

ALTAMONT ENVIRONMENTAL, INC.

ENGINEERING & HYDROGEOLOGY

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May 11, 2011

Ms. Jaclynne Drummond
North Carolina Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699-1646

Subject: Duke Energy Carolinas Marshall Steam Station
Dry Ash Landfill Permit #18-04
Revised Semiannual Groundwater Monitoring Report

Dear Ms. Drummond:

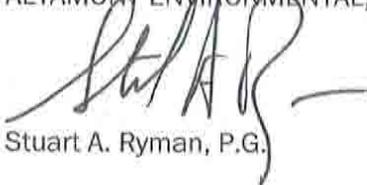
On behalf of Duke Energy Carolinas, Altamont Environmental, Inc. (Altamont) has revised the Semiannual Groundwater Monitoring Report for the Marshall Steam Station, Dry Ash Landfill, Permit #18-04. Please find the revised report enclosed. A description of the revisions is provided on Page iv of the enclosed report.

Groundwater sampling for the landfill was performed on February 8, 2011. The original report was dated May 5, 2011. This report completely supersedes the report dated May 5, 2011.

Please feel free to call or respond with any questions or comments related to this report.

Sincerely,

ALTAMONT ENVIRONMENTAL, INC.



Stuart A. Ryman, P.G.

cc: Ms. Donna Burrell, Mr. Tim Hunsucker, and Mr. Ed Sullivan, Duke Energy Carolinas

DENR USE ONLY:

Paper Report

Electronic Data - Email CD (data loaded: Yes / No)

Doc/Event #:

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. (Altamont)

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: andrewmoore@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 Marshall Steam Station Dry Ash Landfill	8320 East Highway 150 Terrell, Catawba County, North Carolina	18-04	.0500	February 8, 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

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)

Revised 6/2009



ALTAMONT ENVIRONMENTAL, INC.

E N G I N E E R I N G & H Y D R O G E O L O G Y



Semiannual Groundwater Monitoring Report

Marshall Steam Station

Dry Ash Landfill, Permit #18-04

February 2011 Sampling Event

May 11, 2011

Prepared for
Duke Energy Carolinas
8320 East Highway 150
Terrell, NC 28682

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

**Semiannual Groundwater
Monitoring Report
Marshall Steam Station
Dry Ash Landfill, Permit #18-04
February 2011 Sampling Event
May 11, 2011**

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.

Description of Revisions

This report is a re-submittal of the Semiannual Groundwater Monitoring Report, Marshall Steam Station, Dry Ash Landfill, Permit #18-04, February 2011 Sampling Event. The original report was dated May 5, 2011. No revisions to the text were made with the exception of the headers and footers. The following changes were made to Table 2:

- The concentration of copper in MW-2 was changed from .030 U to 0.30 U.
- The concentration of copper in MW-3 was changed from 0.30 U to 0.52 J.
- The concentration of iron in MW-3 was changed from 70.5 to 70.5 J.
- The concentrations of total organic halide were changed for all wells from 0.1 U to 100 U.
- Significant digits of 0 were added to several constituents to be consistent with the laboratory analytical report.

This revised report completely supersedes the report date May 5, 2011.

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1.0 Background

Marshall Steam Station is owned and operated by Duke Energy Carolinas (Duke). The Marshall plant has a generating capacity of 2090 megawatts (MW) of electric power by combustion of coal. Marshall is the second largest coal facility owned by Duke Energy. The Marshall station generates enough electricity to power over one-and-a-half million homes.

The plant is located in Catawba County, on Lake Norman (Figure 1), 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.

Two landfills are permitted at the Marshall Steam Station under the North Carolina Department of Environment and Natural Resources (DENR) Solid Waste Permit #18-04. The permitted landfill areas are located north and east of the steam station and are located adjacent to the Marshall Ash Basin. The location of the permitted landfill areas is shown on Figure 1. The larger of the two landfills has an area of approximately 47 acres. The smaller of the two landfills is approximately 14.5 acres in area.

The monitoring system at the landfill consists of five groundwater monitoring wells as listed below.

Monitoring Wells:	MW-1
	MW-2
	MW-3
	MW-4
	MW-5

The locations of the wells are shown on Figure 2. Monitoring wells MW-2, MW-3, and MW-5 are located adjacent to the larger fill. Monitoring well MW-1 and observation well OB-1 are located adjacent to the smaller fill. Monitoring well MW-4 is located upgradient from the 47-acre landfill and serves as the background well. Observation OB-1 is located adjacent to the smaller fill and is used only to measure groundwater levels.

The ground surface in the area of the landfill slopes from the elevation along Island Point Road (located north of MW-4), approximate elevation 880 feet to 890 feet, towards the Marshall Ash Basin, with a surface water elevation of approximately 790 feet. Lake Norman is located to the east of the Marshall Ash Basin. The normal pond elevation of Lake Norman is 760 feet.

2.0 Methods

2.1 Sampling Methods

Groundwater sampling and documentation of sampling activities were performed by Duke personnel. The groundwater samples were analyzed by Pace Analytical Services, Inc. Asheville (North Carolina Laboratory Certification #40), Pace Analytical Services, Inc. Minneapolis (North Carolina Laboratory Certification #530), and Summit Environmental Technologies, Inc. (North Carolina Laboratory Certification #631).

The groundwater samples were analyzed for the following constituents and/or parameters:

- Select metals using U.S. Environmental Protection Agency (EPA) Method 6010 and 6020
- Mercury using EPA Method 7470
- Total Dissolved Solids using method 2540C
- Biological Oxygen Demand using Standard Method (SM) 5210B
- Nitrate as Nitrogen using EPA Method 353.2
- Fluoride and Sulfate using EPA Method 300.0
- Chloride using SM 4500-Cl-E
- Chemical Oxygen Demand using SM 5220 D
- Total Organic Carbon using SM 5310 B
- Total Organic Halides using EPA Method 9020

2.2 Analysis

Altamont Environmental Inc. (Altamont) completed the following tasks:

- Received field sampling information provided by Duke (performed by Duke personnel) for monitoring wells MW-1, MW-2, MW-3, MW-4, and MW-5. The samples were collected on February 8, 2011 and Altamont received the data on March 1, 2011.
- Reviewed the laboratory analytical results for samples. The results were adapted to conform to the format requirements of the DENR Electronic Data Deliverable template.
- Developed a 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 the measured groundwater elevations in the wells from the February 8, 2011 sampling, and using the approximate surface water elevations for the Marshall Ash Basin and the adjacent Lake Norman.

Groundwater flow at the site is from areas of higher topography towards the ash basin and on towards Lake Norman. Well MW-4 is located north of the landfill and is at the highest topographic elevation. Groundwater flow is generally from MW-4 towards the 47-acre portion of the landfill and to the ash basin. It is expected that flow would be from the topographically higher region north of MW-3 and MW-5 towards the landfill, or in the case of MW-5, towards the portion of ash basin located to the east of the landfill.

The water elevation in well MW-2 is approximately the same as the pond elevation in the ash basin. Well MW-2 is located approximately 200 feet from the shore of the ash basin. Based on the location of the well and the observed water levels in the well relative to the ash basin, the well is likely influenced more by the water levels in the ash basin than from groundwater flowing from the landfill.

The water elevation at well MW-3 is approximately the same as the pond elevation of the two adjacent ponded areas. These ponded areas are part of the ash basin that was cut off from the remainder of the ash basin by construction of the landfill.

Well MW-5 is located adjacent to the landfill and is adjacent to an arm that was a part of the ash basin. This arm no longer contains appreciable free water and is filled with ash that was sluiced from the ash basin.

The groundwater flow in the region near the smaller fill area (14.5-acre landfill) appears to be from the ash basin (elevation 790 feet) towards the arm of Lake Norman (elevation 760 feet) located east of wells OB-1 and MW-1.

3.2 Analytical Results

Water samples were received from the following locations:

Monitoring Wells	MW-1, MW-2, MW-3, MW-4, MW-5
------------------	------------------------------

The chain-of-custody forms can be found in Appendix A. A summary of the field data is presented in Table 1.

The results of the laboratory analyses are summarized in Table 2.

Results from the monitoring wells met the corresponding North Carolina Administrative Code (NCAC) 2L groundwater quality standards (2L standards) with the exceptions noted below:

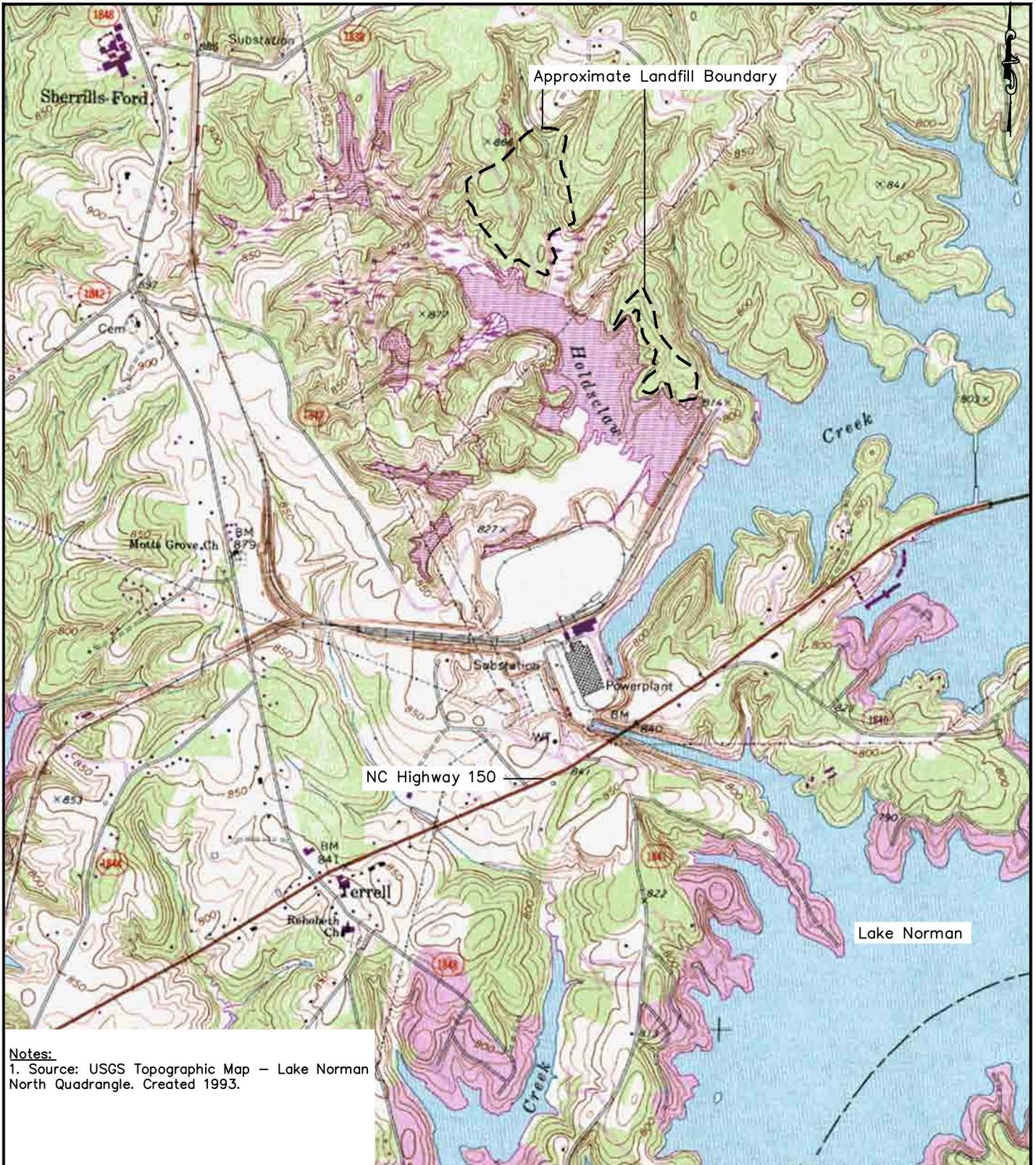
- pH values below 6.5 were measured in wells MW-1, MW-2, MW-3, MW-4, and MW-5. The measured pH values below 6.5 ranged from 4.4 (Standard Units) in MW-3 to 5.5 in MW-1. The pH values measured at these locations are consistent with historic readings at the site.
- Boron was measured above the 2L standard of 700 micrograms per liter ($\mu\text{g/L}$) in MW-2 at 2,740 $\mu\text{g/L}$. The concentration of boron in MW-2 decreased from 2,770 $\mu\text{g/L}$ measured in the August 2010 sampling event. The concentration of boron in MW-2 is consistent with concentrations measured over the previous two years. As was discussed in section 3.1, monitoring well MW-2 is located adjacent to the ash basin. Based on the location of MW-2, it is more likely influenced by the water in the ash basin pond than by water from the landfill.

- Manganese was measured above the 2L standard of 50 µg/L in MW-3 and MW-5 at concentrations of 55.8 µg/L and 51.9 µg/L, respectively. The concentration of manganese in MW-3 is consistent with historic concentrations at the site. The concentration of manganese in MW-5 increased in February of 2008 and has remained elevated since that sampling event. Monitoring wells MW-3 and MW-5 are both located adjacent to former arms of the ash basin. These arms still contain ash from the ash basin. The concentrations of manganese measured in MW-3 and MW-5 may be influenced by the ash from the ash basin rather than from the landfill.
- Selenium was measured above the 2L standard of 20 µg/L in MW-2 at 29.6 µg/L. As was discussed in Section 3.1, the water quality in monitoring well MW-2 is likely affected by water quality in the ash basin.
- Fluoride is reported to exceed the 2L standard of 2,000 µg/L in MW-1 and MW-2 with values of 2,500 µg/L and 5,000 µg/L, respectively. Note that these concentrations were measured with dilution factors of 5 and 10, respectively, resulting in elevated method detection limits. Fluoride has not been detected in these wells in excess of the 2L standard in previous sampling events.

In addition to the constituents listed above, the constituents and compounds at the following wells were detected at concentrations equal to or above the corresponding SWSL:

- Barium in excess of the SWSL of 100 µg/L was detected in MW-3 at 356 µg/L.
- Zinc in excess of the SWSL of 10 µg/L was detected in MW-3 at 17.9 µg/L.

FIGURES



Notes:
 1. Source: USGS Topographic Map – Lake Norman North Quadrangle. Created 1993.

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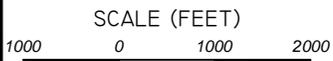
SITE LOCATION MAP

**MARSHALL STEAM STATION
 DRY ASH LANDFILL PERMIT #18-04**

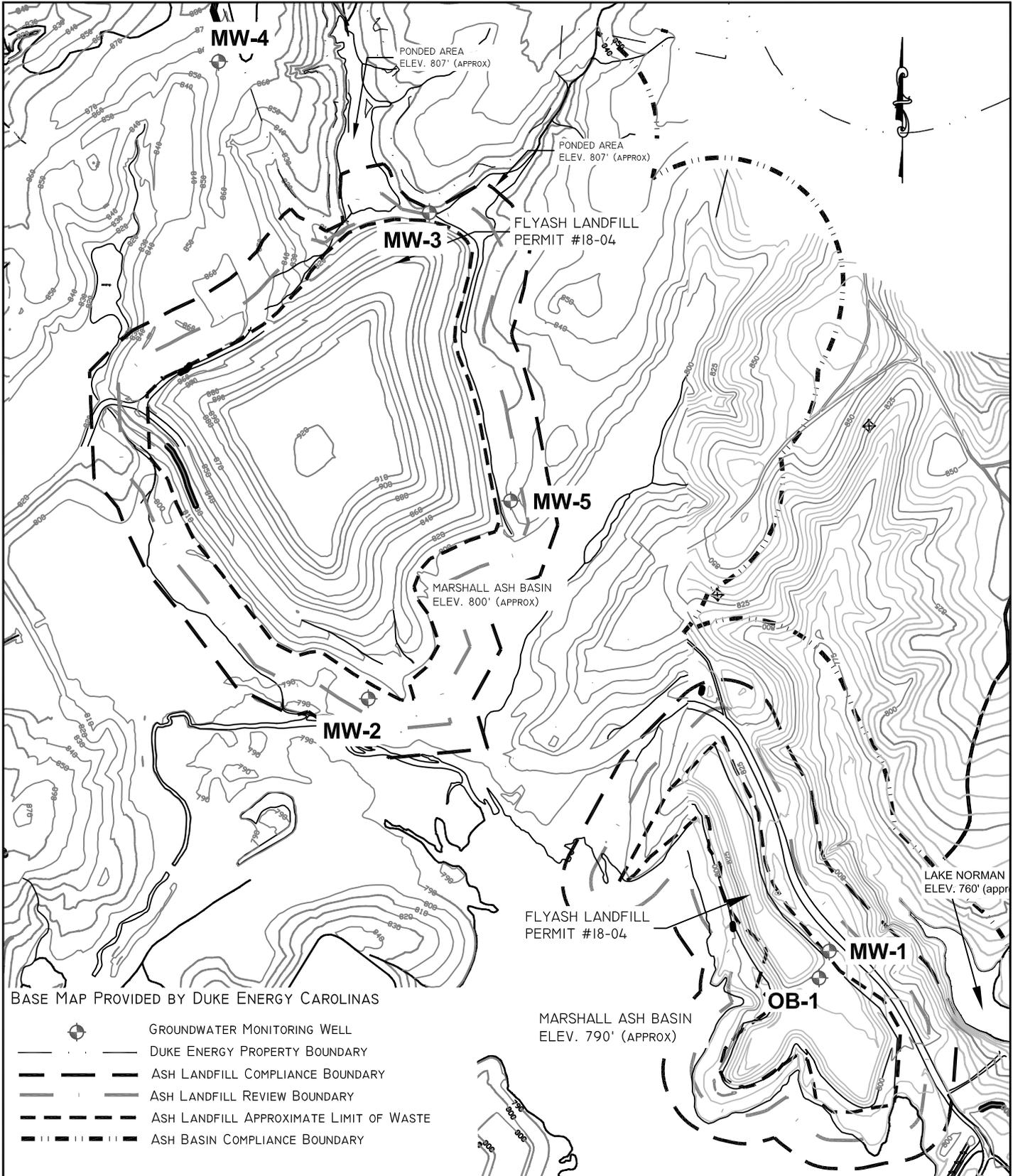
FIGURE

1

DRAWN BY: ANDREW MOORE
 PROJECT MANAGER: WILLIAM M. MILLER
 CLIENT: DUKE ENERGY
 DATE: 3/16/11



FILE PATH: P:\DUKE-LF GROUNDWATER REPORTS-2369\2369.05 MSS ASH LF\FIGURES\SITE LOCATION MAP



BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS

- GROUNDWATER MONITORING WELL
- DUKE ENERGY PROPERTY BOUNDARY
- ASH LANDFILL COMPLIANCE BOUNDARY
- ASH LANDFILL REVIEW BOUNDARY
- ASH LANDFILL APPROXIMATE LIMIT OF WASTE
- ASH BASIN COMPLIANCE BOUNDARY

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SAMPLE LOCATIONS

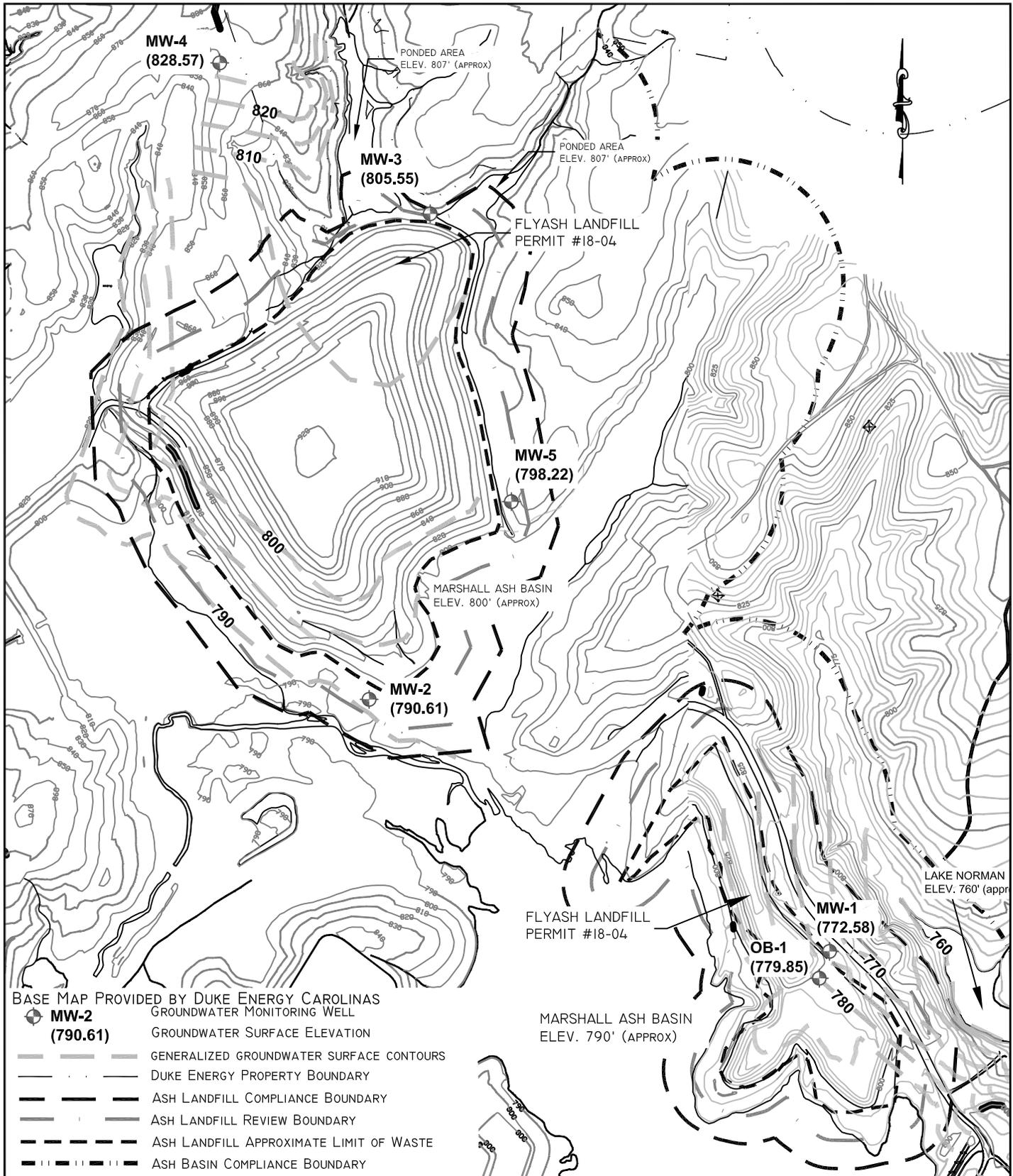
MARSHALL STEAM STATION
 DRY ASH LANDFILL PERMIT #18-04

FIGURE

2

DRAWN BY: ANDREW MOORE
 PROJECT MANAGER: WILLIAM M. MILLER
 CLIENT: DUKE ENERGY
 DATE: 3/16/11





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**GENERALIZED
 GROUNDWATER SURFACE
 CONTOURS**
 FEBRUARY 8, 2011
 MARSHALL STEAM STATION
 DRY ASH LANDFILL PERMIT #18-04

FIGURE
3

DRAWN BY: ANDREW MOORE
 PROJECT MANAGER: WILLIAM M. MILLER
 CLIENT: DUKE ENERGY
 DATE: 3/16/11



FILE PATH: P:\DUKE-LF GROUNDWATER REPORTS-2359\2359.05 MSS ASH LF\2011\FEBRUARY SAMPLING\FIGURES\MARSHALL ASH LANDFILL

TABLES

**Table 1 - Field Data Parameters
Duke Energy Carolinas Marshall Steam Station
Dry Ash Landfill - Permit #18-04
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	TURBIDITY (NTU)	ORP (mV-NHE)	DO (mg/L)
2/8/2011	MW-1	78.75	51.12	772.58	N/A	N/A	CP	N/A	4.51	13.50	NO	14.5	136	5.5	1.8	N/A	N/A
2/8/2011	MW-2	35.10	6.61	790.61	N/A	N/A	CP	N/A	4.65	14.25	NO	15.2	355	5.1	0.5	N/A	N/A
2/8/2011	MW-3	28.15	7.52	805.55	N/A	N/A	CP	N/A	3.36	10.50	NO	15.1	98	4.4	4.3	N/A	N/A
2/8/2011	MW-4	50.20	38.81	828.57	N/A	N/A	CP	N/A	1.86	2.50	YES	12.8	48	5.2	7.4	N/A	N/A
2/8/2011	MW-5	30.71	24.47	798.22	N/A	N/A	CP	N/A	1.02	3.00	NO	13.8	38	5.2	2.0	N/A	N/A
2/8/2011	OB-1	65.50	46.00	779.85	N/A	N/A	N/A	N/A	3.18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

1. Purge Methods; LF=Low Flow, CP=Conventional Purge (3-5 well volumes), BP=No Purge (HydraSleeve).
2. Field sampling performed by Duke Energy personnel.

**Table 2 - Field and Analytical Results
Duke Energy Carolinas Marshall Steam Station
Dry Ash Landfill - Permit #18-04
Groundwater Monitoring Report**

Facility: Marshall Steam Station - Dry Ash Landfill - Permit #18-04				Laboratory Certificate Codes:								
Sample Date: February 8, 2011				Duke Power #5193								
Field Sampling performed by Duke Energy Carolinas				Pace Lab #40								
				Summit Environmental Technologies, Inc. #631								
Parameter	SWS ID	Units	Certificate Code	1804 MW-1	1804 MW-2	1804 MW-3	1804 MW-4	1804 MW-5	1804 OB-1	1804 Field Blank	SWSL	15A NCAC 2L
Field pH	320	Std. Units	5193	5.5	5.1	4.4	5.2	5.2				6.5-8.5
Field Specific Conductivity	323	umho/cm	5193	136	355	98	48	38				
Temperature	325	°C	5193	14.5	15.2	15.1	12.8	13.8				
Top Casing	328	msl-feet		823.70	797.22	813.07	867.38	822.69	825.85			
Depth to Water	318	feet		51.12	6.61	7.52	38.81	24.47	46.00			
Water Elevation	319	msl-feet		772.58	790.61	805.55	828.57	798.22	779.85			
Well Depth	411	feet		78.75	35.10	28.15	50.20	30.71				
Arsenic	14	ug/L	530	0.075 J	0.11 J	0.062 U	0.062 U	0.062 U		0.062 U	10	10
Barium	15	ug/L	40	70.5 J	61.0 J	356	48.6 J	49.0 J		0.54 J	100	700
Boron	428	ug/L	40	488	2740	60.9	53.9	48.3 J		40.5 J	NE	700
BOD, 5 day	316	ug/L	40	2000 U	2000 U	2000 U	2000 U	2000 U			NE	NE
Cadmium	34	ug/L	530	0.032 J	0.075 J	0.022 J	0.020 U	0.020 U		0.020 U	1	2
Chemical Oxygen Demand	317	ug/L	40	25000 U	51000	81000	25000 U	25000 U		25000 U	NE	NE
Chloride	455	ug/L	40	5000 U	5100	10100	5000 U	5000 U		5000 U	NE	250000
Chromium	51	ug/L	40	7.9 J	0.74 J	1.3 J	1.3 J	0.40 U		0.40 U	10	10
Copper	54	ug/L	40	0.30 J	0.30 U	0.52 J	0.30 U	0.40 J		0.30 U	10	1000
Fluoride	312	ug/L	40	2500 U	5000 U	500 U	500 U	500 U		500 U	2000	2000
Iron	340	ug/L	40	23.6 J	14.0 U	70.5 J	57.3 J	60.3 J		14.0 U	300	300
Lead	131	ug/L	530	0.025 J	0.030 J	0.25 J	0.036 J	0.033 J		0.020 U	10	15
Manganese	342	ug/L	40	6.3 J	11.0 J	55.8	2.4 J	51.9		0.30 U	50	50
Mercury	132	ug/L	40	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U		0.10 U	0.2	1
Nickel	152	ug/L	40	1.7 U	1.7 U	1.8 J	1.7 U	1.7 U		1.7 U	50	100
Nitrogen, Nitrate	303	ug/L	40	100 U	430 J	6760 J	100 U	100 U		100 U	10000	10000
Selenium	183	ug/L	530	2.1 J	29.6	0.10 U	0.10 U	0.10 U		0.14 J	10	20
Silver	184	ug/L	40	0.66 J	1.7 J	0.17 J	0.19 J	0.22 J		0.12 J	10	20
Sulfate	315	ug/L	40	39700 J	138000 J	5000 U	5000 U	5000 U		5000 U	250000	250000
Total Dissolved Solids	311	ug/L	40	87000	243000	44000	41000	35000			NE	500000
Total Organic Carbon	357	ug/L	40	1000 U	4830	1000 U	1010	1570		1000 U	NE	NE
Total Organic Halide	396	ug/L	631	100 U	100 U	100 U	100 U	100 U		100 U	NE	NE
Zinc	213	ug/L	40	3.6 J	3.9 J	17.9	2.5 J	2.3 J		3.9 J	10	1000

Notes:

- Concentrations presented in micrograms per liter (ug/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.
- 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 MCL.
- 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 Method Detection Limit (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 MDL but less than the SWSL.
- Data obtained from Pace Analytical Services, Inc. Report No. 9287361.

APPENDICES

APPENDIX A
Chain-of-Custody Forms

