# PLAN FOR IDENTIFICATION OF NEW DISCHARGES

## FOR

## ROXBORO STEAM ELECTRIC PLANT
## 1700 DUNNAWAY ROAD
## SEMORA, NORTH CAROLINA 27343
## NPDES PERMIT #NC0003425

**PREPARED FOR**

**DUKE ENERGY PROGRESS, INC.**
**410 S. WILMINGTON STREET/NC14**
**RALEIGH, NORTH CAROLINA 27601**

**Submitted: September 2014**


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# 1.0 INTRODUCTION

The purpose of this document is to address the requirements of North Carolina General Statute (GS)130A-309.210 (d) *Identification and assessment of discharges; correction of unpermitted discharges*, as modified by North Carolina Senate Bill 729, for the Roxboro Steam Electric Plant (Mayo) ash basin operated under National Pollution Discharge Elimination System (NPDES) Permit NC0038377.

The following requirements are contained in General statue 130A-309.210:

*d) Identification of New Discharges. – No later than October 1, 2014, the owner of a coal combustion residuals surface impoundment shall submit a proposed Plan for the Identification of New Discharges to the Department for its review and approval as provided in this subsection.*

*(1) The proposed Plan for the Identification of New Discharges shall include, at a minimum, all of the following:*

*a. A procedure for routine inspection of the coal combustion residuals surface impoundment to identify indicators of potential new discharges, including toe drain outfalls, seeps, and weeps.*

*b. A procedure for determining whether a new discharge is actually present.*

*c. A procedure for notifying the Department when a new discharge is confirmed.*

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

*(2) The Department shall approve the Plan for the Identification of New Discharges 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 Plan for the Identification of New Discharges, the owner shall begin implementation of the Plan in accordance with the Plan.*

The North Carolina Senate Bill 729 establishes the submittal date of this Plan for Identification of New Discharges no later than October 1, 2014.

This bill also modified GS 130A to establish the following submittals that are related to this Plan. GS130A-309.210(a) was modified to require:

*(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 inspection procedures presented in this plan, developed to satisfy the requirements of GS130A-309.210(d), will be used as the basis for developing the topographic map required by GS130A-309.210(a)(2).

# 2.0 SITE DESCRIPTION

## 2.1 Plant Description

Duke Energy Progress, Inc. (Duke Energy) owns and operates the Roxboro Plant located in north-central North Carolina in Person County near Semora, North Carolina. The Plant is located on Dunnaway Road, approximately 10 miles northwest of the city of Roxboro. The Plant is situated on the southeast side of Hyco Lake, a lake formed from the impoundment of the Hyco River. The Plant property is roughly bounded by Hyco Lake to the north and west, NC Highway 57 (Semora Road) to the south and west, and State Highway 1336 (McGhees Mill Road) to the east. The overall topography of the Plant generally slopes toward the north (Hyco Lake). The site location is shown on **Figure 1**.

The Roxboro Plant began operations in the 1960s and continued to add capacity through the 1980s. The Roxboro Plant uses coal-fired units to produce steam. Ash generated from coal combustion has been stored on-site in ash basins.

## 2.2 Ash Basin Description

Ash generated from coal combustion has been stored in on-site ash basins and a lined landfill. Ash has been sluiced to the ash basins or conveyed in its dry form to the lined landfill. Two ash basins areas have been used at the Roxboro Plant and are referenced using the date of construction and relative location: the 1966 semi-active east ash basin and the 1973 active west ash basin. The east ash basin is located southeast of the plant, and the west ash basin is located south of the plant. An unlined landfill was constructed on the east ash basin in the late 1980s. A lined landfill was subsequently constructed over the unlined landfill around 2004. The ash basins are impounded by earthen dams. Surface water runoff from the east ash basin and the lined landfill are routed into the west ash basin to allow settling.

The Roxboro Plant NPDES permit (NC0003425) authorizes two discharges to Hyco Lake. Outfall 003 discharges cooling water, stormwater run-off, and ash basin wastewater. Outfall 006 discharges runoff from the coal pile and other coal handling operations after the runoff has been treated.

# 3.0 SITE GEOLOGY AND HYDROGEOLOGY

## 3.1 Site Geologic/Soil Framework

The Roxboro Plant is situated in the eastern Piedmont Region of north-central North Carolina. The Piedmont is characterized by well-rounded hills and rolling ridges cut by small streams and drainages. Elevations in the area of the Roxboro Plant range between 410 feet above mean sea level (msl) during full pool at Hyco Lake to 570 feet msl near the Dunnaway Road and McGhees Mill Road intersection southeast of the Plant.

Geologically, the Plant is located near the contact of two regional geologic zones: the Inner Piedmont zone and the Carolina zone. Both zones are generally comprised of igneous and metamorphosed igneous and sedimentary rocks of Paleozoic age. In general, the rocks are highly fractured and folded and have been subjected to long periods of physical and chemical weathering. The *Geologic Map of North Carolina* (1985) places the rocks of the Plant area in the Charlotte Terrane: a belt of metamorphic rock trending generally southwest to northeast characterized by strongly foliated felsic mica gneiss and schist and metamorphosed intrusive rocks. The rocks of the area near the Plant are described as biotite gneiss and schist. The gneiss contains small masses of granite rock. The felsic mica gneiss of the Charlotte Terrane is described as being interlayered with biotite and hornblende schist. Later mapping generally confirms these observations and places the Roxboro Plant near the contact between the Inner Piedmont zone, characterized by the presence of biotite gneiss and schist, and the Charlotte Belt (or Charlotte Terrane), characterized by felsic mica gneiss (Dicken, et. al., 2007).

One of the most important interpretations concerning the geologic nature of the region is the discovery and description of the Hyco shear zone, a tectonic boundary comprised of a ductile shear zone that sharply separates contrasting rocks of the Charlotte (Milton) and Carolina Terranes in north-central North Carolina and southern Virginia (Hibbard, et. al., 1998). The Hyco shear zone was mapped as directly underlying Hyco Lake.

## 3.2 Site Hydrogeologic Framework

An accepted conceptual model of groundwater flow in the Piedmont has been articulated by LeGrand (1988; 2004). In the Piedmont, the groundwater system is effectively a two-medium system restricted to the local drainage basin and comprised of two interconnected layers: residuum/saprolite and weathered rock overlying fractured crystalline rock separated by the transition zone. Typically, the residuum/saprolite is partly saturated and the water table fluctuates within it. The residuum acts as a reservoir for water supply to the fractures and joints in the underlying bedrock. Relatively shallow fractured crystalline rocks can form extensive aquifers, and the

character of such aquifers results from the combined effects of the rock type, fracture system geometry, topography, and weathering. Topography exerts an influence on both weathering and the opening of fractures while the weathering of the crystalline rock modifies both transmissive and storage characteristics.

Shallow groundwater generally flows from local recharge zones in topographically high areas, such as ridges, toward groundwater discharge zones, such as stream valleys. Groundwater flow patterns in recharge areas tend to develop a somewhat radial pattern from the center of the recharge area outward toward the discharge areas and mimic surface topography. Within each of these small, localized drainage basins, the movement of groundwater is generally restricted to the area extending from the drainage divides to a perennial stream or river (slope-aquifer system; LeGrand 1988, 2004). Each basin is similar to adjacent basins and the conditions are generally repetitive from basin to basin. Within a basin, rarely does groundwater move beneath a perennial stream or river to another more distant stream (LeGrand 2004).

Groundwater beneath the Roxboro Plant area occurs within the residuum/partially weathered rock or competent bedrock at depths ranging from three to 20 feet below land surface (bls) along the downgradient compliance boundary and greater than 35 feet bls upgradient of the ash basins. Routine water level measurements and corresponding elevations from the compliance monitoring well network indicate that groundwater generally flows from upland areas along the south, west, and eastern boundaries towards the north and Hyco Lake. Groundwater generally flows from the south to the north along the western portion of the property and from the southeast to the northwest across the remainder of the property. The approximate groundwater gradient along the western portion of the property for July 2014 data was 85.04 feet (vertical change) over 530 feet (horizontal distance) or 16 feet/100 feet as measured from background well BG-1 to well CW-2. The approximate groundwater gradient along the northern compliance boundary for July 2014 was slightly less at 76.64 feet (vertical change) over 570 feet (horizontal distance) or 13.4 feet over 100 feet as measured from well CW-1 to well CW-2.

# 4.0 IDENTIFICATION OF NEW DISCHARGES

## 4.1 Purpose of Inspection

The purpose of the inspection is to identify new discharges and indicators of potential new discharges, including toe drain outfalls, seeps, and weeps associated with the coal combustion residuals surface impoundments (ash basins).

## 4.2 Seepage

Seepage is considered to be the movement of wastewater from the ash basin through the ash basin embankment, the embankment foundation, the embankment abutments, or 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 (NCDENR, 1985). However, in many instances, indicators of seeps do not necessarily indicate the presence of seeps.

## 4.3 Area to be Inspected for New Discharges

The areas to be inspected are the areas of the site where water contained in the ash basin might infiltrate into the underlying residual material and be expressed as seepage. The extent of the areas to be inspected was determined based on site topography and surface water drainage features around the ash basin. At the Roxboro Plant, flow of water from the ash basins is from higher to lower elevations. For the west ash basin, flow is mostly north towards the basin dam and Hyco Lake. For the east ash basin, flow is mostly towards the northwest for the largest area of the basin and to east for the eastern side of the lined landfill. The areas to be inspected are shown on **Figure 2**.

## 4.4 Inspection Procedure

The inspection procedure for identification of new discharges and indicators of potential new discharges associated with the Roxboro Plant ash basins are provided in **Appendix A**. In addition to the specific requirements for the inspection, **Appendix A** also provides the general requirements, the frequency of inspections, documentation

requirements, and provides a decision flow chart for determining if the potential new discharge is associated with the ash basin.

# 5.0 REFERENCES

Dicken, Connie L., Suzanne W. Nicholson, John D. Horton, Michael P. Foose, and Julia A.L. Mueller, December 2007, *Preliminary integrated geologic map databases for the United States – Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina, Version 1.1:* United States Geological Survey, USGS Open File Report 2005-1323, < http://pubs.usgs.gov/of/2005/1323>.

Hibbard, James P., Glenn S. Shell, Phillip J. Bradley, Scott D. Samson, and Greg L. Wortman, February 1998, *The Hyco shear zone in North Carolina and southern Virginia: Implications for the Piedmont Zone-Carolina Zone boundary in the southern Appalachians*. American Journal of Science, V. 298, p. 85 – 107.

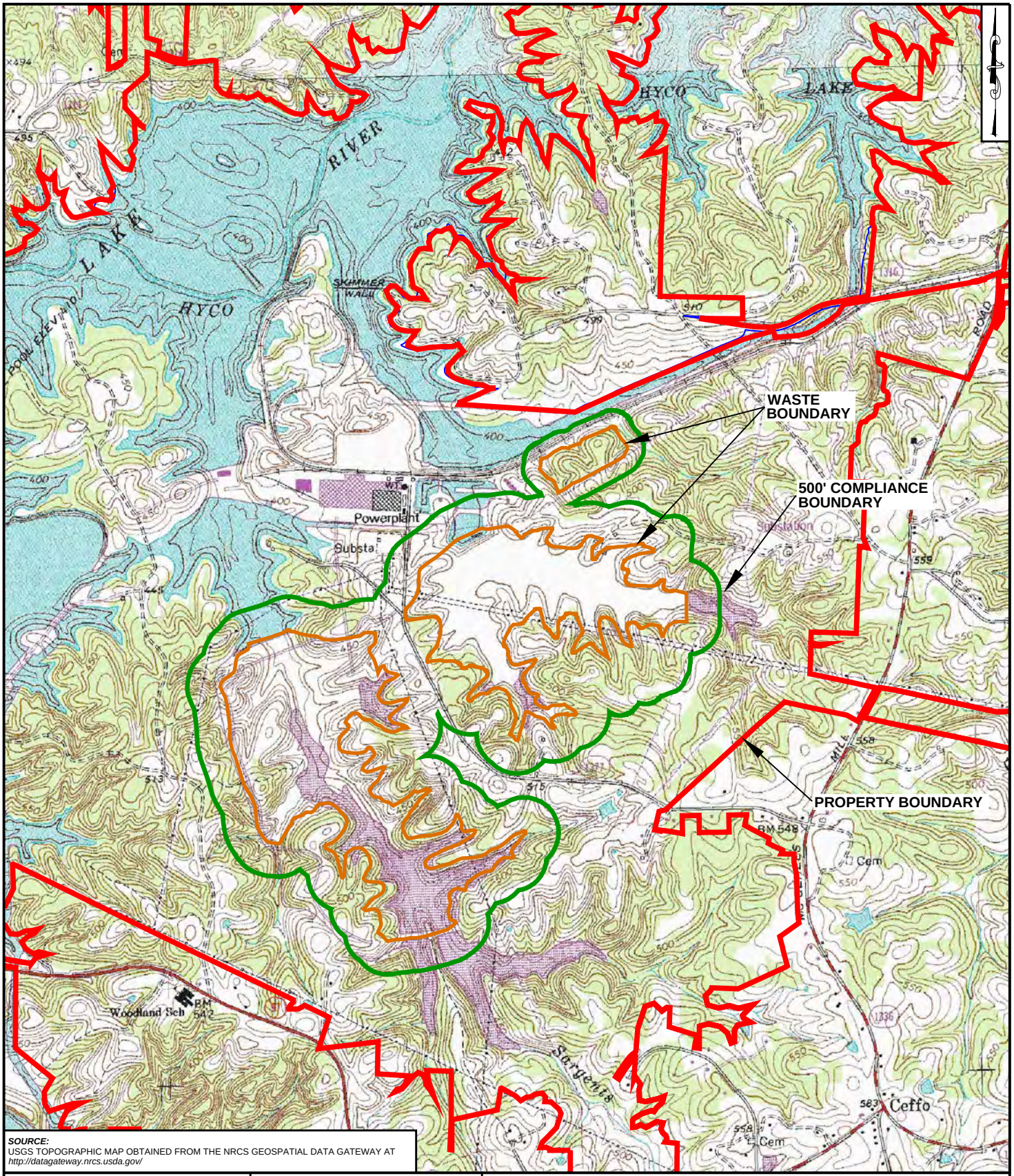
LeGrand, H.E., 1988, *Region 21, Piedmont and Blue Ridge*, p.201-208, in Black, W., Rosenhein, J.S., and Seaber, P.R., eds., Hydrogeology: Geological Society of America, The Geology of North America, v. O-2, Boulder, Colorado, 524 p.

LeGrand, H.E., 2004, *A Master Conceptual Model for Hydrogeological Site Characterization in the Piedmont and Mountain Region of North Carolina: A Guidance Manual*, North Carolina Department of Environment and Natural Resources, Division of Water Quality – Groundwater Section.

NCDENR, "Dam Operation, Maintenance, and Inspection Manual", 1985 (Revised 2007).

North Carolina Geological Survey, 1985, *Geologic map of North Carolina*: North Carolina Geological Survey, General Geologic Map, scale 1:500,000.

# FIGURES




**SOURCE:**
USGS TOPOGRAPHIC MAP OBTAINED FROM THE NRCS GEOSPATIAL DATA GATEWAY AT
*http://datagateway.nrcs.usda.gov/*

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# FIGURE 1
# SITE LOCATION MAP
# DUKE ENERGY PROGRESS
# ROXBORO STEAM ELECTRIC PLANT
# 1700 DUNWAY RD
# SEMORA, NORTH CAROLINA
# OLIVE HILL, NC QUADRANGLE

DRAWN BY: S. ARLEDGE
PROJECT MANAGER: KATHY WEBB
LAYOUT: FIG 1 (USGS SITE LOCATION)
DATE: 2014-09-26
CONTOUR INTERVAL: 10ft
MAP DATE: 1994

GRAPHIC SCALE
1000 0 1000 2000
IN FEET


## LEGEND

- DUKE ENERGY PROGRESS ROXBORO PLANT
- 500 ft COMPLIANCE BOUNDARY
- WASTE BOUNDARY
- BOUNDARY OF AREA TO BE INSPECTED FOR SEEPS
- FLOW DIRECTION
- 520 — 2007 LiDAR CONTOUR MAJOR
- NPDES OUTFALL 003 — NPDES OUTFALL LOCATION
- CB-9 — ASH BASIN COMPLIANCE GROUNDWATER MONITORING WELL
- CMW-8 — MONITORING WELL (SURVEYED)

***SOURCES:***

1. 2012 AERIAL PHOTOGRAPH OF PERSON COUNTY, NORTH CAROLINA WAS OBTAINED FROM THE USGS EARTH EXPLORER WEB SITE AT *http://earthexplorer.usgs.gov/*
2. WELL SURVEY INFORMATION, PROPERTY LINE, LANDFILL LIMITS AND BOUNDARIES ARE FROM ARCGIS FILES PROVIDED BY S&ME AND PROGRESS ENERGY.
3. PARCEL BOUNDARIES WERE OBTAINED FROM PERSON COUNTY (NC) GIS DATA AT *http://gis.personcounty.net*
4. 2014 AERIAL PHOTOGRAPH WAS OBTAINED FROM WSP FLOWN ON APRIL 17, 2014.
5. DRAWING HAS BEEN SET WITH A PROJECTION OF NORTH CAROLINA STATE PLANE COORDINATE SYSTEM FIPS 3200 (NAD 83).
6. 10ft CONTOUR INTERVALS FROM NCDOT LIDAR DATED 2007
*https://connect.ncdot.gov/resources/gis/pages/cont-elev_v2.aspx*

***NOTE:***

1. CONTOUR LINES ARE USED FOR REPRESENTATIVE PURPOSES ONLY AND ARE NOT TO BE USED FOR DESIGN OR CONSTRUCTION PURPOSES.

GRAPHIC SCALE
500 0 500 1000
IN FEET


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|---|---|---|---|
| DRAWN BY: | S. ARLEDGE | DATE: | 2014-09-26 |
| CHECKED BY: | J. WYLIE | DATE: | 2014-09-26 |
| PROJECT MANAGER: | K. WEBB | | |
| LAYOUT NAME: | FIG 2 (SEEP INSPECTION AREA) | | |

DUKE ENERGY PROGRESS

**ROXBORO STEAM ELECTRIC PLANT**
**1700 DUNNAWAY RD**
**SEMORA, NORTH CAROLINA**

# FIGURE 2
# AREAS TO BE INSPECTED FOR SEEPS

# APPENDIX A

# INSPECTION FOR IDENTIFICATION OF NEW DISCHARGES

## 1. Purpose of Inspection

The purpose of the inspection is to identify new discharges and indicators of potential new discharges, including toe drain outfalls, seeps, and weeps that arise after the initial submittal of maps required by North Carolina General Statute 130A-309.210(a)(2)(ii). Seepage is considered to be the movement of wastewater from the ash basin through the ash basin embankment, the embankment foundation, the embankment abutments, or through residual material in areas adjacent to the ash basin. Therefore, a seep is defined in this document as an expression or occurrence of potential wastewater at the ground surface. A weep is understood to have the same meaning as a seep. If new discharges or indicators of potential new discharges are identified, the decision flow chart (see Figure A-1) will be used to determine if the potential new discharge is from the ash basin and if notification to the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Resources (DWR) is required.

## 2. General Inspection Requirements

2.1. Inspections are to be performed on areas that are below the ash basin full pond elevation and within the area shown on **Figure A-2**. The scope of the inspections includes identification of seeps from residual ground and outfalls from engineered channels.

2.2. If required, a larger scale figure showing the locations of outfalls from engineered channels will be developed. If a separate figure showing outfalls from engineered channels is not developed, **Figure A-2** will be revised to show these features.

2.3. Inspections of areas on or adjacent to the ash basin embankments should be performed within two months after mowing, if possible.

2.4. Inspections should not be performed if the following precipitation amounts have occurred in the respective time period preceding the planned inspection:

2.4.1. Precipitation of 0.1 inches or greater within 72 hours, or

2.4.2. Precipitation of 0.5 inches or greater within 96 hours.

2.5. Record most recent ash basin water surface elevation.

2.6. Review previous inspections for new discharges prior to performing inspection.

2.7. Review the most recent previous dam inspections.

2.8. Conduct an interview with the Site Environmental Coordinator prior to performing inspection to inquire about possible changes to site conditions, such as pond elevations, operations, additions or removal of wastewater discharges to the ash basin, changes to site surface water drainage, etc.

**3. Frequency of Inspections**

Inspections will be performed on a semi-annual basis during the first quarter of the year (January to March representative of seasonal high precipitation and while vegetation is dormant) and during the third quarter (July to September representative of seasonal low precipitation and vegetative growth).

**4. Qualifications**

The inspections shall be performed under the direction of a qualified Professional Engineer or Professional Geologist.

**5. Documentation of Inspection**

The inspection shall be documented by the individual performing the inspection. The report should contain observations and descriptions of the seeps observed, changes in observations compared to previous inspections, estimates of flows quantities, and photographs of seeps and outfalls of engineered channels designed or improved for collecting water from the impoundment. Photographs are to be numbered and captioned.

**6. Initial Inspection**

An initial inspection should be performed to identify features and document baseline conditions including location, extent (i.e., dimensions of affected area), and flow. Seep locations should be recorded using a Global Positioning System (GPS) device. Photographs should be taken from vantage points that can be replicated during subsequent semi-annual inspections.

**7. Inspection For New Seeps at Outfalls From Engineered Outfalls**

Inspect the outfalls from engineered channels designed and/or improved (such as through the placement of rip-rap) associated with the ash basin dikes to identify new seeps or indicators of new seeps.

7.1. Inspect all outfalls from engineered channels designed and/or improved (such as through the placement of rip-rap).

7.2. Document the condition of the outfall of the engineered channel with photographs. Photographs are to be taken from a similar direction and scale as the original photographs taken during the initial inspection.

7.3. Observe outfall for seepage and for indicators of seeps.

7.4. Compare current seepage location, extent, and flow to seepage photographs and descriptions from previous inspections.

7.5. Record flow rate if measureable.

**8. Inspection For New Seeps Not Captured by Engineered Channels**

Inspect areas below the ash basin full pond elevation and within the boundary of the area to be inspected as shown on **Figure A-2** to identify new seeps or indicators of new seeps. Inspect topographic drainage features that potentially could contain new seeps that potentially discharge from the ash basin. Requirements for documentation of the inspection are found in Section 5.

8.1. Previously Identified Seeps

a) Inspect previously identified seep locations. Document the condition of the seeps with a photograph. Photographs are to be taken from similar direction and at a similar scale as the original photograph documenting the seep. Describe the approximate dimensions and flow conditions of the seep.

b) If measureable, record flow.

c) Observe seep to determine if changes to location, extent, of flow are present. Document changes to location, extent, and/or flow amount or pattern.

8.2. New Seep or Indicators of Seep

a) Mark the location of new seep or indicators of seep using a GPS device.

b) Document the condition of the seeps or indicators of seeps with a photograph.

c) Describe the approximate dimensions and flow conditions of the seep.

d) Map the location of new seep or indicator of seep using GPS coordinate points collected during the site visit.

e) If seep or indicator of seep was not caused by changes in surface water drainage and if the location is below the ash basin pond elevation, utilize the decision flow chart to determine if the seep represents a discharge from the ash basin and if notification to DWR is required.

**9. Update Maps Identifying Seeps**

If new seeps are identified during the inspection, **Figure A-2** shall be updated to show the location of the new seeps.

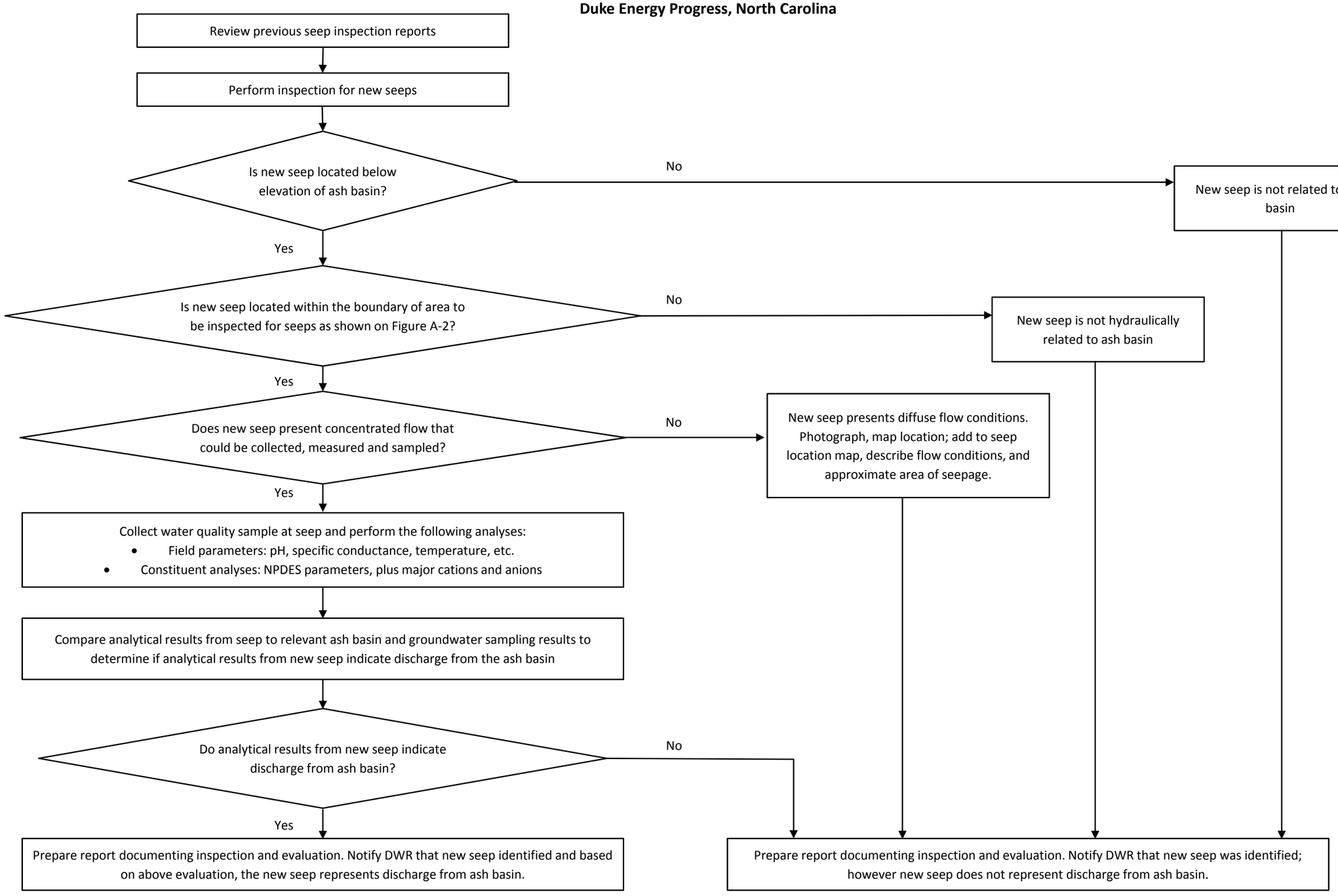
**10. Decision Flow Chart**

The decision flow chart developed to determine whether a new seep discharges from the ash basin is found in **Figure A-1**.

**11. Procedure for Notifying NCDENR DWR If New Discharge Is Confirmed**

If it is determined that a newly identified seep is present, Duke Energy will notify the DWR regional office by mail within 14 days after the determination.

**Figure A-1 Decision Flow Chart for Determining If New Seep Represents Discharge From the Ash Basin Locations**
**Duke Energy Progress, North Carolina**




**Notes:**
1. If no new seeps are identified, inspection will be documented however no notification to NCDENR DWR is required.
2. If new seeps are identified that do not represent discharge from the ash basin during the same inspection that identifies new seeps that do represent a discharge from the ash basin, a single report will be submitted to NCDENR DWR.


## LEGEND

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GRAPHIC SCALE

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IN FEET


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| DRAWN BY: | S. ARLEDGE | DATE: | 2014-09-26 |
| CHECKED BY: | J. WYLIE | DATE: | 2014-09-26 |
| PROJECT MANAGER: | K. WEBB | | |
| LAYOUT NAME: | FIG A-2 (SEEP INSPECTION AREA) | | |

DUKE ENERGY PROGRESS

**ROXBORO STEAM ELECTRIC PLANT**
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# FIGURE A-2
# AREAS TO BE INSPECTED FOR SEEPS