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February 15, 2013

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

Subject: Semi-annual Groundwater Monitoring Report – December 2012  
Duke Energy Carolinas, LLC  
McGuire Nuclear Station  
Landfill #2 (Synthetically Lined), Permit #6004

Dear Ms. Werner:

Duke Energy is providing the results of semi-annual groundwater monitoring for the synthetically-lined McGuire Nuclear Station Landfill #2, located in Huntersville, North Carolina.

On December 4, 2012, groundwater, surface water, and leachate samples were collected in accordance with the SAP. Table 2 provides a summary of groundwater field and analytical results. Table 3 provides a summary of surface water field and analytical results. Table 4 provides a summary of leachate field and analytical results. A table summarizing sampling results that equal or exceed NCAC 2L standards is provided as Table 5.

Duke Energy personnel sample designated groundwater, surface water and leachate locations at McGuire Nuclear Station's Landfill #2 (Synthetically Lined) semi-annually during June and December. The next landfill monitoring event is planned for June 2013 with a report of monitoring results to follow.

If you have any questions or concerns, please contact me at 704-382-4761 or at Sean.DeNeale@duke-energy.com

Sincerely,

Sean DeNeale, Engineer I  
Environment, Health & Safety

Electronic cc: Mr. John Williamson – McGuire Nuclear Station  
Mr. Ed Sullivan – Duke Energy Corporation  
Mr. Tim Hunsucker – Duke Energy Corporation  
Mr. Bill Miller – HDR Engineering, Inc.  
Mr. Scott Spinner – HDR Engineering, Inc.

NC DENR

**Environmental Monitoring Reporting Form**

Division of Waste Management - Solid Waste

**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):

HDR Engineering, Inc. of the Carolinas (Consultant)

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

Name: William M. Miller

Phone: 828-891-6296

E-mail: bill.miller@hdrinc.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 McGuire Nuclear Station Landfill #2 (Synthetically Lined)	13339 Hagers Ferry Road Huntersville, NC 28078	6004	.0500	December 4, 2012

**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.

William M. Miller

Senior Engineer

(828) 891-6296

Facility Representative Name (Print)

Title

(Area Code) Telephone Number

*William M. Miller*

February 11, 2013

Affix NC Licensed Professional Geologist Seal

Signature

Date

440 S. Church Street Suite 1000, Charlotte, NC 28202

Facility Representative Address

F-0116

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



*William M. Miller 2/11/2013*

**SEMIANNUAL GROUNDWATER  
MONITORING REPORT**

**MCGUIRE NUCLEAR STATION**

**LANDFILL #2 (SYNTHETICALLY LINED)  
PERMIT NO. 6004**

**DECEMBER 2012 SAMPLING EVENT**

**Prepared for:  
DUKE ENERGY CAROLINAS, LLC  
13339 Hagers Ferry Road  
Huntersville, NC 28078**

**Prepared by:  
HDR ENGINEERING, INC. OF THE CAROLINAS  
Charlotte, North Carolina**

**February 11, 2013**



REPORT VERIFICATION

**PROJECT:** SEMIANNUAL GROUNDWATER MONITORING REPORT  
MCGUIRE NUCLEAR STATION  
LANDFILL #2 (SYNTHETICALLY LINED)  
PERMIT NO. 6004

**TITLE:** DECEMBER 2012 SAMPLING EVENT

This document has been reviewed for accuracy and quality commensurate with the intended application.

Prepared by: *S. Allshouse*

Date: 2/11/2013

Checked by: *William M. Miller*

Date: 2/11/2013

Approved by: *T. Ziegler*

Date: 2/11/2013

Project Manager: Ty Ziegler, PE

Professional Engineer Seal:



*William M. Miller* 2/11/2013

HDR Engineering, Inc. of the Carolinas  
440 South Church St., Suite 1000  
Charlotte, NC 28202

North Carolina Engineering Firm Number F-0116

**SEMIANNUAL GROUNDWATER MONITORING REPORT  
MCGUIRE NUCLEAR STATION  
LANDFILL #2 (SYNTHETICALLY LINED)  
PERMIT NO. 6004**

**DECEMBER 2012 SAMPLING EVENT**

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## Section 1

# Background

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The McGuire Nuclear Station Landfill #2 (Synthetically Lined)<sup>1</sup> is located at the Duke Energy Carolinas, LLC (Duke Energy) McGuire Nuclear Station, in Mecklenburg County, NC. The landfill is permitted to accept waste that is specified by the Permit to Operate. The landfill was constructed with a high-density polyethylene (HDPE) synthetic liner and with a leachate collection and removal system. Leachate and contact stormwater are collected in a lined leachate collection basin and pumped to the McGuire Nuclear Station wastewater treatment system. The landfill is permitted under the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Permit No. 6004.

The landfill and nearby area are depicted on Figures 1 and 2. The landfill is located south of North Carolina Highway 73, north of Cashion Road, and to the west of Linderman Road. Cashion Road runs along a surface water divide, with surface flow draining to the northwest and to the southeast. A surface water drainage feature is located to the northeast of the landfill. This feature drains to the northwest, to a perennial, unnamed stream. Surface water sample location SW-1 is located in this unnamed stream (north of the landfill) and is upstream from the confluence with the surface water drainage feature. Surface water sample location SW-2 is also located in this unnamed stream, downstream from SW-1 and west of the landfill. The unnamed stream drains to the west, to the Catawba River. A second surface water drainage feature is located to the southwest of the landfill, draining to the northwest into the unnamed stream.

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<sup>1</sup> In response to the North Carolina Division of Public Health, Radiation Protection Section, November 17, 2006 letter to Duke Energy, LLC, Duke Energy offered to indicate the McGuire Nuclear Station Landfill #2 as “(Synthetically Lined)” in reports.

As described in the Sampling and Analysis Plan<sup>2</sup> (SAP), the monitoring system at the landfill consists of the following:

Monitoring Wells:	MW-5	MW-5A
	MW-6	MW-6A
	MW-7	MW-7A
	MW-8	MW-8A
	MW-9	MW-9A
	MW-10A	
Surface Water:	SW-1	SW-2
Leachate Sample:	Leachate Pond	

The leachate sample is collected from a leachate pipe, which conveys leachate from the landfill to the leachate collection basin. The locations of the monitoring wells, the surface water sample locations, and the leachate collection basin are shown on Figure 2.

With the exception of well MW-10A, the wells are installed as well pairs with one shallow well and one deeper well adjacent to one another. The well with the “A” designation is the deeper well in each well pair. Well pair MW-9 and MW-9A are installed adjacent to and downgradient from the leachate collection basin. The remaining wells are installed adjacent to the landfill.

According to the SAP, monitoring wells MW-5 and MW-5A are the upgradient wells, and are considered the background wells for the site.

The sampling was conducted by Duke Energy according to the North Carolina Solid Waste Management Guidelines. The parameters and constituents sampled were selected by Duke Energy and the NCDENR Division of Solid Waste and were analyzed by a North Carolina certified laboratory.

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<sup>2</sup> *McGuire Nuclear Station Landfill #2, Permit Number 6004 Groundwater Monitoring Program Sampling and Analysis Plan*, February 24, 2009.

## Section 2

# Methods

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### 2.1 Sampling and Analysis Methods

Collection of samples and documentation of sampling was performed by Duke Energy personnel. The groundwater, surface water, and leachate samples were analyzed by Pace Analytical Services, Inc., Charlotte (North Carolina Laboratory Certification #12) and the Duke Energy Analytical Laboratory (North Carolina Laboratory Certification #248).

The groundwater, surface water, and leachate samples were analyzed for the following constituents, in accordance with the SAP:

- Select metals using US Environmental Protection Agency (EPA) Methods 200.7 and 200.8
- Mercury using EPA Method 7470
- Chloride and sulfate using EPA Method 300.0
- Volatile organic compounds (VOCs) using EPA Method 8260
- Total petroleum hydrocarbons (TPH) diesel range organics (DRO) using EPA Method 8015 Modified

In addition, the following analyses were performed in accordance with the requirements of the Radioactive Materials License No. 060-0379-7 issued by the North Carolina Division of Radiation Protection:

- Gross alpha radioactivity using EPA Method 900
- Gross beta radioactivity using EPA Method 900
- Tritium using EPA Method 906.0 Modified
- Gamma radioactivity for select isotopes

## 2.2 Statement of Work

HDR Engineering, Inc. (HDR) completed the following tasks:

- Received field sampling information provided by Duke Energy (performed by Duke Energy personnel) for monitoring wells MW-5, MW-5A, MW-6, MW-6A, MW-7, MW-7A, MW-8, MW-8A, MW-9, and MW-9A. No sample was collected from MW-10A due to insufficient volume in the well. No water level reading or sample was collected from MW-5 or MW-7 due to insufficient water in the wells. Data were also received for surface water sample locations SW-1 and SW-2, as well as for the leachate pond sample, collected at the outfall of the pipe conveying leachate from the landfill to the leachate collection basin. The samples were collected on December 4, 2012 and HDR received the data on January 14, 2013.
- Reviewed the laboratory analytical results for samples. The Electronic Data Deliverable (EDD), provided by Duke Energy, was adapted to conform to the format requirements of the NCDENR EDD template. HDR added an italicized J data qualifier (*J*) to indicate a detected concentration that attains or is greater than the laboratory's method reporting limit (MRL), but lower than the Solid Waste Section Limit<sup>3</sup> (SWSL). A copy of the original EDD is retained in HDR's files.
- Developed a generalized groundwater surface contour map using map data and groundwater elevation data supplied by Duke Energy.
- Prepared and submitted this Semiannual Groundwater Monitoring Report to Duke Energy.

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<sup>3</sup> Solid Waste Section Limits (SWSL) is defined by NCDENR as the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy. The SWSL is the concentration below which reported results must be qualified as estimated. NCDENR Division of Waste Management Memorandum dated February 23, 2007.

## Section 3

# Results

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### 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 shallow wells on the date of sampling.

Groundwater in the area of the landfill is generally from the southeast end of the landfill toward the northwest and the unnamed stream described above. Groundwater flow on the east side of the landfill is towards the northeast, toward wells MW-6, MW-6A, and MW-10A, and the surface water drainage feature located northeast of the wells.

### 3.2 Analytical Results

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

The groundwater sampling field and analytical results are summarized in Table 2. The groundwater monitoring analysis results for the semiannual constituents are compared to the groundwater standards found in Title 15A NCAC 02L .0202 (g) (2L Standards). A quality control (QC) sample from MW-5A was analyzed for TPH DRO. No EPA Method 8260 VOCs were measured above the laboratory's method detection limits (MDLs). A summary of the well analytical results that equal or exceed the 2L Standards is presented in Table 5.

Surface water sample locations SW-1 and SW-2 are located on an unnamed stream. The unnamed stream is a tributary of the Catawba River, which is classified by the NCDENR Division of Water Quality as a Class WS-IV water at the confluence with the unnamed stream. As a result, the field and analytical results from these locations are compared to Title 15A, NCAC, Subchapter 2B Standards (2B Standards) for Class WS-IV water. The field and analytical results of surface water sampling are summarized in Table 3.

The MDL was greater than the respective 2L Standard for the following constituents:

- 1,1,2,2-Tetrachloroethane
- 1,2,3-Trichloropropane

- 1,2-Dibromo-3-chloropropane
- 1,2-Dibromoethane (EDB)
- Vinyl chloride

The MDL was greater than the respective 2B Standard for the following constituents:

- 1,1,2,2-Tetrachloroethane
- 1,2,3-Trichloropropane
- 1,2-Dibromo-3-chloropropane
- 1,2-Dibromoethane (EDB)
- Acrylonitrile
- Mercury
- Silver
- Vinyl chloride

The MDLs for the abovementioned constituents were all below their corresponding SWSLs as required by the February 23, 2007 NCDENR memo. These constituents were not detected above the MDL in the analyzed samples, and are not considered to exceed their respective 2L or 2B Standards.

The field and analytical results for leachate sampling are summarized in Table 4.

No sampled constituents were found to equal or exceed their respective SWSLs.

Selected samples were diluted as is normal laboratory practice to bring samples within the calibrated range of the analysis. Specifics regarding the samples that were diluted, including the dilution amount, are reported in the EDD.

The results of the radiological analyses are presented in Table 6. A copy of this report has been submitted to the NCDENR Radiation Protection Section for reference. HDR did not evaluate this data.

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

## **FIGURES**



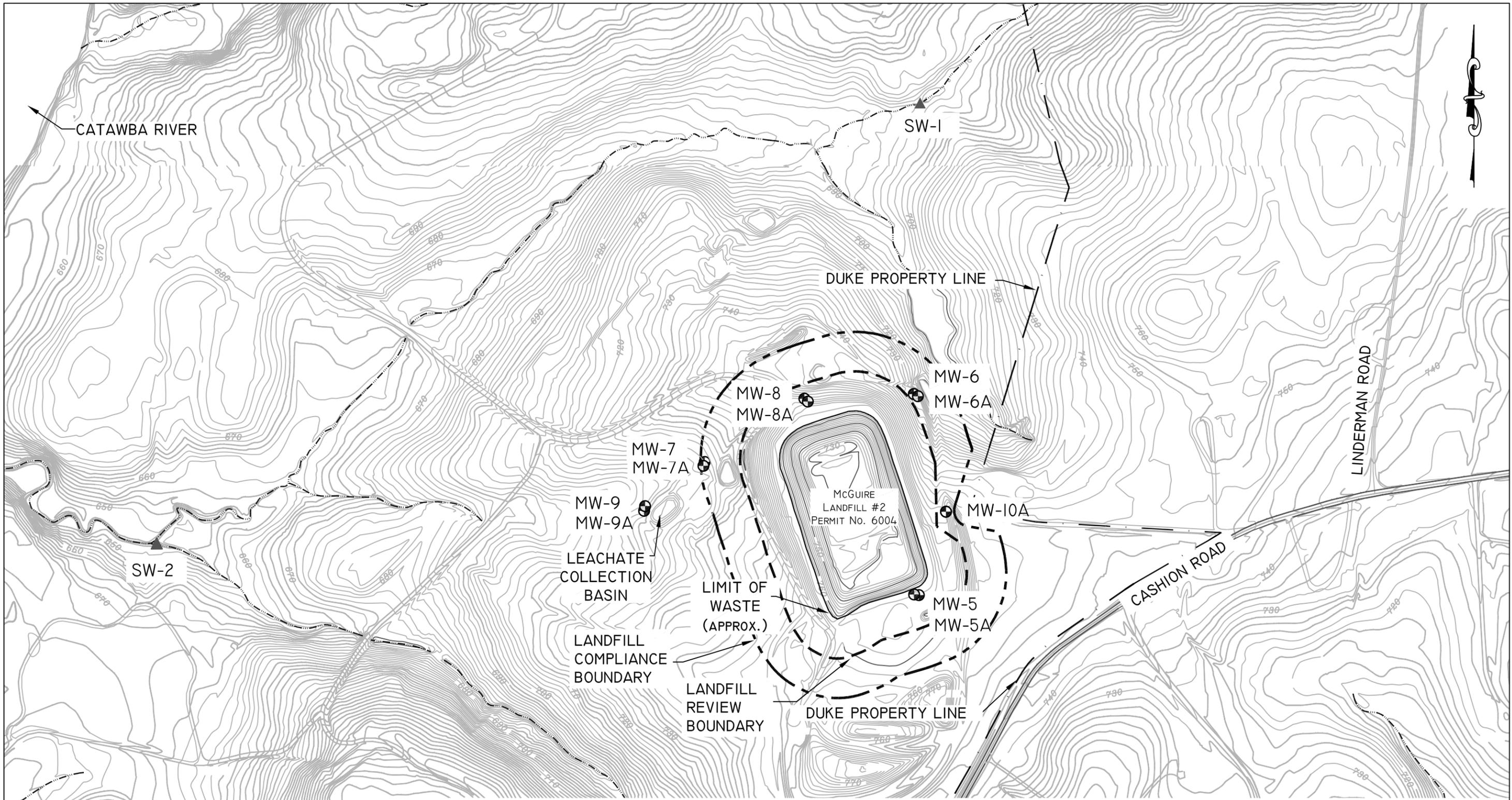
NOTES:  
 SOURCE: USGS TOPOGRAPHIC MAP - LAKE NORMAN  
 SOUTH QUADRANGLE. CREATED 2011.



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

**SITE LOCATION MAP  
 MCGUIRE NUCLEAR STATION  
 LANDFILL #2 (SYNTHETICALLY LINED)  
 PERMIT NO. 6004**

DATE	FEB. 11, 2013
FIGURE	1



BASE MAP AND STREAM DATA PROVIDED BY DUKE ENERGY CAROLINAS, LLC.

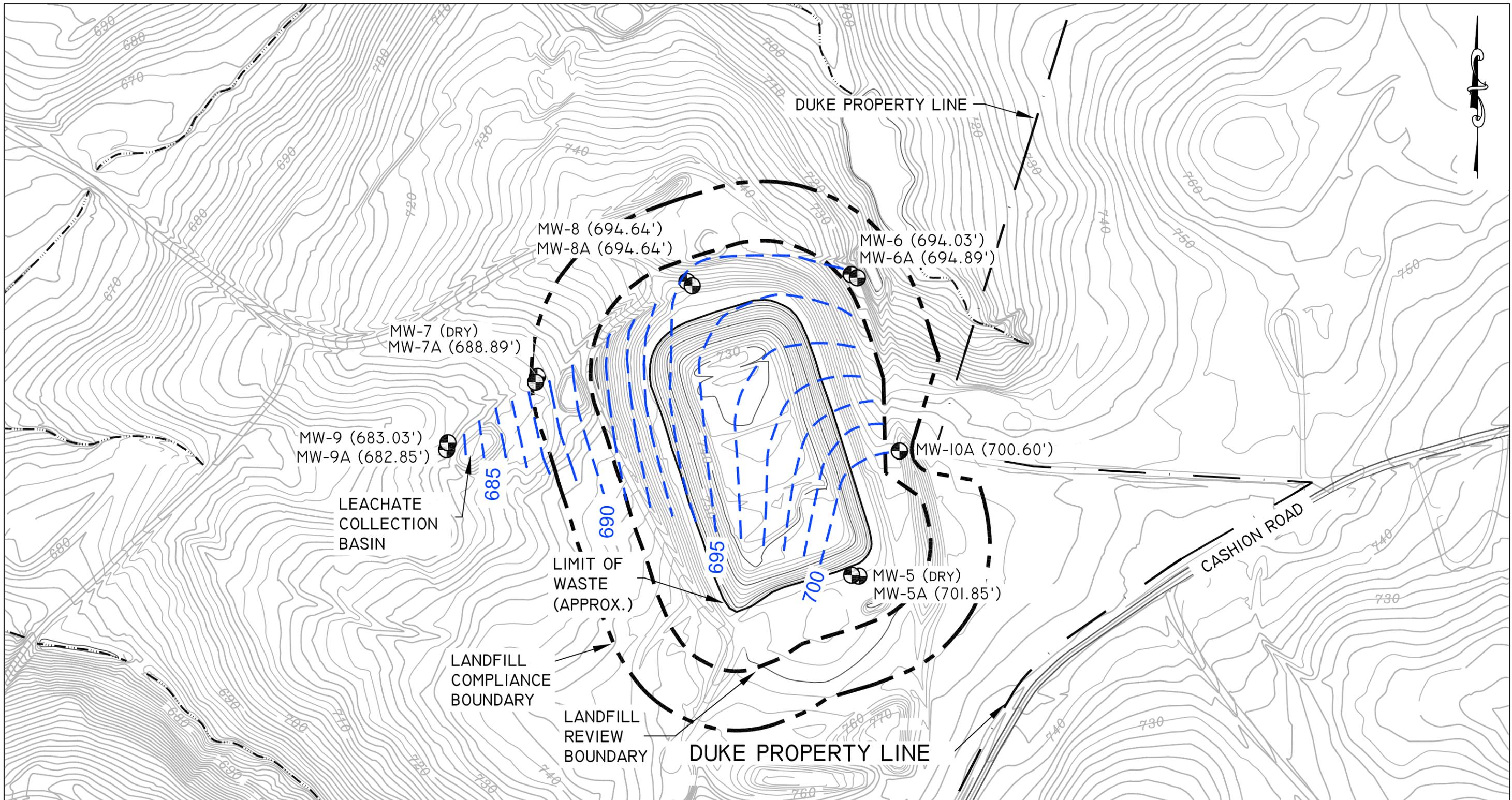
**LEGEND**

-  GROUNDWATER MONITORING WELLS
-  SURFACE WATER SAMPLE LOCATION
-  APPROXIMATE LIMIT OF WASTE
-  LANDFILL REVIEW BOUNDARY
-  LANDFILL COMPLIANCE BOUNDARY
-  DUKE PROPERTY BOUNDARY
-  STREAM



**SAMPLE LOCATIONS  
MCGUIRE NUCLEAR STATION  
LANDFILL #2 (SYNTHETICALLY LINED)  
PERMIT NO. 6004**

DATE	FEBRUARY 11, 2013
FIGURE	2



BASE MAP AND STREAM DATA PROVIDED BY DUKE ENERGY CAROLINAS, LLC.

LEGEND	
	GROUNDWATER MONITORING WELLS
MW-9 (683.03')	GROUNDWATER ELEVATION (FEET)
	APPROXIMATE LIMIT OF WASTE
	LANDFILL REVIEW BOUNDARY
	LANDFILL COMPLIANCE BOUNDARY
	DUKE PROPERTY BOUNDARY
	STREAM
	GROUNDWATER SURFACE CONTOUR

NOTE: GROUNDWATER CONTOURS DRAWN FROM SHALLOW WELLS ONLY.

NOTE: GROUNDWATER ELEVATIONS WERE INFERRED AT MONITORING WELLS MW-5 AND MW-7.



**GENERALIZED GROUNDWATER  
SURFACE CONTOURS DECEMBER 4, 2012  
MCGUIRE NUCLEAR STATION  
LANDFILL #2 (SYNTHETICALLY LINED)  
PERMIT NO. 6004**

DATE  
FEBRUARY 11, 2013  
FIGURE  
**3**

## **TABLES**

**Table 1–Field Data Parameters**  
**Duke Energy Carolinas, LLC/McGuire Nuclear Station**  
**Landfill #2 (Synthetically Lined) - Permit No. 6004**

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)
12/4/2012	MW-5	63.90	DRY	—	N/A	N/A	NS	NS	NS	NS	NS	NS	NS	NS	NS	N/A	N/A
12/4/2012	MW-5A	96.00	66.57	701.85	N/A	N/A	CP	N/A	4.80	15.00	NO	15.97	55	6.2	0.9	N/A	N/A
12/4/2012	MW-6	37.20	34.42	694.03	N/A	N/A	CP	N/A	0.45	2.50	NO	16.85	167	5.9	11.4	N/A	N/A
12/4/2012	MW-6A	47.90	34.09	694.89	N/A	N/A	CP	N/A	2.25	6.75	NO	17.79	68	5.5	2.5	N/A	N/A
12/4/2012	MW-7	37.30	DRY	—	N/A	N/A	NS	NS	NS	NS	NS	NS	NS	NS	NS	N/A	N/A
12/4/2012	MW-7A	59.40	35.77	688.89	N/A	N/A	CP	N/A	3.85	12.00	NO	16.23	109	6.5	1.2	N/A	N/A
12/4/2012	MW-8	71.50	64.96	694.64	N/A	N/A	EOP	N/A	1.07	0.54	N/A	18.02	142	6.5	3.7	N/A	N/A
12/4/2012	MW-8A	84.40	65.04	694.64	N/A	N/A	CP	N/A	3.16	9.75	NO	16.36	102	6.6	0.5	N/A	N/A
12/4/2012	MW-9	30.80	28.84	683.03	N/A	N/A	CP	N/A	0.32	0.32	YES	15.07	134	5.8	5.3	N/A	N/A
12/4/2012	MW-9A	47.80	29.28	682.85	N/A	N/A	CP	N/A	3.02	9.75	NO	17.07	100	6.3	0.2	N/A	N/A
12/4/2012	MW-10A	59.23	55.18	700.60	N/A	N/A	NS	NS	NS	NS	NS	NS	NS	NS	NS	N/A	N/A
12/4/2012	SW-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.37	119	6.5	27.0	N/A	N/A
12/4/2012	SW-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.26	119	7.0	3.1	N/A	N/A
12/4/2012	LEACHATE POND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.62	945	7.8	6.4	N/A	N/A

Notes:

1. Purge Methods; NS=No Sample, LF=Low Flow, CP=Conventional Purge (3-5 well volumes), NP=No Purge (HydraSteeve), EOP=Equipment Only Purge.
2. Field sampling performed by Duke Energy Carolinas, LLC personnel.
3. There was insufficient volume in MW-10A to obtain a groundwater sample.
4. There was insufficient water in MW-5 and MW-7 to obtain a depth to water reading or to collect a groundwater sample.
5. umho/cm indicates micromhos per centimeter.
6. SU indicates Standard Units.
7. NTU indicates Nephelometric Turbidity Units.
8. mV-NHE indicates millivolts-Normal Hydrogen Electrode.
9. Information provided by Tim Hunsucker of Duke Energy Carolinas, LLC on January 14, 2013.
10. N/A indicates not applicable.

**Table 2--Groundwater Field and Analytical Results  
Duke Energy Carolinas, LLC/McGuire Nuclear Station  
Landfill #2 (Synthetically Lined) - Permit No. 6004**

Sample Date: December 4, 2012				Laboratory Certificate Codes: Duke Energy Carolinas Field #5193 Duke Energy Analytical Laboratory #248 Pace Analytical Services, Inc. #12											
Field Sampling performed by Duke Energy Carolinas, LLC				Monitoring Wells								SWSL	15A NCAC 2L		
Parameter	SWS ID	Units	Certificate Code	6004-MW-5	6004-MW-5A	6004-5A QC	6004-MW-6	6004-MW-6A	6004-MW-7	6004-MW-7A	SWSL	15A NCAC 2L			
Field pH	320	SU	5193	NS	<b>6.2</b>		<b>5.9</b>	<b>5.5</b>	NS	<b>6.5</b>	-	6.5-8.5			
Specific Conductance	323	umho/cm	5193	NS	55		167	68	NS	109	-	-			
Temperature	325	°C	5193	NS	15.97		16.85	17.79	NS	16.23	-	-			
Top Casing	328	feet	-	NS	768.42		728.45	728.98	NS	724.66	-	-			
Depth to Water	318	feet	-	DRY	66.57		34.42	34.09	DRY	35.77	-	-			
Water Elevation	427	feet	-	--	701.85		694.03	694.89	--	688.89	-	-			
Well Depth	411	feet	-	63.90	96.00		37.20	47.90	37.30	59.40	-	-			
Arsenic	14	µg/L	248	NS	0.667	U	NA	0.667	U	0.667	U	10	10		
Barium	15	µg/L	248	NS	24	J'	NA	48.8	J'	59.5	J'	100	700		
Cadmium	34	µg/L	248	NS	0.667	U	NA	0.667	U	0.667	U	1	2		
Chloride	455	µg/L	248	NS	1,240		NA	15,100		8,380		NE	250,000		
Chromium	51	µg/L	248	NS	3.34	U	NA	3.34	U	3.34	U	10	10		
Lead	131	µg/L	248	NS	0.667	U	NA	0.667	U	0.667	U	10	15		
Mercury	132	µg/L	248	NS	0.033	U	NA	0.033	U	0.033	U	0.2	1		
Selenium	183	µg/L	248	NS	0.667	U	NA	0.667	U	0.667	U	10	20		
Silver	184	µg/L	248	NS	3.34	U	NA	3.34	U	3.34	U	10	20		
Sulfate	315	µg/L	248	NS	3,110	J'	NA	396	J'	84.2	J	250,000	250,000		
TPH DRO	NE	µg/L	12	NS	62	U	62	U	62	U	NS	62	U	NE	NE
EPA 8260 (VOCs)	SEE NOTE 15														

Notes:

- Concentrations presented in micrograms per liter (µg/L), except where noted.
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. NCDENR defines the SWSL as 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," NCDENR (last amended on January 1, 2010).
- Grayed values indicate values that attain or exceed the SWSL Standard.
- Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
- TPH DRO indicates Total Petroleum Hydrocarbons Diesel Range Organics.
- NE indicates 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 greater than the method detection limit (MDL).  
"J" is used for parameters detected at estimated concentrations greater than the MDL but less than the laboratory's method reporting limit (MRL).  
An italicized J-flag is a data qualifier, added by HDR to indicate a detected concentration which attains or is greater than the laboratory's MRL but less than the SWSL.
- Data obtained from Electronic Data Deliverable (EDD) and EnRad Laboratory Report provided by Tim Hunsucker of Duke Energy Carolinas on January 14, 2013.
- According to the Constituent Look-up webpage on the NCDENR 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 Standard listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).
- NS indicates no sample was collected.
- NA indicates not analyzed.
- SU indicates Standard Units.
- No EPA Method 8260 volatile organic compounds (VOCs) were measured above their MDL.

**Table 2—Groundwater Field and Analytical Results  
Duke Energy Carolinas, LLC/McGuire Nuclear Station  
Landfill #2 (Synthetically Lined) - Permit No. 6004**

Parameter	SWS ID	Units	Certificate Code	Monitoring Wells					Trip Blank	Field Blank	SWSL	15A NCAC 2L
				6004-MW-8	6004-MW-8A	6004-MW-9	6004-MW-9A	6004-MW-10A				
Field pH	320	SU	5193	<b>6.5</b>	6.6	<b>5.8</b>	<b>6.3</b>	NS	-	-	-	6.5-8.5
Specific Conductance	323	umho/cm	5193	142	102	134	100	NS	-	-	-	-
Temperature	325	°C	5193	18.02	16.36	15.07	17.07	NS	-	-	-	-
Top Casing	328	feet	-	759.60	759.68	711.87	712.13	755.78	-	-	-	-
Depth to Water	318	feet	-	64.96	65.04	28.84	29.28	55.18	-	-	-	-
Water Elevation	427	feet	-	694.64	694.64	683.03	682.85	700.60	-	-	-	-
Well Depth	411	feet	-	71.50	84.40	30.80	47.80	59.23	-	-	-	-
Arsenic	14	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	NS	NA	0.667 U	10	10
Barium	15	µg/L	248	17.6 J'	28.2 J'	27.9 J'	9.1 J'	NS	NA	3.34 U	100	700
Cadmium	34	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	NS	NA	0.667 U	1	2
Chloride	455	µg/L	248	1,450	1,850	1,410	1,450	NS	NA	39.8 J	NE	250,000
Chromium	51	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	NS	NA	3.34 U	10	10
Lead	131	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	NS	NA	0.667 U	10	15
Mercury	132	µg/L	248	0.033 U	0.033 U	0.033 U	0.033 U	NS	NA	0.033 U	0.2	1
Selenium	183	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	NS	NA	0.667 U	10	20
Silver	184	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	NS	NA	3.34 U	10	20
Sulfate	315	µg/L	248	774 J'	1,220 J'	125 J'	212 J'	NS	NA	31.4 J	250,000	250,000
TPH DRO	NE	µg/L	12	62 U	62 U	62 U	62 U	NS	NA	62 U	NE	NE
EPA 8260 (VOCs)				SEE NOTE 15								

Notes:

- Concentrations presented in micrograms per liter (µg/L), except where noted.
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. NCDENR defines the SWSL as 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," NCDENR (last amended on January 1, 2010).
- Grayed values indicate values that attain or exceed the SWSL Standard.
- Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
- TPH DRO indicates Total Petroleum Hydrocarbons Diesel Range Organics.
- NE indicates 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 greater than the method detection limit (MDL).  
"J" is used for parameters detected at estimated concentrations greater than the MDL but less than the laboratory's method reporting limit (MRL).  
An italicized J'-flag is a data qualifier, added by HDR to indicate a detected concentration which attains or is greater than the laboratory's MRL but less than the SWSL.
- Data obtained from Electronic Data Deliverable (EDD) and EnRad Laboratory Report provided by Tim Hunsucker of Duke Energy Carolinas on January 14, 2013.
- According to the Constituent Look-up webpage on the NCDENR 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 Standard listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).
- NS indicates no sample was collected.
- NA indicates not analyzed.
- SU indicates Standard Units.
- No EPA Method 8260 volatile organic compounds (VOCs) were measured above their MDL.

**Table 3—Surface Water Field and Analytical Results  
Duke Energy Carolinas, LLC/McGuire Nuclear Station  
Landfill #2 (Synthetically Lined) - Permit No. 6004**

Sample Date: December 4, 2012				Laboratory Certificate Codes: Duke Energy Carolinas Field #5193 Duke Energy Analytical Laboratory #248 Pace Analytical Services, Inc. #12					
Field Sampling performed by Duke Energy Carolinas, LLC									
Parameter	SWS ID	Units	Certificate Code	Surface Water Sampling Locations				15A NCAC 2B	
				6004-SW-1		6004-SW-2			SWSL
Field pH	320	SU	5193	6.5		7.0		-	6.0-9.0
Specific Conductance	323	umho/cm	5193	119		119		-	-
Temperature	325	°C	5193	11.37		12.26		-	-
Arsenic	14	µg/L	248	0.667	U	0.667	U	10	10
Barium	15	µg/L	248	32.9	<i>J'</i>	20.8	<i>J'</i>	100	1,000
Cadmium	34	µg/L	248	0.667	U	0.667	U	1	2.0
Chloride	455	µg/L	248	3,050		2,260		NE	230,000
Chromium	51	µg/L	248	3.34	U	3.34	U	10	50
Lead	131	µg/L	248	0.667	U	0.667	U	10	25
Mercury	132	µg/L	248	0.033	U	0.033	U	0.2	0.012
Selenium	183	µg/L	248	0.667	U	0.667	U	10	5
Silver	184	µg/L	248	3.34	U	3.34	U	10	0.06
Sulfate	315	µg/L	248	519	<i>J'</i>	2,450	<i>J'</i>	250,000	250,000
TPH DRO	NE	µg/L	12	62	U	62	U	NE	NE
EPA 8260 (VOCs)	SEE NOTE 14								

Notes:

- Concentrations presented in micrograms per liter (µg/L), except where noted.
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. NCDENR defines the SWSL as the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy.
- 15A NCAC 2B Standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2B - Surface Water and Wetland Standards," (last amended on May 1, 2007) for Class WS-IV water.
- The unnamed tributary to the Catawba River is classified as WS-IV waters. Regulation 15A NCAC 02B .0216 provides water quality standards for WS-IV waters. Class C water quality standards also apply to WS-IV waters. Class C water quality standards are provided in regulation 15A NCAC 02B .0211. For parameters and constituents where standards exist for both classes, the more stringent is listed as the 2B Standard. Reference 15A NCAC 2B .0200 Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of N.C. Amended Effective: May 1, 2007.
- Grayed values indicate values that attain or exceed the SWSL Standard.
- Bold values indicate values that attain or exceed the 15A NCAC 2B Standard.
- TPH DRO indicates Total Petroleum Hydrocarbons Diesel Range Organics.
- 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 greater than the method detection limit (MDL). "J" is used for parameters detected at estimated concentrations greater than the MDL but less than the laboratory's method reporting limit (MRL). An italicized *J'*-flag is a data qualifier, added by HDR, to indicate a detected concentration attains or is greater than the laboratory's MRL but less than the SWSL.
- Data obtained from Electronic Data Deliverable (EDD) and EnRad Laboratory Report provided by Tim Hunsucker of Duke Energy Carolinas on January 14, 2013.
- According to the Constituent Look-up webpage on the NCDENR Division of Waste Management webpage, there is no SWSL for choride associated with CAS number 16887-00-6, which is the CAS reported by the laboratory for the analyses completed. Therefore, the SWSL listed is for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).
- SU indicates Standard Units.
- No EPA Method 8260 volatile organic compounds (VOCs) were measured above their MDL.

**Table 4–Leachate Sample Field and Analytical Results  
Duke Energy Carolinas, LLC/McGuire Nuclear Station  
Landfill #2 (Synthetically Lined) - Permit No. 6004**

Sample Date: December 4, 2012			Laboratory Certificate Codes:		
			Duke Energy Carolinas Field #5193		
			Duke Energy Analytical Laboratory #248		
Field Sampling performed by Duke Energy, LLC			Pace Analytical Services, Inc. #12		
Parameter	SWS ID	Units	Certificate Code	6004-Leachate Pond	SWSL
Field pH	320	SU	5193	7.8	-
Specific Conductance	323	umho/cm	5193	945	-
Temperature	325	°C	5193	15.62	-
Arsenic	14	µg/L	248	0.801 J	10
Barium	15	µg/L	248	32.1 J'	100
Cadmium	34	µg/L	248	0.667 U	1
Chloride	455	µg/L	248	68,500	NE
Chromium	51	µg/L	248	3.34 U	10
Lead	131	µg/L	248	0.667 U	10
Mercury	132	µg/L	248	0.033 U	0.2
Selenium	183	µg/L	248	1.08 J'	10
Silver	184	µg/L	248	3.34 U	10
Sulfate	315	µg/L	248	89,700 J'	250,000
TPH DRO	NE	µg/L	12	6,600	NE
EPA 8260 (VOCs)	SEE NOTE 11				

Notes:

- Concentrations presented in micrograms per liter (µg/L), except where noted.
- SWS ID is the Solid Waste Section Identification Number.
- SWSL is the Solid Waste Section Limit. NCDENR defines the SWSL as the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy.
- Grayed values indicate values that attain or exceed the SWSL Standard.
- TPH DRO indicates Total Petroleum Hydrocarbons Diesel Range Organics.
- NE indicates 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 greater than the method detection limit (MDL).  
"J" is used for parameters detected at estimated concentrations above the MDL but less than the laboratory's method reporting limit (MRL).  
An italicized J'-flag is a data qualifier, added by HDR, to indicate a detected concentration that attains or is greater than the laboratory's MRL but less than the SWSL.
- Data obtained from Electronic Data Deliverable (EDD) and EnRad Laboratory Report provided by Tim Hunsucker of Duke Energy Carolinas on January 14, 2013.
- According to the Constituent Look-up webpage on the NCDENR Division of Waste Management webpage, there is no SWSL for choride associated with CAS number 16887-00-6, which is the CAS reported by the laboratory for the analyses completed. Therefore, the SWSL listed is for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage (last updated June 13, 2011).
- SU indicates Standard Units.
- No EPA Method 8260 volatile organic compounds (VOCs) were measured above their MDL.

**Table 5--Field and Analytical Results that Equal or Exceed  
 NCAC 2L Groundwater Quality Standards  
 Duke Energy Carolinas, LLC/McGuire Nuclear Station  
 Landfill #2 (Synthetically Lined) - Permit No. 6004**

Sample Date: December 4, 2012						
Parameter	Well ID	Result	Units	15A NCAC 2L Standard	Historical Concentrations	Cause and Significance
pH	MW-5A	6.2	SU	6.5 - 8.5	5.0 - 6.8	MW-5A is considered the background well for the site. pH is consistent with historical readings at MW-5A.
	MW-6	5.9			5.6 - 6.3	pH is consistent with historical readings at MW-6.
	MW-6A	5.5			5.1 - 6.0	pH is consistent with historical readings at MW-6A.
	MW-7A	6.5			6.1 - 7.6	pH is consistent with historical readings at MW-7A.
	MW-8	6.5			6.0 - 7.0	pH is consistent with historical readings at MW-8.
	MW-9	5.8			4.8 - 6.2	pH is consistent with historical readings at MW-9.
	MW-9A	6.3			5.8 - 6.7	pH is consistent with historical readings at MW-9A.

Notes:

1. 15A NCAC 2L Standard is from "North Carolina Administrative Code, Title 15A: Department of Environment and Natural Resources, Subchapter 2L - Groundwater Classifications and Standards," NCDENR (last amended on January 1, 2010).
2. Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on January 14, 2013.
3. SU indicates Standard Units.
4. Historical concentrations based on data in Duke Energy Carolinas, LLC analytical results database.

**Table 6--Radiological Analytical Results**  
**Duke Energy Carolinas, LLC/McGuire Nuclear Station**  
**Landfill # 2 (Synthetically Lined) - Permit No. 6004**

Sample Date: December 4, 2012

Laboratory Certificate Codes:  
 Duke Energy Analytical Laboratory #248

Field Sampling Performed by Duke Energy Carolinas, LLC

Parameter	Units	Certificate Code	Monitoring Well Identification											Leachate Pond	SW-1	SW-2
			MW-5	MW-5A	MW-6	MW-6A	MW-7	MW-7A	MW-8	MW-8A	MW-9	MW-9A	MW-10A			
Gross Alpha	pCi/L	248	NS	<0.67	<0.57	<0.41	NS	<0.1	<0.74	<0.25	<0.75	<0.87	NS	<0.079	<0.58	<0.65
BaLa-140	pCi/L	248	NS	<5.95	<5.46	<6.84	NS	<3.39	<7.13	<5.62	<5.16	<9.14	NS	<6.87	<4.38	<4.98
Be-7	pCi/L	248	NS	<27.2	<33.7	<41.2	NS	<27.2	<43.8	<33.5	<28.3	<35.4	NS	<37.7	<32.0	<40.6
Gross Beta	pCi/L	248	NS	<0.14	<0.447	<0.0882	NS	<0.27	<0.0005	<0.401	<0.30	<0.474	NS	12.3	0.781	<0.412
Co-58	pCi/L	248	NS	<3.78	<3.69	<4.64	NS	<3.03	<4.36	<4.12	<3.18	<4.02	NS	<5.45	<3.67	<4.17
Co-60	pCi/L	248	NS	<5.65	<6.82	<8.64	NS	<3.67	<7.11	<7.83	<5.66	<6.06	NS	<7.31	<5.30	<8.99
Cs-134	pCi/L	248	NS	<3.80	<5.37	<4.41	NS	<3.70	<4.92	<4.29	<3.42	<4.64	NS	<4.85	<3.41	<4.56
Cs-137	pCi/L	248	NS	<5.00	<6.15	<5.84	NS	<4.09	<5.74	<4.97	<3.89	<4.55	NS	<5.16	<4.05	<6.72
Fe-59	pCi/L	248	NS	<9.39	<5.47	<9.70	NS	<7.02	<12.9	<7.35	<6.50	<8.74	NS	<7.20	<7.15	<6.90
H3GW (Tritium)	pCi/L	248	NS	<60	<48.8	<4.4	NS	<8.9	<29	<23	<6.9	<53	NS	4,600	<26	<84
I-131	pCi/L	248	NS	<5.06	<5.47	<5.35	NS	<3.72	<5.63	<4.72	<4.21	<5.28	NS	<4.80	<4.52	<5.82
K-40	pCi/L	248	NS	53.7	107	83.2	NS	79.1	136	<73.8	55.9	116	NS	170	<64.5	130
Mn-54	pCi/L	248	NS	<4.01	<3.93	<4.73	NS	<2.58	<4.62	<4.51	<4.11	<4.90	NS	<4.15	<3.68	<4.44
Nb-95	pCi/L	248	NS	<4.17	<4.46	<5.53	NS	<3.26	<6.13	<4.17	<3.93	<4.12	NS	<4.04	<4.20	<4.57
Zn-65	pCi/L	248	NS	<8.27	<9.36	<8.94	NS	<9.22	<8.79	<9.28	<9.05	<8.88	NS	<8.86	<7.31	<8.29
Zr-95	pCi/L	248	NS	<5.62	<8.11	<7.73	NS	<6.30	<8.80	<8.87	<6.12	<7.16	NS	<6.56	<5.61	<6.57

Notes:

1. Concentrations presented in picocuries per liter (pCi/L).
2. There was insufficient volume in MW-10A to obtain a groundwater sample.
3. There was insufficient water in MW-5 and MW-7 to obtain a groundwater sample.
4. NS indicates no sample was collected.
5. Data obtained from EnRad Laboratory Report Job: MCGUIRE\_15NOV2012\_A MNS LANDFILL 2 provided by Tim Hunsucker of Duke Energy Carolinas on January 14, 2013.

## **APPENDICES**

**APPENDIX A**  
**CHAIN-OF-CUSTODY FORMS**



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  
(980) 875-5245  
Fax: (980) 875-5038

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Analytical Laboratory Use Only

LIMS # **J12110375** MATRIX: **GW-RCRA** Samples Originating From **NC**  **SC**

Logged By **cpk** Date & Time **12-5-12** **0736**

Vet/dor **PACE** Cooler Temp (C) **<6**

PO # **1, 4**

MR # **3**

15 Preserv.: 1=HCL, 2=H2SO4, 3=HNO3, 4=Ice, 5=None

SAMPLE PROGRAM  
Ground Water   
NPDES   
Drinking Water   
UST   
RCRA Waste

19 Page 1 of 55  
Page 55 of 55  
DISTRIBUTION  
ORIGINAL to LAB,  
COPY to CLIENT  
Revised 10/12/12

1) Project Name **MNS LANDFILL 2** 2) Phone No: 980-875-5257  
Permit # **60-04**

3) Client **C. Campbell / T Hunsucker** 4) Fax No: 875-4349

5) Business Unit: 20036 6) Process: **BLDFLGN** 7) Resp. To: **MC00**

8) Project ID: 9) Activity ID: 10) Mail Code: **MGO3A3**

- LAB USE ONLY
- 11 Lab ID
- 2012025177
  - 2012025178
  - 2012025179
  - 2012025180
  - 2012025181
  - 2012025182
  - 2012025183
  - 2012025184
  - 2012025185
  - 2012025186
  - 2012025187
  - 2012025188
  - 2012025189
  - 2012025190
  - 2012025191
  - 2012025192
  - 2012025193

11 Lab ID	13 Sample Description or ID	14 Collection Information			16 TESTS	18 Grab	15 Analyses Required (See Attached List)	ALK (4,5), SO4, Cl (IC)	Metals Prep - 3030C (ICP-EPA-200.7) Ag, Ba, Ca, Cr, K, Mg, Na (7) Hg (7470) (1) (IMS-EPA-200.8) As, Cd, Pb, Se (4)	Chlorine (ppm) (8015 / 3520) TPH-DRO	20 Total # of Containers	
		Date	Time	Signature								
2012025177	TRIP BLANK	12/4/12	0410	WC	1	X	3				n/a	3
2012025178	MW-5 — NO SAMPLE			WC	7	X	3	1	1	1		6
2012025179	MW-5A	12/4/12	0800	WC	7	X	3	1	1	1		6
2012025180	MW-6	12/4/12	1305	WC	7	X	3	1	1	1		6
2012025181	MW-6A	12/4/12	1345	WC	7	X	3	1	1	1		6
2012025182	MW-7 — NO SAMPLE			WC	7	X	3	1	1	1		6
2012025183	MW-7A	12/4/12	0930	WC	7	X	3	1	1	1		6
2012025184	MW-8	12/4/12	1235	MJR	7	X	3	1	1	1		6
2012025185	MW-8A	12/4/12	1315	MJR	7	X	3	1	1	1		6
2012025186	MW-9	12/4/12	0725	MJR	7	X	3	1	1	1		6
2012025187	MW-9A	12/4/12	0815	MJR	7	X	3	1	1	1		6
2012025188	MW-10A — NO SAMPLE			MJR	7	X	3	1	1	1		6
2012025189	SW-1	12/4/12	1120	WC	7	X	3	1	1	1		6
2012025190	SW-2	12/4/12	1045	WC	7	X	3	1	1	1		6
2012025191	LEACHATE POND	12/4/12	1010	WC	7	X	3	1	1	1		6
2012025192	QC - WELL # MW-5A	12/4/12	0800	WC	1	X				1		1
2012025193	FIELD BLANK	12/4/12	1440	MJR	7	X	3	1	1	1	n/a	6

Customer to sign & date below

21) Relinquished By: **LD Cull** Date/Time: **12/5/12 0730** Accepted By: **John Yarb** Date/Time: **12/5/12 0730**

Relinquished By: **Pa Cuddy** Date/Time: **12-5-12 1322** Accepted By: **John Yarb** Date/Time: **12-5-12 13:22**

23) Seal/Locked By: \_\_\_\_\_ Date/Time: \_\_\_\_\_ Sealed/Lock Opened By: \_\_\_\_\_ Date/Time: \_\_\_\_\_

24) Comments: **Regulatory Agency : NCDENR/DWM -SW Section - State EDD Format Required / Permit # 60-04 Use indicated or comparable analytical methods**  
**INSUFFICIENT VOL TO SAMPLE MW-5 MW-7 MW-10A**

22) Requested Turnaround  
14 Days   
\*7 Days \_\_\_\_\_  
\*48 Hr \_\_\_\_\_  
**12-15-12**  
\*Other \_\_\_\_\_  
\*Add. Cost Will Apply

Customer must Complete

Customer to complete appropriate columns to right

Customer, important please indicate desired turnaround

