

NC DENR  
Division of Waste Management - Solid Waste

**Environmental Monitoring Reporting Form**

Notice: This form and any information attached to it are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

**Instructions:**

- Prepare one form for each individually monitored unit.
- Please type or print legibly.
- Attach a notification table with values that attain or exceed NC 2L groundwater standards or NC 2B surface water standards. The notification must include a preliminary analysis of the cause and significance of each value. (e.g. naturally occurring, off-site source, pre-existing condition, etc.)
- Attach a notification table of any groundwater or surface water values that equal or exceed the reporting limits.
- Attach a notification table of any methane gas values that attain or exceed explosive gas levels. This includes any structures on or nearby the facility (NCAC 13B .1629 (4)(a)(i)).
- Send the original signed and sealed form, any tables, and Electronic Data Deliverable to: Compliance Unit, NCDENR-DWM, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC 27699-1646.

**Solid Waste Monitoring Data Submittal Information**

Name of entity submitting data (laboratory, consultant, facility owner):

Altamont Environmental, Inc. (Consultant)

Contact for questions about data formatting. Include data preparer's name, telephone number and E-mail address:

Name: Andrew Moore Phone: (828) 281-3350  
E-mail: amoore@altamontenvironmental.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
Duke Energy Carolinas, LLC Marshall Steam Station FGD Residue Landfill Phase 1, Cell 1	8320 East NC Highway 150 Terrell, NC 28682	1809	.0500	September 27, 2011

**Environmental Status: (Check all that apply)**

- Initial/Background Monitoring  Detection Monitoring  Assessment Monitoring  Corrective Action

**Type of data submitted: (Check all that apply)**

- Groundwater monitoring data from monitoring wells  Methane gas monitoring data  
 Groundwater monitoring data from private water supply wells  Corrective action data (specify) \_\_\_\_\_  
 Leachate monitoring data  Other(specify) \_\_\_\_\_  
 Surface water monitoring data

**Notification attached?**

- No. No groundwater or surface water standards were exceeded.  
 Yes, a notification of values exceeding a groundwater or surface water standard is attached. It includes a list of groundwater and surface water monitoring points, dates, analytical values, NC 2L groundwater standard, NC 2B surface water standard or NC Solid Waste GWPS. and preliminary analysis of the cause and significance of any concentration.  
 Yes, a notification of values exceeding an explosive methane gas limit is attached. It includes the methane monitoring points, dates, sample values and explosive methane gas limits.

**Certification**

To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. Furthermore, I have attached complete notification of any sampling values meeting or exceeding groundwater standards or explosive gas levels, and a preliminary analysis of the cause and significance of concentrations exceeding groundwater standards. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

Stuart A. Ryman P.G. (828) 281-3350  
 Facility Representative Name (Print) Title (Area Code) Telephone Number  
 Signature Date 12-22-11  
 Affix NC Licensed/ Professional Geologist Seal

231 Haywood Street Asheville, NC 28801

Facility Representative Address

C-2185

NC PE Firm License Number (if applicable effective May 1, 2009)



# ALTAMONT ENVIRONMENTAL, INC.

ENGINEERING & HYDROGEOLOGY



## Semiannual Groundwater Monitoring Report

Marshall Steam Station

FGD Residue Landfill, Phase 1, Cell 1  
Permit No. 1809

September 2011 Sampling Event

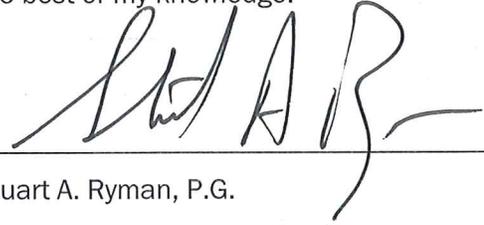
December 22, 2011

Prepared for  
Duke Energy Carolinas, LLC  
Marshall Steam Station  
8320 East NC Highway 150  
Terrell, NC 28682  
Project Number 2369.07

Prepared by  
Altamont Environmental, Inc.  
231 Haywood Street  
Asheville, NC 28801  
(828) 281-3350

## Professional Certification

On behalf of Altamont Environmental, Inc., a firm licensed to practice both engineering (certification number C-2185) and geology (certification number C-299) in the State of North Carolina, I do hereby certify that the information contained in this report is correct and accurate to the best of my knowledge.

A handwritten signature in black ink, appearing to read 'Stuart A. Ryman', is written over a horizontal line. The signature is stylized and cursive.

Stuart A. Ryman, P.G.

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## 1.0 Background

Marshall Steam Station is owned and operated by Duke Energy Carolinas, LLC (Duke). The Marshall plant has a generating capacity of 2090 megawatts (MW) of electric power by combustion of coal. The plant is located in Catawba County, North Carolina, on Lake Norman, and is in the Piedmont physiographic region. The subsurface conditions in the plant area consist of residual soils and partially weathered rock, which have been formed by the in-place weathering of the parent rock. These materials are underlain by bedrock.

The flue gas desulfurization (FGD) landfill is located northwest of the power plant and west of the Marshall Ash Basin as shown on Figure 1. In general, the topography of the landfill site slopes from the west-northwest to the east towards the Marshall Ash Basin.

The monitoring system at the landfill consists of nine groundwater monitoring wells (MS-8, MS-9, MS-10, MS-11, MS-12, MS-13, MS-14, MS-15, and MS-16) and one surface water sample location (SW-1). The locations of the wells and the surface water sample location are shown on Figure 2. Well MS-8 is located north of the landfill and, according to the *Groundwater Sampling and Analysis Plan*<sup>1</sup>, is the background monitoring well for the site. Surface water sample location SW-1 is a groundwater seep and the analytical results are compared to Title 15A, North Carolina Administrative Code (NCAC), Subchapter 2L Standards (2L Standards) for Class GA groundwater.

The landfill is permitted to receive FGD residue (gypsum), clarifier sludge, fly ash, bottom ash, asbestos waste, C&D waste, and mill rejects (pyrites). The clarifier sludge is generated from the FGD wastewater treatment system. Only Cell 1 of the landfill is in operation and is approximately 18 acres in area. The landfill is constructed with an engineered liner system. Contact stormwater and leachate are collected in the lined Cell 1, and then piped to the ash basin. The landfill began receiving wastes in 2007.

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<sup>1</sup> Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill Phase 1, Cell 1 Permit No. 18-09 *Groundwater Sampling and Analysis Plan*. Dated August 19, 2011.

## 2.0 Methods

### 2.1 Sampling and Analysis Methods

Groundwater sampling, surface water sampling, and documentation of sampling were performed by Duke personnel. The groundwater and surface water samples were analyzed by the Duke Energy Analytical Laboratory (North Carolina Laboratory Certification #248) and provided to Altamont by Duke.

The groundwater samples were analyzed for the following constituents:

- Select metals using U.S. Environmental Protection Agency (EPA) Methods 200.7 and 200.8
- Mercury using EPA Method 245.1
- Total dissolved solids using Standard Method (SM) 2540C
- Chloride, fluoride, nitrate as nitrogen, and sulfate using EPA Method 300.0

### 2.2 Statement of Work

Altamont completed the following tasks:

- Received field sampling information provided by Duke (performed by Duke personnel) for monitoring wells MS-8, MS-9, MS-10, MS-11, MS-12, MS-13, MS-14, MS-15, MS-16 and surface water sampling location SW-1. The samples were collected on September 27, 2011.
- Reviewed the laboratory analytical results for the samples noted above. The Electronic Data Deliverable (EDD), provided by Duke, was adapted to conform to the format requirements of the North Carolina Department of Environment and Natural Resources (DENR) EDD template. Altamont added an italicized J data qualifier (*J*) to indicate a detected concentration that is greater than the laboratory's method reporting limit (MRL), but less than the Solid Waste Section Limit (SWSL). A copy of the original EDD is retained in Altamont's files.
- Developed a generalized groundwater surface contour map using map data and groundwater elevation data supplied by Duke.
- Prepared and submitted this Semiannual Groundwater Monitoring Report to Duke and to DENR.

## 3.0 Results

### 3.1 Site Groundwater Flow

Generalized groundwater surface contours for the site are shown on Figure 3. These contours were developed using groundwater elevations measured at the wells on September 27, 2011.

Groundwater flow in the area of the landfill is generally from areas of higher topography, located to the north and west of the landfill, toward the Marshall Ash Basin, located to the east of the landfill. To a lesser extent, some component of groundwater flow is expected toward the surface water drainage feature containing surface water sample location SW-1.

### 3.2 Analytical Results

A summary of the field data is presented in Table 1.

The field and analytical results of groundwater and surface water sampling are summarized in Table 2.

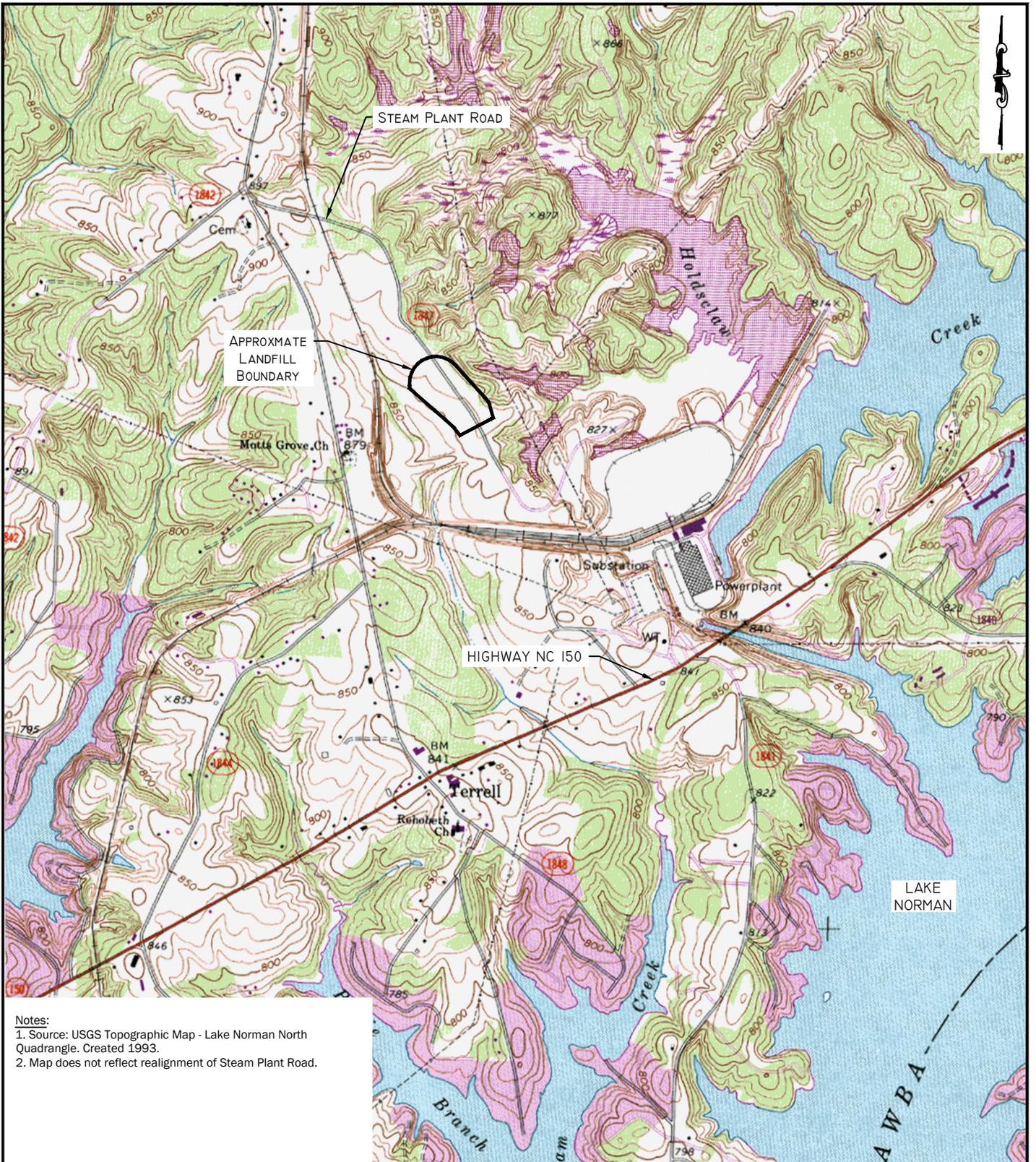
A summary of the 2L Standards exceedances and a preliminary analysis of the cause and significance of the exceedances are presented in Table 3.

The chain-of-custody forms can be found in Appendix A.

In addition to the constituents listed in Table 3, the constituents in the following wells were detected at concentrations equal to or above the corresponding Solid Waste Section Limit (SWSL):

- Barium in MS-10, MS-13, and MS-15

# FIGURES



Notes:  
 1. Source: USGS Topographic Map - Lake Norman North Quadrangle. Created 1993.  
 2. Map does not reflect realignment of Steam Plant Road.

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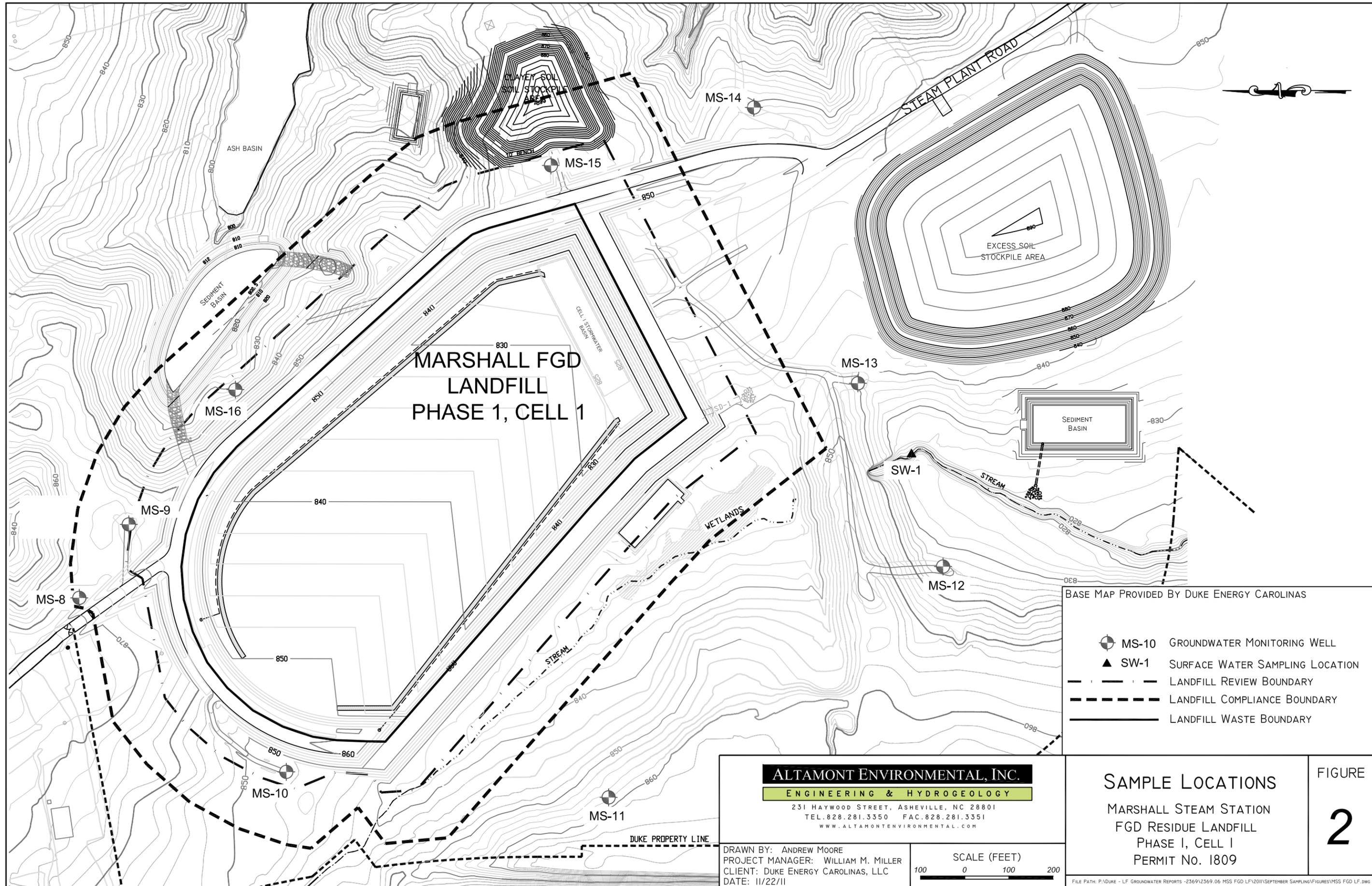
231 HAYWOOD STREET, ASHEVILLE, NC 28801  
 TEL. 828.281.3350 FAC. 828.281.3351  
 WWW.ALTAMONTENVIRONMENTAL.COM

**SITE LOCATION MAP**  
 MARSHALL STEAM STATION  
 FGD RESIDUE LANDFILL  
 PHASE I, CELL I  
 PERMIT No. 1809

**FIGURE**  
**1**

DRAWN BY: ANDREW MOORE  
 PROJECT MANAGER: WILLIAM M. MILLER  
 CLIENT: DUKE ENERGY CAROLINAS, LLC  
 DATE: 11/22/11





BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS

-  MS-10 GROUNDWATER MONITORING WELL
-  SW-1 SURFACE WATER SAMPLING LOCATION
-  LANDFILL REVIEW BOUNDARY
-  LANDFILL COMPLIANCE BOUNDARY
-  LANDFILL WASTE BOUNDARY

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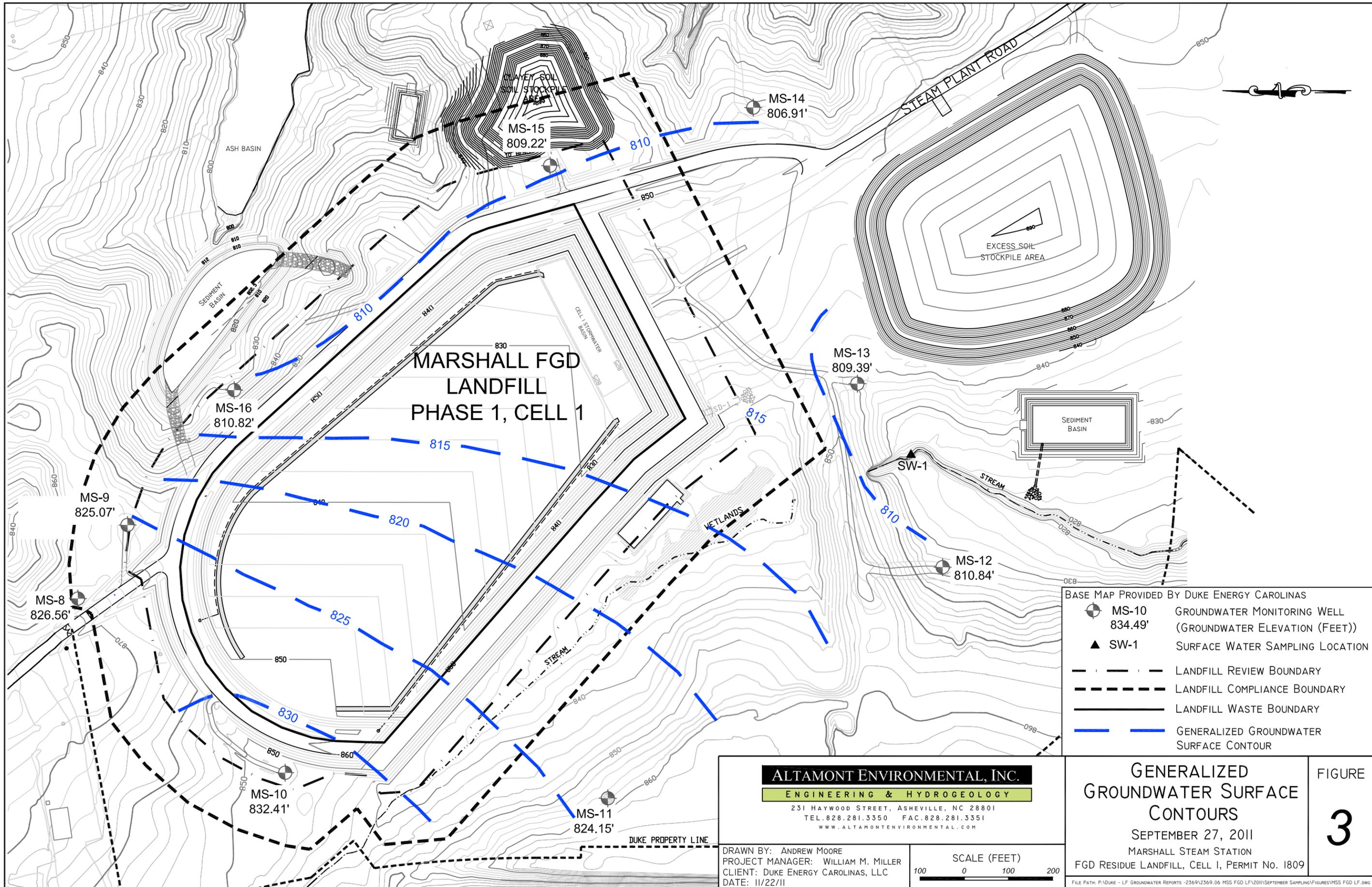
DRAWN BY: ANDREW MOORE  
 PROJECT MANAGER: WILLIAM M. MILLER  
 CLIENT: DUKE ENERGY CAROLINAS, LLC  
 DATE: 11/22/11



**SAMPLE LOCATIONS**  
 MARSHALL STEAM STATION  
 FGD RESIDUE LANDFILL  
 PHASE I, CELL I  
 PERMIT No. 1809

FIGURE  
2

FILE PATH: P:\DUKE - LF GROUNDWATER REPORTS -236912369.06 MSS FGD LF\2011\SEPTEMBER SAMPLING\FIGURES\MSS FGD LF.DWG



BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS

	MS-10	GROUNDWATER MONITORING WELL (GROUNDWATER ELEVATION (FEET))
	834.49'	
	SW-1	SURFACE WATER SAMPLING LOCATION
		LANDFILL REVIEW BOUNDARY
		LANDFILL COMPLIANCE BOUNDARY
		LANDFILL WASTE BOUNDARY
		GENERALIZED GROUNDWATER SURFACE CONTOUR

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DRAWN BY: ANDREW MOORE  
 PROJECT MANAGER: WILLIAM M. MILLER  
 CLIENT: DUKE ENERGY CAROLINAS, LLC  
 DATE: 11/22/11



**GENERALIZED GROUNDWATER SURFACE CONTOURS**  
 SEPTEMBER 27, 2011  
 MARSHALL STEAM STATION  
 FGD RESIDUE LANDFILL, CELL I, PERMIT No. 1809

FIGURE **3**

FILE PATH: P:\DUKE - LF GROUNDWATER REPORTS -236912369.06 MSS FGD LF\2011\SEPTEMBER SAMPLING\FIGURES\MSS FGD LF.DWG

# TABLES

**Table 1--Field Data Parameters**  
**Duke Energy Carolinas, LLC/Marshall Steam Station**  
**FGD Residue Landfill, Phase 1, Cell 1--Permit No. 1809**  
**Groundwater Monitoring Report**

DATE	WELL No.	WELL DEPTH (feet)	DEPTH TO WATER (feet)	WATER ELEV. (feet)	DEPTH TO PRODUCT (feet)	ODOR	PURGE METHOD	PUMP RATE (mL/min)	WELL VOLUME (gal)	EVAC VOLUME (gal)	EVAC (yes/no)	TEMP (deg C)	SPECIFIC CONDUCTANCE (umho/cm)	pH (SU)	TURBIDITY (NTU)	ORP (mV-NHE)	DO (mg/L)
9/27/2011	MS-8	51.58	45.78	826.56	N/A	N/A	CP	N/A	0.95	3.00	NO	17.6	44	6.0	23.7	N/A	N/A
9/27/2011	MS-9	53.00	42.97	825.07	N/A	N/A	CP	N/A	1.64	8.75	NO	16.4	106	6.6	6.1	N/A	N/A
9/27/2011	MS-10	23.34	18.88	832.41	N/A	N/A	CP	N/A	0.73	2.25	NO	17.1	25	5.0	4.2	N/A	N/A
9/27/2011	MS-11	42.72	35.63	824.15	N/A	N/A	CP	N/A	1.16	3.75	NO	15.5	41	5.2	9.5	N/A	N/A
9/27/2011	MS-12	31.09	24.82	810.84	N/A	N/A	CP	N/A	1.02	3.75	NO	15.4	26	4.7	10.7	N/A	N/A
9/27/2011	MS-13	41.52	32.51	809.39	N/A	N/A	CP	N/A	1.47	4.50	NO	15.1	81	4.9	8.0	N/A	N/A
9/27/2011	MS-14	44.38	37.16	806.91	N/A	N/A	CP	N/A	1.18	5.00	NO	15.8	50	5.8	13.4	N/A	N/A
9/27/2011	MS-15	63.08	52.25	809.22	N/A	N/A	CP	N/A	1.77	10.00	NO	16.4	144	6.5	5.3	N/A	N/A
9/27/2011	MS-16	37.46	26.16	810.82	N/A	N/A	CP	N/A	1.84	2.50	YES	17.6	107	5.9	21.0	N/A	N/A
9/27/2011	SW-1	N/A	N/A	N/A	N/A	N/A	NP	N/A	N/A	N/A	N/A	18.3	48	5.2	27.2	N/A	N/A

Notes:

1. Purge Methods; LF=Low Flow, CP=Conventional Purge (3-5 well volumes), NP=No Purge (HydraSleeve).
2. Field sampling performed by Duke Energy Carolinas, LLC personnel.
3. umho/cm indicates micro mhos per centimeter.
4. SU indicates Standard Units.
5. NTU indicates Nephelometric Turbidity Units.
6. mV-NHE indicates millivolts-Normal Hydrogen Electrode.
7. Information provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 6, 2011.

**Table 2–Field and Analytical Results**  
**Duke Energy Carolinas, LLC/Marshall Steam Station**  
**FGD Residue Landfill, Phase 1, Cell 1–Permit No. 1809**  
**Groundwater Monitoring Report**

Sample Date: September 27, 2011			Laboratory Certificate Codes:							
Field Sampling performed by Duke Energy Carolinas, LLC			Duke Energy Carolinas Field #5193							
			Duke Energy Analytical Laboratory #248							
Parameter	SWS ID	Units	Certificate Code	Monitoring Wells					SWSL	15A NCAC 2L
				1809 MS-8	1809 MS-9	1809 MS-10	1809 MS-11	1809 MS-12		
Field pH	320	SU	5193	<b>6.0</b>	6.6	<b>5.0</b>	<b>5.2</b>	<b>4.7</b>	-	6.5-8.5
Field Specific Conductance	323	umho/cm	5193	44	106	25	41	26	-	-
Temperature	325	°C	5193	17.6	16.4	17.1	15.5	15.4	-	-
Top of Casing	328	feet	-	872.34	868.04	851.29	859.78	835.66	-	-
Depth to Water	318	feet	-	45.78	42.97	18.88	35.63	24.82	-	-
Water Elevation	319	feet	-	826.56	825.07	832.41	824.15	810.84	-	-
Well Depth	411	feet	-	51.58	53.00	23.34	42.72	31.09	-	-
Arsenic	14	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	10
Barium	15	µg/L	248	45.5 J	39.8 J	160	69.8 J	84.7 J	100	700
Boron	428	µg/L	248	33.4 U	33.4 U	33.4 U	33.4 U	33.4 U	NE	700
Cadmium	34	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	1	2
Chloride	301	µg/L	248	1,121	1,054	1,096	2,311	3,079	NE	250,000
Chromium	51	µg/L	248	4.37 J	2.31 J	0.687 J	2.7 J	0.893 J	10	10
Copper	54	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	10	1,000
Fluoride	312	µg/L	248	170 J	142 J	74.6 J	73.7 J	63.4 J	2,000	2,000
Iron	340	µg/L	248	<b>474</b>	75 J	28 J	112 J	23.3 J	300	300
Lead	131	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	15
Manganese	342	µg/L	248	15.4 J	11.9 J	30.1 J	8.81 J	16.5 J	50	50
Mercury	132	µg/L	248	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.2	1
Nickel	152	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	50	100
Nitrate as Nitrogen	303	µg/L	248	65.5 J	226 J	1,211 J	8.49 J	40.5 J	10,000	10,000
Selenium	183	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	20
Silver	184	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	10	20
Sulfate	315	µg/L	248	225 J	398 J	48.8 J	194 J	70.2 J	250,000	250,000
Total Dissolved Solids	311	µg/L	248	82,000	95,000	38,000	50,000	31,000	NE	500,000
Zinc	213	µg/L	248	5.27 J	3.34 U	9.73 J	3.34 U	3.9 J	10	1,000

Notes:

- Concentrations presented in micrograms per liter (µg/L).
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. This limit (identified by DENR) is the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy.
- 15A NCAC 2L Standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," DENR (last amended on January 1, 2010).
- Bold values indicate values that attain or exceed the 15A NCAC 2L standard.
- Grayed values indicate values that attain or exceed the SWSL standard.
- NE means Not Established. Blank cells indicate that there is no information relevant to the respective row.
- Qualifiers in non-italicized text are laboratory data qualifiers or "flags". "U" is used for parameters not detected at concentrations above the method detection limit (MDL). "J" is used for parameters detected at estimated concentrations above the MDL but below the laboratory's method reporting limit (MRL). An italicized J-flag is a data qualifier, added by Altamont, to indicate a detected concentration that is greater than the laboratory's MRL but less than the SWSL.
- Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 6, 2011.
- According to the Constituent Look-up webpage on the DENR Division of Waste Management webpage, there is no SWSL or 2L standard for choride associated with CAS number 16887-00-6, which is the CAS reported by the laboratory for the analyses completed. Therefore, the SWSL and 2L listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).

**Table 2—Field and Analytical Results**  
**Duke Energy Carolinas, LLC/Marshall Steam Station**  
**FGD Residue Landfill, Phase 1, Cell 1—Permit No. 1809**  
**Groundwater Monitoring Report**

Sample Date: September 27, 2011										Laboratory Certificate Codes:		
Field Sampling performed by Duke Energy Carolinas, LLC										Duke Energy Carolinas Field #5193		
										Duke Energy Analytical Laboratory #248		
Parameter	SWS ID	Units	Certificate Code	Monitoring Wells					1809 Field Blank	SWSL	15A NCAC 2L	
				1809 MS-13	1809 MS-14	1809 MS-15	1809 MS-16	1809 SW-1				
Field pH	320	SU	5193	<b>4.9</b>	<b>5.8</b>	6.5	<b>5.9</b>	<b>5.2</b>	-	-	6.5-8.5	
Field Specific Conductance	323	umho/cm	5193	81	50	144	107	48	-	-	-	
Temperature	325	°C	5193	15.1	15.8	16.4	17.6	18.3	-	-	-	
Top of Casing	328	feet	-	841.90	844.07	861.47	836.98	-	-	-	-	
Depth to Water	318	feet	-	32.51	37.16	52.25	26.16	-	-	-	-	
Water Elevation	319	feet	-	809.39	806.91	809.22	810.82	-	-	-	-	
Well Depth	411	feet	-	41.52	44.38	63.08	37.46	-	-	-	-	
Arsenic	14	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	10	
Barium	15	µg/L	248	113	43 J	101	87 J	80.6 J	3.34 U	100	700	
Boron	428	µg/L	248	33.4 U	33.4 U	33.4 U	33.4 U	33.4 U	33.4 U	NE	700	
Cadmium	34	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	1	2	
Chloride	301	µg/L	248	4,227	859	2,107	1,411	3,237	23.7 J	NE	250,000	
Chromium	51	µg/L	248	0.667 U	0.667 U	<b>19.7</b>	2.55 J	0.667 U	0.667 U	10	10	
Copper	54	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	10	1,000	
Fluoride	312	µg/L	248	117 J	157 J	126 J	263 J	91.5 J	30.7 J	2,000	2,000	
Iron	340	µg/L	248	28.3 J	163 J	76.1 J	<b>359</b>	<b>624</b>	6.67 U	300	300	
Lead	131	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	15	
Manganese	342	µg/L	248	14.3 J	4.07 J	3.34 U	8.78 J	<b>75.2</b>	3.34 U	50	50	
Mercury	132	µg/L	248	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.2	1	
Nickel	152	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	50	100	
Nitrate as Nitrogen	303	µg/L	248	2,367 J	6.41 J	380 J	376 J	123 J	5.4 U	10,000	10,000	
Selenium	183	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	10	20	
Silver	184	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	10	20	
Sulfate	315	µg/L	248	230 J	65.6 J	1,050 J	350 J	6,420 J	18 U	250,000	250,000	
Total Dissolved Solids	311	µg/L	248	63,000	69,000	122,000	105,000	75,000	-	NE	500,000	
Zinc	213	µg/L	248	5.29 J	3.34 U	3.34 U	3.35 J	5 J	3.34 U	10	1,000	

Notes:

- Concentrations presented in micrograms per liter (µg/L).
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. This limit (identified by DENR) is the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy.
- 15A NCAC 2L Standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," DENR (last amended on January 1, 2010).
- Bold values indicate values that attain or exceed the 15A NCAC 2L standard.
- Grayed values indicate values that attain or exceed the SWSL standard.
- NE means Not Established. Blank cells indicate that there is no information relevant to the respective row.
- Qualifiers in non-italicized text are laboratory data qualifiers or "flags". "U" is used for parameters not detected at concentrations above the method detection limit (MDL). "J" is used for parameters detected at estimated concentrations above the MDL but below the laboratory's method reporting limit (MRL). An italicized J-flag is a data qualifier, added by Altamont, to indicate a detected concentration that is greater than the laboratory's MRL but less than the SWSL.
- Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 6, 2011.
- According to the Constituent Look-up webpage on the DENR Division of Waste Management webpage, there is no SWSL or 2L standard for chloride associated with CAS number 16887-00-6, which is the CAS reported by the laboratory for the analyses completed. Therefore, the SWSL and 2L listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).

**Table 3–North Carolina Administrative Code (NCAC) 2L Groundwater Quality Exceedances  
Duke Energy Carolinas, LLC/Marshall Steam Station  
FGD Residue Landfill, Phase 1, Cell 1 - Permit No. 1804  
Groundwater Monitoring Report**

Sample Date: September 27, 2011						
Parameter	Well ID	Result	Units	15A NCAC 2L Standard	Historic Concentrations	Cause and Significance
Field pH	MS-8	6.0	SU	6.5-8.5	5.2 - 6.3	pH consistent with historic readings at well.
	MS-10	5.0	SU		4.5 - 5.3	pH consistent with historic readings at well.
	MS-11	5.2	SU		5.1 - 5.5	pH consistent with historic readings at well.
	MS-12	4.7	SU		4.5 - 5.1	pH consistent with historic readings at well.
	MS-13	4.9	SU		4.9 - 5.4	pH consistent with historic readings at well.
	MS-14	5.8	SU		5.5 - 6.2	pH consistent with historic readings at well.
	MS-16	5.9	SU		5.9 - 6.4	pH consistent with historic readings at well.
	SW-1	5.2	SU		5.1 - 6.1	pH consistent with historic readings at well.
Chromium	MS-15	19.7	µg/L	10	12 - 21	Chromium concentration consistent with historic readings at well.
Iron	MS-8	474	µg/L	300	626 - 22,000	Iron concentration lowest since sampling began.
	MS-16	359	µg/L		803 - 57,572	Iron concentration in well lowest since sampling began.
	SW-1	624	µg/L		866 - 3,816	Iron concentration in surface water sampling location lowest since sampling began.
Manganese	SW-1	75.2	µg/L	50	< 1 - 447	Manganese concentration consistent with historic readings at well.

Notes:

- Concentrations presented in micrograms per liter (µg/L).
- 15A NCAC 2L Standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," DENR (last amended on January 1, 2010).
- Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on October 6, 2011.
- Historic concentrations based on data in Duke Energy Carolinas, LLC analytical results database.

# APPENDICES

**APPENDIX A**  
**Chain-of-Custody Forms**

# CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



For Detailed Instructions, see:  
http://dewwww/essenv/coc/

**Duke Energy Analytical Lab Services**  
Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd  
Huntersville, N. C. 28078  
(704) 875-5245  
Fax: (704) 875-5038

Analytical Laboratory Use Only			
LIMS # <b>J11090248</b>	MATRIX: <b>GW-RCRA</b>	Samples Originating From	NC <input checked="" type="checkbox"/> SC <input type="checkbox"/>
Logged By <i>gpk</i>	Date & Time <b>9-27-11 1532</b>	SAMPLE PROGRAM Ground Water <input checked="" type="checkbox"/> NPDES <input type="checkbox"/> Drinking Water <input type="checkbox"/> UST <input type="checkbox"/> RCRA Waste <input type="checkbox"/>	
VENDOR <b>&lt;IC</b>		Cooler Temp (C)	
PO #	<sup>15</sup> Preserv.: 1=HCl 2=H <sub>2</sub> SO <sub>4</sub> 3=HNO <sub>3</sub> 4=Ice 5=None		

<sup>19</sup>Page 1 of 1  
**DISTRIBUTION**  
ORIGINAL to LAB,  
COPY to CLIENT

rev Aug 2011

1)Project Name <b>MARSHALL FGD LANDFILL</b> Permit # 18-09		2)Phone No: 875-5257	
3)Client <b>LDC / TSH / Ed Sullivan</b>		4)Fax No:875-4349	
5)Business Unit: 20035	6)Process: <b>BENVWS</b>	7)Resp. To: <b>MS00</b>	
8)Project ID:	9)Activity ID:	10)Mail Code: MGO3A3	

Customer must Complete

Customer to complete all appropriate NON-SHADED areas.

LAB USE ONLY
<sup>11</sup> Lab ID
2011020135
2011020139
2011020140
2011020141
2011020142
2011020143
2011020144
2011020145
2011020146
2011020147
2011020148

Customer to complete appropriate columns to right

<sup>12</sup> Chem Desktop No.	<sup>13</sup> Sample Description or ID	<sup>14</sup> Collection Information			<sup>17</sup> Comp.	<sup>18</sup> Grab	ALK (4.5)	NO <sub>3</sub> -N, Cl, F, SO <sub>4</sub> (IC)	Hg (EPA 245.1)	Metals Prep - 3030C  (ICP - EPA 200.7) Ag, B, Ba, Ca, Cu, Fe, K, Mg, Mn, Na, Ni, Zn  (IMS - EPA 200.8) As, Cd, Cr, Pb, Se	TDS	Total # of Containers
		Date	Time	Signature								
	MS-8	9/27/11	1020	TSH		X	1	1		1		4
	MS-9	9/27/11	0920	TSH		X	1	1		1		4
	MS-10	9/27/11	1120	TSH		X	1	1		1		4
	MS-11	9/27/11	0915	DC		X	1	1		1		4
	MS-12	9/27/11	0835	DC		X	1	1		1		4
	MS-13	9/27/11	0745	DC		X	1	1		1		4
	MS-14	9/27/11	1125	DC		X	1	1		1		4
	MS-15	9/27/11	0815	TSH		X	1	1		1		4
	MS-16	9/27/11	1040	DC		X	1	1		1		4
	SW-1	9/27/11	0935	DC		X	1	1		1		4
	FIELD BLANK	9/27/11	1155	TSH		X	1	1		1		3

Customer to sign & date below

21)Relinquished By <i>LD Bell</i>	Date/Time <b>9/27/11 1405</b>	Accepted By: <i>Cindy Knox</i>	Date/Time <b>9-27-11 1405</b>
Relinquished By	Date/Time	Accepted By:	Date/Time
Relinquished By	Date/Time	Accepted By:	Date/Time
23)Seal/Locked By	Date/Time	Sealed/Lock Opened By	Date/Time
24)Comments <b>Regulatory Agency : NCDENR/DWM -SW Section - State EDD Format Required / Permit # 18-09</b> Use indicated or comparable analytical methods			

Customer, important please indicate desired turnaround

**<sup>22</sup>Requested Turnaround**

14 Days

\*7 Days \_\_\_\_\_

\*48 Hr \_\_\_\_\_

\*Other \_\_\_\_\_

\* Add. Cost Will Apply