plan

NPDES Permit NC0001422

December 30, 2014

DUKE ENERGY®

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Section 1 - Introduction

The purpose of this document is to address the requirements of North Carolina General Statute (GS)130A-309.210(a) *topographic map* and (b) *Assessment of Discharges from Coal Combustion Residuals Surface Impoundments to the Surface Waters of the State*, as modified by North Carolina Senate Bill 729, for the Sutton Energy Complex (Sutton Plant) ash basin operated under National Pollutant Discharge Elimination System (NPDES) Permit NC0001422.

The following requirements are contained in General Statute (GS) 130A-309.210(a):

(1) The owner of a coal combustion residuals surface impoundment shall identify all discharges from the impoundment as provided in this subsection. The requirements for identifying all discharges from an impoundment set out in this subsection are in addition to any other requirements for identifying discharges applicable to the owners of coal combustion residuals surface impoundments.

(2) No later than December 31, 2014, the owner of a coal combustion residuals surface impoundment shall submit a topographic map that identifies the location of all (i) outfalls from engineered channels designed or improved for the purpose of collecting water from the toe of the impoundment and (ii) seeps and weeps discharging from the impoundment that are not captured by engineered channels designed or improved for the purpose of collecting water from the toe of the impoundment to the Department. The topographic map shall comply with all of the following:

a. Be at a scale as required by the Department.

b. Specify the latitude and longitude of each toe drain outfall, seep, and weep.

c. Specify whether the discharge from each toe drain outfall, seep, and weep is continuous or intermittent.

d. Provide an average flow measurement of the discharge from each toe drain outfall, seep, and weep including a description of the method used to measure average flow.

e. Specify whether the discharge from each toe drain outfall, seep, and weep identified reaches the surface waters of the State. If the discharge from a toe drain outfall, seep, or weep reaches the surface waters of the State, the map shall specify the latitude and longitude of where the discharge reaches the surface waters of the State.

f. Include any other information related to the topographic map required by the Department.

The following requirements are contained in General Statute (GS) 130A-309.210(b):

b) Assessment of Discharges from Coal Combustion Residuals Surface Impoundments to the Surface Waters of the State. The owner of a coal combustion residuals surface impoundment shall conduct an assessment of discharges from the coal combustion

residuals surface impoundment to the surface waters of the State as provided in this subsection. The requirements for assessment of discharges from the coal combustion residuals surface impoundment to the surface waters of the State set out in this subsection are in addition to any other requirements for the assessment of discharges from coal combustion residuals surface impoundments to surface waters of the State applicable to the owners of coal combustion residuals surface impoundments.

(1) No later than December 31, 2014, the owner of a coal combustion residuals surface impoundment shall submit a proposed Discharge Assessment Plan to the Department. The Discharge Assessment Plan shall include information sufficient to allow the Department to determine whether any discharge, including a discharge from a toe drain outfall, seep, or weep, has reached the surface waters of the State and has caused a violation of surface water quality standards. The Discharge Assessment Plan shall include, at a minimum, all of the following:

a. Upstream and downstream sampling locations within all channels that could potentially carry a discharge.

b. A description of the surface water quality analyses that will be performed.

c. A sampling schedule, including frequency and duration of sampling activities.

d. Reporting requirements.

e. Any other information related to the identification of new discharges required by the Department.

(2) The Department shall approve the Discharge Assessment Plan if it determines that the Plan complies with the requirements of this subsection and will be sufficient to protect public health, safety, and welfare; the environment; and natural resources.

(3) No later than 30 days from the approval of the Discharge Assessment Plan, the owner shall begin implementation of the Plan in accordance with the Plan's schedule.

The North Carolina Senate Bill 729 establishes the submittal date of this topographic map and Discharge Assessment Plan no later than December 31, 2014.

The Sutton Energy Complex ash basin does not currently have any known unpermitted discharges; however, if any locations were identified, the topographic map, developed to satisfy the requirements of GS130A-309.210(a), would be utilized as the basis for developing the assessment procedures presented in this plan, required by GS130A-309.210(b).

Section 2 - Site Background

2.1 Plant Description

The Sutton Plant is a former coal-fired electricity-generating facility located in New Hanover County, North Carolina, near the City of Wilmington (Figure 1). The Sutton Plant started operations in 1954. As of November 2013, all of the coal-fired units were retired when a new, natural gas-fired combined-cycle unit began operation. The facility is located of Wilmington on the west side of Highway 421. The topography around the property is relatively gentle, generally sloping downward toward the Cape Fear River. The Sutton Plant utilizes an approximate 1,100-acre cooling pond located adjacent to the Cape Fear River. The ash management area is located adjacent to the cooling pond, north of the Sutton Plant.

2.2 Ash Management Description

TheSutton Plant, cooling pond and ash management area are located on the east side of the Cape Fear River. The ash management area is located adjacent to the cooling pond, north of Sutton Plant. The ash management area consists of:

- A former ash disposal area located south of the ash basins, on the south side of the canal;
- An ash basin built in approximately 1971 (old ash basin); and
- A clay-lined ash basin built in approximately 1984 (new ash basin) and located toward the northern portion of the ash management area.

The ash basins are impounded by an earthen dike. The ash basin system was an integral part of Sutton Plant's wastewater treatment system which received inflows from the ash removal system, Sutton Plant yard drain sump, and stormwater flows. During coal-fired electrical generation, inflows to the ash basins were highly variable due to the cyclical nature of the operations. The Sutton Plant NPDES permit authorizes the discharge of cooling pond blowdown, recirculation cooling water, non-contact cooling water and treated wastewater from Internal Outfalls 002, 003, 004 via Outfall 001 from the cooling pond to the Cape Fear River. The 500-foot compliance boundary circles the ash basins and former ash disposal area.

2.3 Site Geologic/Soil Framework

According to the Geologic Map of North Carolina, published by the North Carolina Department of Natural Resources and Community Development (1985), the Sutton Plant lies within the Coastal Plain Physiographic Province.

The North Carolina Coastal Plain is approximately 90 to 150 miles wide from the Atlantic Ocean westward to its boundary with the Piedmont province. Two natural subdivisions of the Coastal Plain were described by Stuckey (1965): the Tidewater region and the Inner Coastal Plain. Sutton Plant is located within the Tidewater region, which consists of the coastal area where large streams and many of their tributaries are affected by ocean tides (Winner, Jr. and Coble, 1989). Sutton Plant is located on the east side of the Cape Fear River within the alluvial plain between the coastal dunes and the interior uplands (NUS Corporation, 1989).

The Coastal Plain comprises a wedge-shaped sequence of stratified marine and nonmarine sedimentary rocks deposited on crystalline basement. The sedimentary sequences range in age from recent to lower Cretaceous (Narkunas, 1980).

In the eastern part of the North Carolina Coastal Plain, groundwater is obtained from the surficial, Castle Hayne, and Peedee aquifers. The Coastal Plain groundwater system consists of aquifers comprised of permeable sands, gravels, and limestone separated by confining units of less permeable material.

Unconformably, underlying the surficial aquifer, which has an average thickness of 35 feet, is the Castle Hayne confining unit, with an average thickness of 20 feet. The Castle Hayne aquifer is composed of fine-grained sand, interbedded with gray shell limestone and shell fragments. Sand beds contain varying amounts of dark green weathered glauconite. Shells are common throughout the aquifer. The average thickness of the aquifer is 60 feet in the northern Wilmington area.

In the Wilmington area, the Peedee confining unit has an average thickness of 10 feet. The Peedee Formation, which underlies the Upper Castle Hayne Formation, contains fine to medium grained sand interbedded with gray to black marine clay and silt. Sand beds are commonly gray or greenish gray and contain varying amounts of glauconite. Thin beds of consolidated calcareous sandstone and impure limestone are interlayered with the sands in some places.

According to Winner, Jr. and Coble (1989), the surficial aquifer consists primarily of fine sands, clays, shells, peat beds, and scattered deposits of coarse-grained material in the form of relic beach ridges and floodplain alluvium. The areal extent of the surficial aquifer in the Coastal Plain is approximately 25,000 square miles with an average thickness of 35 feet. The average estimated hydraulic conductivity is 29 feet per day (Winner, Jr. and Coble, 1989).

Water level maps for the site indicate the general direction of groundwater flow appears to be radial from the ash management area with flow toward the north, east, and south. However, the water level elevation of the cooling pond is lower than the groundwater elevation measured in a number of nearby monitoring wells, indicating a component of groundwater flow from the ash management area would also be toward the west.

2.4 Topographic Map and Identification of Discharges

A topographic map is presented in Figure 2 to meet the requirements of GS 130A-309.210(a) in the identification of outfalls from engineered channels, as well as seeps and weeps.

Seepage is the movement of wastewater from the ash basin through the ash basin embankment, the embankment foundation, the embankment abutments, basin rim, through residual material in areas adjacent to the ash basin. A seep is defined in this document as an expression of seepage at the ground surface. A weep is understood to have the same meaning as a seep.

Indicators of seepage include areas where water is observed on the ground surface and/or where vegetation suggests the presence of seepage. Seepage can emerge anywhere on the downstream face, beyond the toe, or on the downstream abutments at elevations below normal

pool. Seepage may vary in appearance from a "soft," wet area to a flowing "spring." Seepage may show up first as only an area where the vegetation is lusher and darker green than surrounding vegetation. Cattails, reeds, mosses, and other marsh vegetation often become established in a seepage area. However, in many instances, indicators of seeps do not necessarily indicate the presence of seeps. Areas of apparent iron staining and/or excess iron bacteria may also indicate the presence of a seep.

The Sutton Energy Complex ash basin does not currently have any known unpermitted discharges; however, if any locations were identified, locations of seepage at the ground surface adjacent to the ash basin would be shown on Figure 2. This figure would include engineered drainage system features, or outfalls, associated with the ash basin dam as required by GS 130A-309.210(a)(2)(i) and seeps as required by GS 130A-309.210(a)(2)(ii).

Section 3 - Discharge Assessment Plan

3.1 Purpose of Assessment

The purpose of the assessment is to determine whether existing, known discharges from toe drain outfalls, seeps, and weeps associated with the coal combustion residuals surface impoundment (ash basin) have reached the surface waters of the State and have caused a violation of surface water quality standards as required by North Carolina General Statute 130A-309.210(b). Had discharges been identified, Figure 2 and a summary table of discharges would present the locations to be considered as part of this Discharge Assessment Plan (DAP).

These locations would then be assessed by comparing surface water sampling analytical results of the associated background location with the corresponding downstream location.

3.2 Assessment Procedure

The assessment procedure that would be associated with the Sutton Plant ash basin if unpermitted discharges were identified is provided within this section. In addition to the specific requirements for the assessment, Section 3.2 also provides the general requirements, the frequency of assessment, documentation requirements, and a description of the surface water quality analyses that will be performed.

3.2.1 General Assessment Requirements

Assessments are to be performed in three phases as follows:

- Observation and sampling (assessment site visit),
- Evaluation, and
- Assessment reporting

The assessment site visit would be performed when the background and downstream locations are accessible and not influenced by weather events. Locations on or adjacent to the ash basin embankments would be performed within two months after mowing, if possible. In addition, the assessment site visit would not be performed if the following precipitation amounts have occurred in the respective time period preceding the planned assessment site visit:

- Precipitation of 0.1 inches or greater within 72 hours or
- Precipitation of 0.5 inches or greater within 96 hours.

The assessments would be performed under the direction of a qualified Professional Engineer or Professional Geologist on a semi-annual basis within two nonadjacent quarters. The date of the initial assessment site visit would be selected no later than 30 days from the approval of the Discharge Assessment Plan and would fall within one of the semi-annual timeframes. Additional seep locations that may have been identified and documented in an Identification of New Discharge report(s) would be reviewed prior to performing an assessment site visit, if available.

3.2.2 Observation and Sampling

The initial assessment site visit would be performed to document baseline conditions of the discharge channel, including location, extent (i.e., dimensions of affected area), and flow of

each discharge. Discharge channel background and downstream locations would be verified using a Global Positioning System (GPS) device. Photographs would be taken from vantage points that can be replicated during subsequent semi-annual assessments.

Initial and subsequent assessment site visits would document a minimum of the following to respond to the requirements in 130A-309.210.1(b):

- Record the most recent ash basin water surface elevation and compare to the seep and outfall and associated discharge location surface water elevations.
- For each discharge channel, the observer would note the following as applicable on the day of the assessment site visit:
    - Is the discharge channel flowing at the time of the assessment site visit?
    - Does the discharge channel visibly flow into a Water of the U.S. at the time of the assessment site visit?
    - How far away is the nearest Water of the U.S.?
    - Document evidence that flow has or could reach a Water of the U.S. (e.g., description of flow, including extent and/or direction) and describe the observed condition. Evidence that flow could or has reached a Water of the U.S. may be indicated by an inspection of the adjacent and downstream topographic drainage features.
    - Observe and document the condition of the discharge channel and outfall of the engineered channel or seep location with photographs. Photographs are to be taken from similar direction and scale as photographs taken during the initial assessment site visit.
- Record flow rate within the discharge channel, if measureable, using the following methods:
    - Timed-volumetric method: Collect a volume of water from the discharge of the PVC pipe directly into an appropriately sized container. Measure volumes (in mL) in the field utilizing a graduated container. Record the amount of time (in seconds) needed to collect the volume of water and calculate the flows (in MGD) for the timed-volume.
    - A V-notch weir apparatus will be installed, if necessary, during the initial assessment site visit to impound seepage at locations with a defined channel. Once the impounded seep reaches equilibrium discharge, flows will be measured using the timed-volumetric method described above.
    - Area-velocity method: Measure point velocities and water depth at a minimum of 20 stations along a transect setup perpendicular to the direction of flow using a Swoffer® 3000 flow meter mounted to a standard United States Geologic Survey

(USGS) top-set wading rod. Utilize the average velocity and cross-sectional area of the wetted channel to calculate flows in MGD.

- Collect water quality samples using the following methods:
    - Collect background and downstream samples during a period with minimal preceding rainfall to minimize potential effects of stormwater runoff. Collect samples from the discharge channel at the flow measurement devices or directly from the discharge into sample bottles while minimizing disturbance and entrainment of soil/sediment. After collection, samples will be preserved and stored according to parameter-specific methods and delivered to the laboratory under proper Chain-of-Custody (COC) procedures.
    - Analytical parameters for analysis include: Fluoride, Arsenic, Cadmium, Copper, Chromium, Nickel, Lead, Selenium, and Mercury. This list includes all parameters previously identified for seep sampling at Duke Energy power plants for which relevant stream water quality standards are in place. (This list is responsive to the statutory requirement for the discharge assessment to allow determination whether discharges from toe drain outfalls, seeps, or weeps have reached surface waters and caused a violation of surface water quality standards.) Analyses would be conducted by Duke Energy's Huntersville Analytical Laboratory (NC Wastewater Certification #248) and Pace Analytical Laboratories (NC Wastewater Certification # 12). Laboratory analytical methods used for each constituent are provided in Table 1.
    - Seep in-situ measurements: In-situ field parameters (temperature and pH) would be measured utilizing calibrated field meters either at the discharge of the seep directly, at the discharge of the flow measurement devices, or in the water pool created behind the device, if sufficient water depth did not exist at the device discharge.
    - Cape Fear River and Ash Basin Sample Collection Method: Water quality samples and in-situ measurements from the Cape Fear River would be collected at a location upstream and downstream of the ash basin. Additionally, water samples and in-situ measurements would be collected from an in-process ash basin location. The grab samples would be collected from the river and basin's surface (0.3 m) directly into appropriate sample bottles.

3.2.3 Evaluation

Evaluation of the data from the initial assessment site visit would establish baseline conditions and will serve as the basis for comparison for subsequent assessment site visit results. Evaluation of observations and sampling results would include location, extent (i.e., dimensions of affected area), and flow of each discharge. The analytical results of the upstream and downstream locations would be compared to the 15A NCAC 2B standards for surface water quality upon receipt to identify potential exceedances.

3.2.4 Assessment Reporting

Each assessment site visit would be documented by the individual performing the assessment, as described in Section 3.2.2 to meet the requirements in 130A-309.210.1(b). The report would contain site background, observation and sampling methodology, and a summary of the observations and descriptions of the discharge channels observed, changes in observations compared to previous assessment events, estimates of flows quantities, and photographs of discharges and outfalls of engineered channels designed or improved for collecting water from the impoundment. Photographs would be numbered and captioned. The flow and analytical results would be recorded and presented in tables similar to the example provided as Table 2. The analytical results would be compared to the 15A NCAC 2B standards for surface water quality and exceedances highlighted. This information would be compiled, reviewed, and submitted to NCDENR within 90 days from the Observation and Sampling event.

Section 4 - References

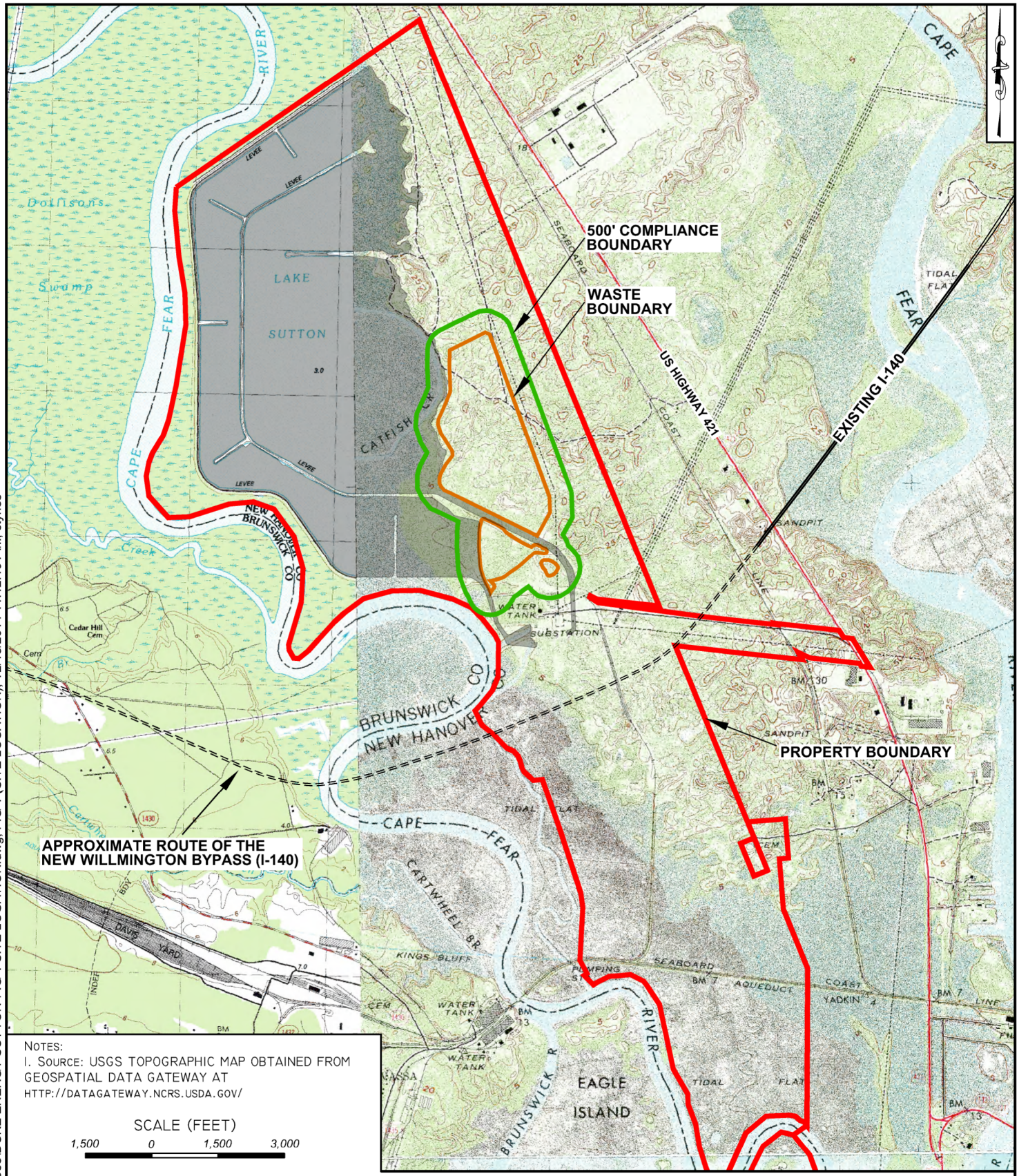
Narkunas, J., 1980, Groundwater Evaluation in the Central Coastal Plain of North Carolina, North Carolina Department of Natural Resources and Community Development, 119 pp.

North Carolina Department of Environment and Natural Resources. 2007. *Dam Operation, Maintenance, and Inspection Manual,* North Carolina Department of Environment and Natural Resources, Division of Land Resources, Land Quality Division, 1985 (Revised 2007).

NUS Corporation 1989. Screening Site Inspection Phase I, Carolina Power and Lighting, Sutton Steam Plant, Wilmington, New Hanover County, North Carolina, EPA I.D. NCD000830646.

Winner, M.D., Jr., and Coble, R.W., 1989, Hydrogeologic Framework of the North Carolina Coastal Plain Aquifer System: U.S. Geological Survey Open-File Report.

FIGURES AND TABLES



NOTES:
1. SOURCE: USGS TOPOGRAPHIC MAP OBTAINED FROM GEOSPATIAL DATA GATEWAY AT HTTP://DATAGATEWAY.NCRS.USDA.GOV/

SCALE (FEET)

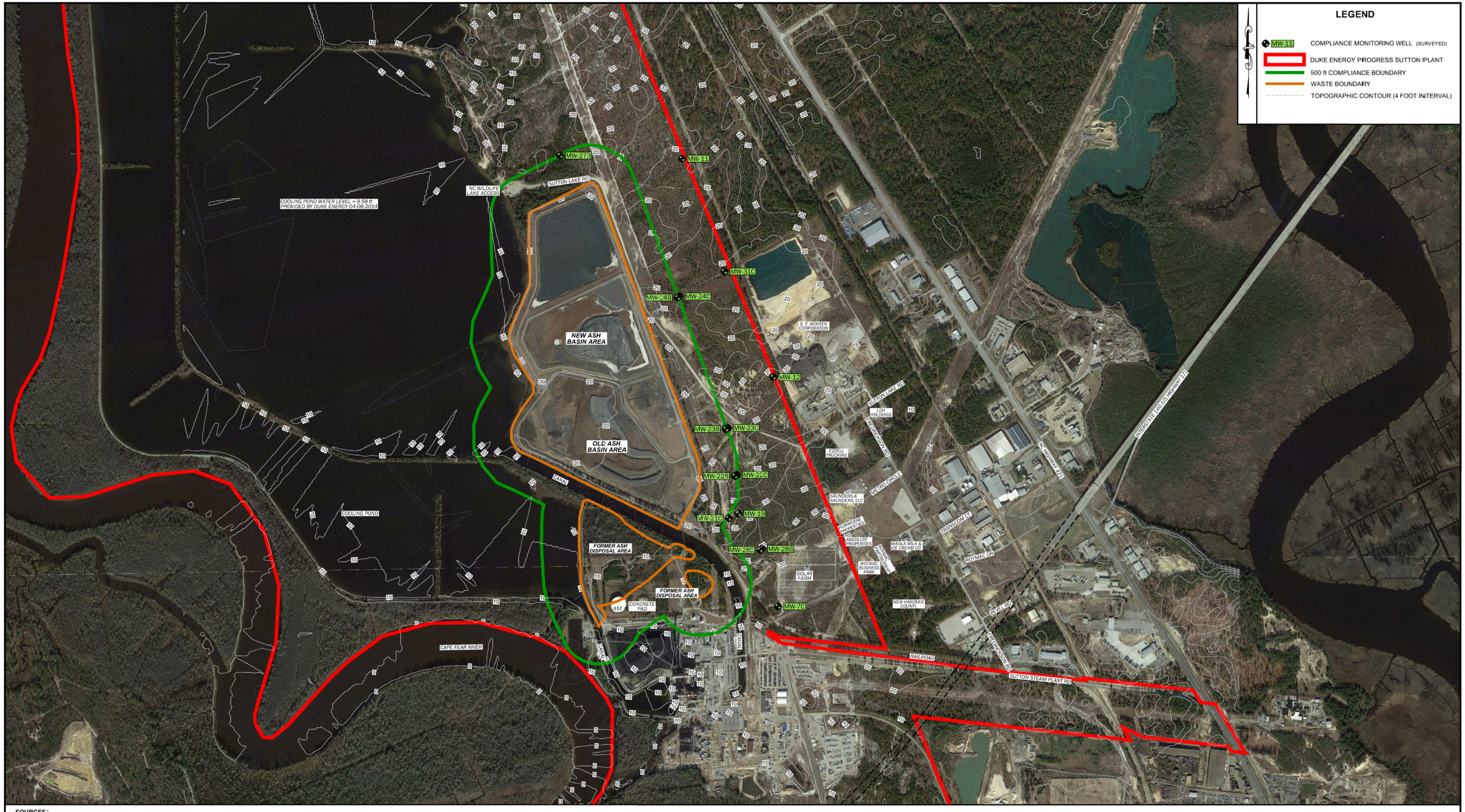
1,500 0 1,500 3,000

License Number: F-0116
440 South Church Street Charlotte, NC 28202

SITE LOCATION MAP
DUKE ENERGY PROGRESS
L.V. SUTTON ENERGY COMPLEX
NPDES PERMIT #NC0001422
WILMINGTON, NORTH CAROLINA

DATE
DEC. 16, 2014

FIGURE
1



SOURCES:

1. 2014 AERIAL PHOTOGRAPH WAS OBTAINED FROM WSP FLOWN ON APRIL. 17, 2014
2. 2013 AERIAL PHOTOGRAPH WAS OBTAINED FROM THE NRCS GEOSPATIAL DATA GATEWAY AT *http://datagateway.nrcs.usda.gov/*
3. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE COORDINATE SYSTEM FIPS 3200 (NAD 83).
4. WELL LOCATIONS AND MEASURING POINTS WERE BASED ON A SURVEY BY JAMES L. HAINES & ASSOCIATES FOR ISH, INC. DATED DECEMBER 23, 2008. ISH DRAWING IS TITLED "POTENTIAL LOCATIONS FOR PROPOSED GEOPROBE AND WELL INSTALLATIONS", DATED FEBRUARY 25, 2009 WITH A CAD FILE NAME Figure 22.dwg
5. THE PROPERTY BOUNDARY FOR THE L.V. SUTTON STEAM ELECTRIC PLANT WAS BASED ON A COMPOSITE MAP PREPARED BY DAVIS-MARTIN-POWELL & ASSOC., INC. THE DRAWINGS ARE DATED JUNE, 1995 WITH REVISION NOTE FOR MARCH 4, 2004. FILE NAME IS L-D-9022-7.DWG. HORIZONTAL DATUM IS NAD83 AND THE VERTICAL DATUM IS NGV 29.
6. THE LOCATION OF THE FORMER ASH DISPOSAL AREAS WAS BASED ON A FIGURE 2-2 PREPARED BY BLASLAND, BOUCK & LEE, INC. THE FIGURE IS TITLED "HORIZONTAL EXTENT OF THE ASH WITHIN THE FORMER DISPOSAL AREA".

GRAPHIC SCALE
600 0 300 600 1200
(IN FEET)

HDR

TOPOGRAPHIC MAP WITH IDENTIFIED SEEPS AND OUTFALLS
DUKE ENERGY CAROLINAS, LLC
L.V. SUTTON ENERGY COMPLEX
NPDES PERMIT #NC0001422
WILMINGTON, NORTH CAROLINA

DATE
DECEMBER 2014

FIGURE
2

Table 1 – Laboratory Analytical Methods

Parameter	Method	Reporting Limit	Units	Laboratory
Fluoride (F)	EPA 300.0	1	mg/l	Duke Energy
Mercury (Hg)	EPA 245.1	0.05	µg/l	Duke Energy
Arsenic (As)	EPA 200.8	1	µg/l	Duke Energy
Cadmium (Cd)	EPA 200.8	1	µg/l	Duke Energy
Chromium (Cr)	EPA 200.8	1	µg/l	Duke Energy
Copper (Cu)	EPA 200.8	1	µg/l	Duke Energy
Lead (Pb)	EPA 200.8	1	µg/l	Duke Energy
Nickel (Ni)	EPA 200.8	1	µg/l	Duke Energy
Selenium (Se)	EPA 200.8	1	µg/l	Duke Energy

Table 2 – Sutton Energy Complex Ash Basin – Example of Surface Water/Seep MonitoringFlow and Analysis Results Table

Parameter	Units	Seep Location, if applicable	Cape Fear River- Upstream	Cape Fear River- Downstream
Fluoride	**mg/l**			
Hg - Mercury (71900)	**µg/l**			
As - Arsenic (01002)	**µg/l**			
Cd - Cadmium (01027)	**µg/l**			
Cr - Chromium (01034)	**µg/l**			
Cu - Copper (01042)	**µg/l**			
Pb - Lead (01051)	**µg/l**			
Ni - Nickel (01067)	**µg/l**			
Se - Selenium (01147)	**µg/l**			
pH	**s.u.**			
Temperature	**℃**			
Flow	**MGD**			