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):

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 Belews Creek Steam Station FGD Residue Landfill	3195 Pine Hall Road Belews Creek, NC	8505	.0500	November 26, 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
☐ Groundwater monitoring data from private water supply wells
☒ Leachate monitoring data
☒ Surface water monitoring data
☐ Methane gas monitoring data
☐ Corrective action data (specify) _____
☐ Other(specify) _____

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 — January 28, 2013

Signature — Date

Affix NC Licensed/Professional Geologist Seal

William M. Miller Jan 28, 2013

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)

Revised 6/2009

SEMIANNUAL GROUNDWATER MONITORING REPORT

BELEWS CREEK STEAM STATION

FGD RESIDUE LANDFILL PERMIT NO. 8505

NOVEMBER 2012 SAMPLING EVENT

Prepared for:
DUKE ENERGY CAROLINAS, LLC
Belews Creek Steam Station
3195 Pine Hall Road
Belews Creek, NC 27042

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

January 28, 2013

REPORT VERIFICATION

PROJECT: **SEMIANNUAL GROUNDWATER MONITORING REPORT**
BELEWS CREEK STEAM STATION
FGD RESIDUE LANDFILL
PERMIT NO. 8505

TITLE: **NOVEMBER 2012 SAMPLING EVENT**

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

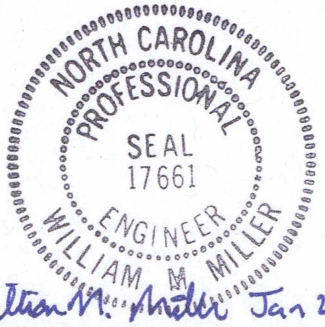
Prepared by: Abigail Vorhaes (by Scott Spinner) Date: Jan 28, 2013

Checked by: Scott Spinner Date: Jan 28, 2013

Approved by: William M. Miller Date: Jan 28, 2013

Project Manager: Ty Ziegler, PE

Professional Engineer Seal:



William M. Miller Jan 28, 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
BELEWS CREEK STEAM STATION
FGD RESIDUE LANDFILL
PERMIT NO. 8505

NOVEMBER 2012 SAMPLING EVENT

TABLE OF CONTENTS

Section 1
Background

The flue gas desulfurization (FGD) residue landfill is located at the Duke Energy Carolinas, LLC (Duke Energy) Belews Creek Steam Station, in Stokes County, North Carolina. The FGD residue landfill is permitted to receive FGD residue (gypsum) from Belews Creek Steam Station operations. The landfill is permitted under the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Permit No. 8505.

The FGD residue landfill is located south of the Belews Creek plant, on land between two arms of the Belews Lake. The West Belews Creek arm of the lake is located west of the landfill site and the East Belews Creek arm of the lake is located east of the site. Craig Road is located to the west of the landfill. The FGD residue landfill and nearby surrounding area are depicted on Figure 1.

The landfill consists of four cells contained in an area of approximately 24 acres. The adjacent stormwater basin occupies an area of approximately 2.4 acres. This stormwater basin is used to manage leachate and stormwater collected from the landfill. The landfill has an engineered liner system consisting of a leachate collection system, underlain by a high-density polyethylene (HDPE) geomembrane liner, underlain by a geo-synthetic clay liner.

The subsurface conditions in the landfill area consist of residual soils, saprolite, partially weathered rock, and bedrock, as described in the Water Quality Monitoring Plan.[1]

As is typical for groundwater systems located in the Piedmont region, groundwater at the landfill site occurs within the residuum, saprolite, partially weathered rock, and shallow fractured bedrock under unconfined aquifer conditions. The groundwater flow in the area of the landfill is generally from areas of higher topography, located to the east of the landfill, to the west and to the northwest of the landfill, towards Belews Lake.

[1] *Water Quality Monitoring Plan FGD Scrubber Residue Landfill Belews Creek Steam Station,* December 07, 2007.

The monitoring system for the landfill consists of the following:

Monitoring Wells:	BC-20
	BC-21
	BC-22
	BC-23A
	BC-25
	BC-26
	BC-27
	BC-28
	BC-29
	BC-30
	BC-31
Observation Well:	BC-7
Surface Water:	SW-1
Leachate Sample:	Leachate

The monitoring system for the landfill is shown on Figure 2. Monitoring wells BC-23A and BC-28 are considered to represent background groundwater quality, according to the Water Quality Monitoring Plan. The groundwater monitoring locations are sampled on a semi-annual basis and the results compared to groundwater quality standards found in 15A NCAC .02L .0202(g) (2L Standards).

Observation well BC-7 is used for water level measurements only. Monitoring wells are used to monitor groundwater quality and to measure groundwater levels.

SW-1 is a groundwater seep located to the east of well BC-28. When water is present, it emanates from the ground just above the sampling location. SW-1 analytical results are compared to 2L Standards. This surface water feature drains to Belews Lake.

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

Section 2
Methods

2.1 Sampling and Analysis Methods

Groundwater sampling and documentation of sampling activities were performed by Duke Energy personnel (Duke Energy Carolinas Field Certification #5193). The groundwater samples were analyzed by the Duke Energy Analytical Laboratory (North Carolina Laboratory Certification #248) and provided to HDR Engineering, Inc. (HDR) by Duke Energy.

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

- Arsenic, barium, boron, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver, and zinc using Environmental Protection Agency (EPA) Methods 200.7 and 200.8
- Chloride, fluoride, nitrate as nitrogen, and sulfate using EPA Method 300.0
- Mercury using EPA Method 245.1
- Total Dissolved Solids using Standard Method (SM) 2540C

2.2 Statement of Work

HDR completed the following tasks:

- Received field sampling information provided by Duke Energy (performed by Duke Energy personnel) for monitoring wells BC-20, BC-21, BC-22, BC-23A, BC-25, BC-26, BC-27, BC-28, BC-29, BC-30, BC-31, surface water sampling location SW-1, and the leachate sampling location. The samples were collected on November 26, 2012 and HDR received the data on December 5, 2012.
- Reviewed the laboratory analytical results for the samples noted above. 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 less than the Solid Waste Section Limit[2] (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.

[2] 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

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 the date of sampling.

Based on the groundwater elevations measured at the wells on the date of sampling, groundwater flow in the area of the landfill is generally from areas of higher topography, located to the east of the landfill, to the west and to the northwest of the landfill, towards Belews Lake.

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.

The field and analytical results of leachate sampling results are summarized in Table 3.

A summary of 2L Standard exceedances and a preliminary analysis of the cause and significance of the exceedances are presented in Table 4.

With the exception of pH, the concentrations reported in Table 4 are equal to or greater than their respective SWSLs.[3] Concentrations equal to or greater than the respective SWSLs, but less than the 2L Standards, were measured at the following locations:

- Barium at BC-20, BC-26, and BC-29
- Zinc at BC-20, BC-26, BC-27, and SW-1

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

The chain-of-custody forms are located in Appendix A.

[3] There is no SWSL for pH.

HDR previously prepared and submitted an assessment to NCDENR for exceedances of 2L Standards at this landfill (*Groundwater Assessment Belews Creek Steam Station FGD Residue Landfill, Permit No. 8505. October 5, 2012*).

The report assessed 2L Standard exceedances for iron, sulfate, and total dissolved solids (TDS) at monitoring well BC-25. The iron exceedances were determined to be attributed to turbidity in the groundwater samples and naturally occurring conditions. The assessment report concluded that the source of the sulfate in BC-25 appeared to be from the landfill.

The report assessed the exceedances of the 2L Standards at wells BC-20, BC-21, BC-23A, BC-26, BC-27, BC-29, and BC-31 and at surface water sampling location SW-1. The assessment report concluded:

- the source of iron exceedances reported in BC-20, BC-21, BC-23A, BC-26, BC-27, BC-29, and BC-31 appear to be related to turbidity introduced from naturally occurring sources,
- the source of manganese exeedances reported in BC-27 appear to be related to turbidity introduced from naturally occurring sources,
- the manganese results at BC-21 do not appear to be related to turbidity, and
- the iron and manganese exceedances at surface water sampling location SW-1 are from naturally occurring sources and are not related to impacts from the landfill.

HDR recommended installing an additional monitoring well at the review boundary between BC-25 and the landfill to further delineate the sulfate and TDS concentrations in this area and improve the understanding of groundwater flow and quality near BC-25. After the installation of the new monitoring well, a supplemental assessment will be performed considering the results from the new well and monitoring wells BC-20, BC-21, BC-25, and BC-26. HDR further recommended that BC-21 be re-sampled when the proposed well is sampled and the results be submitted to NCDENR with the results of the supplemental assessment of the exceedances at BC-25. In the report, HDR also recommended continued semi-annual monitoring for all wells.

In a letter dated November 28, 2012[4] to Mr. Ed Sullivan, P.E., of Duke Energy, the NCDENR Solid Waste Section approved the recommendations presented in the groundwater assessment report dated October 5, 2012.

[4] *North Carolina Department of Environment and Natural Resources, Division of Waste Management. November 28, 2012, Groundwater Assessment Report Response. Duke Energy – Belews Creek FGD Landfill, DOC ID 17761.*

FIGURES

HDR Engineering, Inc. of the Carolinas

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

SITE LOCATION MAP
BELEWS CREEK STEAM STATION
FGD RESIDUE LANDFILL
PERMIT NO. 8505

DATE
January 28, 2013

FIGURE
1

FACILITY BOUNDARY

COMPLIANCE BOUNDARY

REVIEW BOUNDARY

Transmission Towers

BC-21

BC-25

BC-20

BC-22

SEDIMENT BASIN SB-6

SEDIMENT BASIN SB-7

LIMIT OF WASTE

CELL 1

CELL 2

CELL 3

CELL 4

BC-26

CRAIG ROAD

BELEWS LAKE

STORMWATER BASIN

LEACHATE SAMPLE LOCATION

BC-27

BC-23A

EXISTING GRAVEL ACCESS ROAD

Exist. Gravel Access Rd.

LIMIT OF WASTE

ST-7

BC-29

SB-5

LIMIT OF WASTE

BC-31

BC-7

BC-30

REVIEW BOUNDARY

COMPLIANCE BOUNDARY

FACILITY BOUNDARY

BC-28

SURFACE WATER SAMPLE LOCATION (SW-1)

EXISTING GRAVEL ACCESS ROAD

BELEWS LAKE

BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS, LLC.

- BC-22 GROUNDWATER MONITORING WELL
- BC-7 GROUNDWATER OBSERVATION WELL
- SURFACE WATER SAMPLE LOCATION
- LEACHATE SAMPLE LOCATION
- LANDFILL REVIEW BOUNDARY
- LANDFILL COMPLIANCE BOUNDARY
- APPROXIMATE LIMIT OF WASTE
- FACILITY BOUNDARY

SCALE (FEET)

100 0 100 200

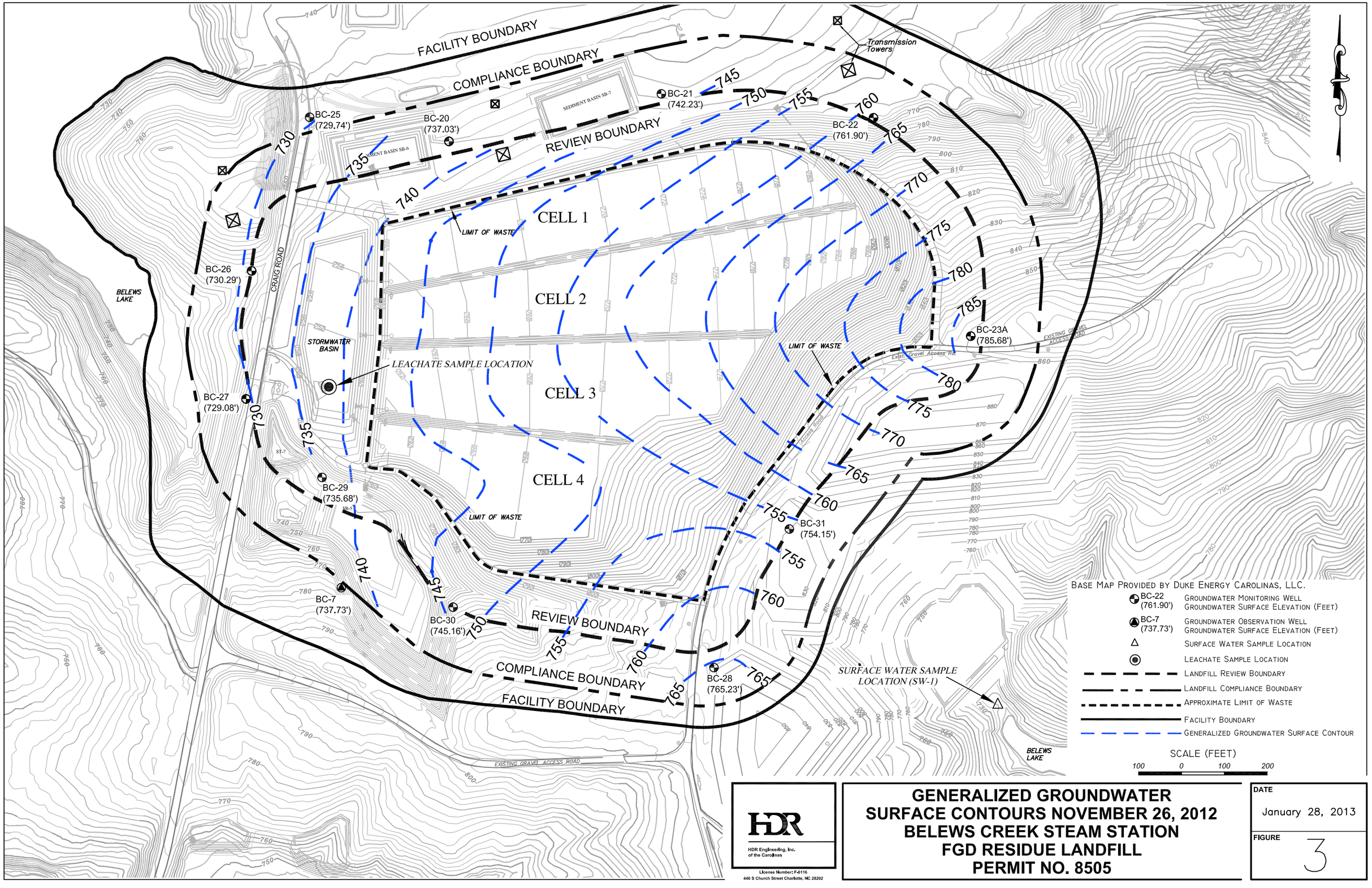
HDR Engineering, Inc. of the Carolinas

License Numbers: F-0116
440 S Church Street Charlotte, NC 28202

SAMPLE LOCATIONS
BELEWS CREEK STEAM STATION
FGD RESIDUE LANDFILL
PERMIT NO. 8505

DATE: January 28, 2013

FIGURE: 2



HDR Engineering, Inc. of the Carolinas
License Number: F-0116
440 S Church Street Charlotte, NC 28202

GENERALIZED GROUNDWATER SURFACE CONTOURS NOVEMBER 26, 2012 BELEWS CREEK STEAM STATION FGD RESIDUE LANDFILL PERMIT NO. 8505

DATE
January 28, 2013

FIGURE
3

TABLES

Table 1–Field Data Parameters
Duke Energy Carolinas LLC/Belews Creek Steam Station
FGD Residue Landfill, Permit No. 8505
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)
11/26/2012	BC-7	52.30	40.07	737.73	N/A	N/A	LO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11/26/2012	BC-20	24.22	20.19	737.03	N/A	None	CP	N/A	0.66	2.25	NO	17.54	241	5.6	28.4	N/A	N/A
11/26/2012	BC-21	16.77	14.46	742.23	N/A	None	CP	N/A	0.38	2.50	NO	17.90	297	5.6	11.1	N/A	N/A
11/26/2012	BC-22	13.00	4.01	761.90	N/A	None	CP	N/A	1.47	4.50	NO	15.21	65	5.8	1.4	N/A	N/A
11/26/2012	BC-23A	101.21	78.11	785.68	N/A	None	CP	N/A	3.77	11.25	NO	14.93	40	6.0	9.4	N/A	N/A
11/26/2012	BC-25	23.15	16.22	729.74	N/A	None	CP	N/A	1.13	3.75	NO	18.94	960	5.4	40.1	N/A	N/A
11/26/2012	BC-26	23.26	19.03	730.29	N/A	None	CP	N/A	0.69	2.25	NO	16.19	113	5.0	9.8	N/A	N/A
11/26/2012	BC-27	34.95	32.80	729.08	N/A	None	CP	N/A	0.35	0.50	YES	15.88	95	5.2	154.0	N/A	N/A
11/26/2012	BC-28	60.20	52.86	765.23	N/A	None	CP	N/A	1.20	3.75	NO	14.96	61	5.9	2.7	N/A	N/A
11/26/2012	BC-29	22.30	17.50	735.68	N/A	None	CP	N/A	0.78	3.00	NO	15.89	47	5.3	9.3	N/A	N/A
11/26/2012	BC-30	34.10	30.56	745.16	N/A	None	CP	N/A	0.58	2.25	NO	14.18	72	5.8	8.1	N/A	N/A
11/26/2012	BC-31	83.30	62.25	754.15	N/A	None	CP	N/A	3.43	10.20	NO	14.57	96	6.0	30.2	N/A	N/A
11/26/2012	SW-1	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A	N/A	6.81	166	7.2	17.9	N/A	N/A
11/26/2012	LEACHATE	N/A	N/A	N/A	N/A	None	N/A	N/A	N/A	N/A	N/A	15.78	2800	6.6	0.9	N/A	N/A

Notes:

1. Purge Methods; LF=Low Flow, CP=Conventional Purge (3-5 well volumes), NP=No Purge (HydraSleeve), NS=No Sample, LO=Level Only.
2. Field sampling performed by Duke Energy Carolinas, LLC personnel.
3. umho/cm indicates micromhos 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 December 5, 2012.
8. Observation well BC-7 was sampled for depth to water only.
9. N/A = Not Applicable.

Table 2–Field and Analytical Results
Duke Energy Carolinas LLC/Belews Creek Steam Station
FGD Residue Landfill, Permit No. 8505
Groundwater Monitoring Report

Sample Date: November 26, 2012

Field Sampling performed by Duke Energy Carolinas, LLC

Laboratory Certificate Codes:
Duke Energy Carolinas Field #5193
Duke Energy Analytical Laboratory #248

Parameter	SWS ID	Units	Certificate Code	Monitoring Wells							SWSL	15A NCAC 2L
				8505 BC-20	8505 BC-21	8505 BC-22	8505 BC-23A	8505 BC-25	8505 BC-26	8505 BC-27		
Field pH	320	SU	5193	**5.6**	**5.6**	**5.8**	**6.0**	**5.4**	**5.0**	**5.2**	-	6.5-8.5
Field Specific Conductance	323	umho/cm	5193	241	297	65	40	960	113	95	-	-
Temperature	325	°C	5193	17.54	17.90	15.21	14.93	18.94	16.19	15.88	-	-
Top of Casing	328	feet	-	757.22	756.69	765.91	863.79	745.96	749.32	761.88	-	-
Depth to Water	318	feet	-	20.19	14.46	4.01	78.11	16.22	19.03	32.80	-	-
Water Elevation	319	feet	-	737.03	742.23	761.90	785.68	729.74	730.29	729.08	-	-
Well Depth	411	feet	-	24.22	16.77	13.00	101.21	23.15	23.26	34.95	-	-
Arsenic	14	µg/L	248	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	1.67 J'	10	10
Barium	15	µg/L	248	300	41.1 J'	54.5 J'	28 J'	37.4 J'	224	55.9 J'	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	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	0.667 U	1	2
Chloride	301	µg/L	248	5,730	14,800	3,670	2,410	13,600	9,380	3,730	NE	250,000
Chromium	51	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	6.3 J'	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	6.67 J'	10	1,000
Fluoride	312	µg/L	248	88 J	92.6 J	86.1 J	93.7 J	135 J	72.8 J	111 J'	2,000	2,000
Iron	340	µg/L	248	**3,350**	157 J'	133 J'	157 J'	**1,650**	183 J'	**4,320**	300	300
Lead	131	µg/L	248	0.693 J	0.667 U	0.667 U	0.667 U	0.667 U	0.667 U	3.23 J'	10	15
Manganese	342	µg/L	248	**57.9**	24.9 J'	18.4 J'	3.34 J	27 J'	22.1 J'	**113**	50	50
Mercury	132	µg/L	248	0.007 J	0.006 U	0.006 U	0.006 U	0.014 J	0.007 J	0.184 J'	0.2	1
Nickel	152	µg/L	248	4.99 J	3.34 U	3.34 U	3.34 U	22.9 J'	5.2 J'	5.35 J'	50	100
Nitrate (as Nitrogen)	303	µg/L	248	6,720 J'	2,950 J'	1,050 J'	5.4 U	4,570 J'	3,210 J'	8.37 J	10,000	10,000
Selenium	183	µg/L	248	1.18 J'	2.55 J'	0.667 U	0.667 U	3.7 J'	0.667 U	0.699 J	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	3.34 U	10	20
Sulfate	315	µg/L	248	71,200 J'	91,500 J'	4,330 J'	225 J'	**394,000**	16,500 J'	10,600 J'	250,000	250,000
Total Dissolved Solids	311	µg/L	248	214,000	224,000	65,000	53,000	**668,000**	78,000	52,000	NE	500,000
Zinc	213	µg/L	248	17.4	3.34 U	3.34 U	3.34 U	9.29 J'	35.2	138	10	1,000

Notes:

1. Concentrations presented in micrograms per liter (µg/L) except where noted.
2. SWS ID is the Solid Waste Section Identification Number.
3. 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.
4. 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).
5. umho/cm indicates micromhos per centimeter.
6. SU indicates Standard Units.
7. Grayed values indicate values that attain or exceed the SWSL standard.
8. Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
9. NE means Not Established. Blank cells indicate that there is no information relevant to the respective row.
10. 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 HDR, to indicate a detected concentration that attains or is greater than the laboratory's MRL but less than the SWSL.
11. Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on December 5, 2012.
12. 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 listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage.

Table 2–Field and Analytical Results
Duke Energy Carolinas LLC/Belews Creek Steam Station
FGD Residue Landfill, Permit No. 8505
Groundwater Monitoring Report

Sample Date: November 26, 2012

Field Sampling performed by Duke Energy Carolinas, LLC

Laboratory Certificate Codes:
Duke Energy Carolinas Field #5193
Duke Energy Analytical Laboratory #248

Parameter	SWS ID	Units	Certificate Code	Monitoring Wells				8505 SW-1	Field Blank	SWSL	15A NCAC 2L
				8505 BC-28	8505 BC-29	8505 BC-30	8505 BC-31				
Field pH	320	SU	5193	**5.9**	**5.3**	**5.8**	**6.0**	7.2	-	-	6.5-8.5
Field Specific Conductance	323	umho/cm	5193	61	47	72	96	166	-	-	-
Temperature	325	°C	5193	14.96	15.89	14.18	14.57	6.81	-	-	-
Top of Casing	328	feet	-	818.09	753.18	775.72	816.40	-	-	-	-
Depth to Water	318	feet	-	52.86	17.50	30.56	62.25	-	-	-	-
Water Elevation	319	feet	-	765.23	735.68	745.16	754.15	-	-	-	-
Well Depth	411	feet	-	60.20	22.30	34.10	83.30	-	-	-	-
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	28.6 J'	101	19.3 J'	19.5 J'	36.6 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	1,630	5,830	4,080	1,530	4,620	82.2 J	NE	250,000
Chromium	51	µg/L	248	3.34 U	3.34 U	3.34 U	3.34 U	3.34 U	3.34 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	90.3 J	74.4 J	94.3 J	135 J'	103 J'	50.7 J	2,000	2,000
Iron	340	µg/L	248	33.3 J'	169 J'	228 J'	**771**	**3,970**	6.67 U	300	300
Lead	131	µg/L	248	0.667 U	0.667 U	0.667 U	0.882 J	0.667 U	0.667 U	10	15
Manganese	342	µg/L	248	3.67 J	7.13 J'	6.43 J'	28.9 J'	**710**	3.34 U	50	50
Mercury	132	µg/L	248	0.006 U	0.013 J	0.006 U	0.007 J	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	1,360 J'	361 J'	391 J'	295 J'	26.8 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	422 J'	562 J'	839 J'	2,670 J'	41,100 J'	18 U	250,000	250,000
Total Dissolved Solids	311	µg/L	248	61,000	46,000	73,000	93,000	118,000	N/A	NE	500,000
Zinc	213	µg/L	248	3.34 U	3.5 J	3.34 U	9.93 J'	69	3.34 U	10	1,000

Notes:

1. Concentrations presented in micrograms per liter (µg/L) except where noted.
2. SWS ID is the Solid Waste Section Identification Number.
3. 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.
4. 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).
5. umho/cm indicates micromhos per centimeter.
6. SU indicates Standard Units.
7. Grayed values indicate values that attain or exceed the SWSL standard.
8. Bold values indicate values that attain or exceed the 15A NCAC 2L Standard.
9. NE means Not Established. Blank cells indicate that there is no information relevant to the respective row.
10. 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 HDR, to indicate a detected concentration that attains or is greater than the laboratory's MRL but less than the SWSL.
11. Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas, LLC on December 5, 2012.
12. 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 listed are for the chloride with CAS number SW301 as specified on the Constituent Look-up webpage.
13. N/A means Not Analyzed.

Table 3–Leachate Analytical Results
Duke Energy Carolinas LLC/Belews Creek Steam Station
FGD Residue Landfill, Permit No. 8505
Groundwater Monitoring Report

Sample Date: November 26, 2012

Field Sampling performed by Duke Energy Carolinas, LLC

Laboratory Certificate Codes:
Duke Energy Carolinas Field #5193
Duke Energy Analytical Laboratory #248

Parameter	SWS ID	Units	Certificate Code	8505 Leachate		SWSL
Field pH	320	SU	5193	6.6		-
Field Specific Conductance	323	umho/cm	5193	2,800		-
Temperature	325	ºC	5193	15.78		-
Arsenic	14	µg/L	248	3.34	U	10
Barium	15	µg/L	248	17	J'	100
Boron	428	µg/L	248	11,900		NE
Cadmium	34	µg/L	248	3.34	U	1
Chloride	301	µg/L	248	124,000		NE
Chromium	51	µg/L	248	3.34	U	10
Copper	54	µg/L	248	3.34	U	10
Fluoride	312	µg/L	248	1,200	J'	2,000
Iron	340	µg/L	248	22.8	J'	300
Lead	131	µg/L	248	3.34	U	10
Manganese	342	µg/L	248	10,900		50
Mercury	132	µg/L	248	0.006	U	0.2
Nickel	152	µg/L	248	8.84	J'	50
Nitrate (as Nitrogen)	303	µg/L	248	318	J'	10,000
Selenium	183	µg/L	248	823		10
Silver	184	µg/L	248	3.34	U	10
Sulfate	315	µg/L	248	1,630,000		250,000
Total Dissolved Solids	311	µg/L	248	2,720,000		NE
Zinc	213	µg/L	248	10.3		10

Notes:

1. Concentrations presented in micrograms per liter (µg/L) except where noted.
2. SWS ID is the Solid Waste Section Identification Number.
3. 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.
4. umho/cm indicates micromhos per centimeter.
5. SU indicates Standard Units.
6. Grayed values indicate values that attain or exceed the SWSL standard.
7. 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 HDR, to indicate a detected concentration that attains or is greater than the laboratory's MRL but less than the SWSL.
8. Data obtained from Electronic Data Deliverable (EDD) provided by Tim Hunsucker of Duke Energy Carolinas on December 5, 2012.
9. 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 16887-08-6, 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.

Table 4–North Carolina Adminstrative Code (NCAC) 2L Groundwater Quality Exceedances
Duke Energy Carolinas LLC/Belews Creek Steam Station
FGD Residue Landfill, Permit No. 8505
Groundwater Monitoring Report

Sample Date: November 26, 2012						
Parameter	**Well ID**	**Result**	**Units**	**15A NCAC 2L Standard**	**Historical Concentrations**	**Cause and Significance**
Field pH	BC-20	5.6	SU	6.5 - 8.5	5.5 - 5.9	pH in BC-20 is consistent with historical readings at well.
	BC-21	5.6	SU		5.0 - 5.8	pH in BC-21 is consistent with historical readings at well.
	BC-22	5.8	SU		5.5 - 5.9	pH in BC-22 is consistent with historical readings at well.
	BC-23A	6.0	SU		5.6 - 6.1	BC-23A is considered one of the background wells for the site.
	BC-25	5.4	SU		5.2 - 5.8	pH in BC-25 is consistent with historical readings at well.
	BC-26	5.0	SU		4.9 - 5.2	pH in BC-26 is consistent with historical readings at well.
	BC-27	5.2	SU		5.1 - 5.7	pH in BC-27 is consistent with historical readings at well.
	BC-28	5.9	SU		5.7 - 6.1	pH in BC-28 is consistent with historical readings at well.
	BC-29	5.3	SU		5.0 - 5.5	pH in BC-29 is consistent with historical readings at well.
	BC-30	5.8	SU		5.6 - 5.9	pH in BC-30 is consistent with historical readings at well.
	BC-31	6.0	SU		6.0 - 6.6	pH in BC-31 is consistent with the lowest historic reading at well.
Iron	BC-20	3,350	µg/L	300	772 - 148,000	Iron concentration in BC-20 is consistent with historical readings at well. Turbidity measured at 28.4 NTUs.
	BC-25	1,650	µg/L		374 - 288,000	Iron concentration in BC-25 is consistent with historical readings at well. Turbidity measured at 40.1 NTUs.
	BC-27	4,320	µg/L		2,850 - 32,300	Iron concentration in BC-27 is consistent with historical readings at well. Turbidity measured at 154.0 NTUs.
	BC-31	771	µg/L		513 - 22,300	Iron concentration in BC-31 is consistent with historical readings at well. Turbidity measured at 30.2 NTUs.
	SW-1	3,970	µg/L		1,010 - 7,625	Iron concentration in SW-1 is consistent with historical readings at well. Turbidity measured at 17.9 NTUs.
Manganese	BC-20	57.9	µg/L	50	12.4 - 1,140	Manganese concentration in BC-20 is consistent with historical readings at well. Turbidity measured at 28.4 NTUs.
	BC-27	113	µg/L		113 - 780	Manganese concentration in BC-27 is the lowest reading in the period of record. Turbidity measured at 154.0 NTUs.
	SW-1	710	µg/L		660 - 1,779	Manganese concentration in SW-1 is consistent with historical readings at well. Turbidity measured at 17.9 NTUs.
Sulfate	BC-25	394,000	µg/L	250,000	14,320 - 428,000	Sulfate concentration in BC-25 is consistent with historical readings at well.
Total Dissolved Solids	BC-25	668,000	µg/L	500,000	74,000 -719,000	TDS concentration in BC-25 is consistent with historical readings at well.

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 December 5, 2012.
3. Historical concentrations based on data in Duke Energy Carolinas, LLC analytical results database.
4. NTU indicates Nephelometric Turbidity Units.
5. SU indicates Standard Units.
6. µg/L indicates micrograms per liter.

APPENDICES

APPENDIX A
CHAIN-OF-CUSTODY FORMS

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Duke Energy SM

For Detailed Instructions, see:
http://dewww/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 # J12110204 | MATRIX: GW-RCRA | Samples Originating From: NC √ SC ___

Logged By: cpb | Date & Time: 11-27-12 0730 | SAMPLE PROGRAM: Ground Water √, NPDES ___, Drinking Water ___, UST ___, RCRA Waste ___

VENDOR | Cooler Temp (C): <1

PO # | MR #

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DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

Revised 10/2/12

Customer must Complete

1)Project Name: BELEWS CREEK FGD LANDFILL Permit #85-05		2)Phone No: 875-5257
3)Client: LDC / TSH / Ed Sullivan		4)Fax No:875-4349
5)Business Unit: 20003	6)Process: BENVWS	7)Resp. To: BC00
8)Project ID:	9)Activity ID:	10)Mail Code: MGO3A3

Customer to complete all appropriate NON-SHADED areas.

[15]Preserv.: 1=HCl, 2=H_2SO_4, 3=HNO_3, 4=Ice, 5=None

[16]Analyses Required

LAB USE ONLY [11]Lab ID	[12]Chem Desktop No.	[13]Sample Description or ID	[14]Collection Information Date	Time	Signature	[18]TESTS	[18]Grab	NO3-N, SO4, Cl, F - (IC) and ALK (4.5)	4	3 Metals Prep - 3030C: (ICP- EPA-200.7) Ag, B, Ba, Ca, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Zn (13)	3 Hg (EPA 245.1) (1)	3 (IMS-EPA-200.8) As, Cd, Pb, Se (4)	4 TDS	[20]Total # of Containers
2012024300		BC-20	11/26/12	1320	RW	6	X	1		1			1	3
2012024301		BC-21	11/26/12	1210	VDC	6	X	1		1			1	3
2012024302		BC-22	11/26/12	1115	VDC	6	X	1		1			1	3
2012024303		BC-23A	11/26/12	0845	VDC	6	X	1		1			1	3
2012024304		BC-25	11/26/12	1200	RW	6	X	1		1			1	3
2012024305		BC-26	11/26/12	1255	VDC	6	X	1		1			1	3
2012024306		BC-27	11/26/12	1030	RW	6	X	1		1			1	3
2012024307		BC-28	11/26/12	0910	RW	6	X	1		1			1	3
2012024308		BC-29	11/26/12	1030	VDC	6	X	1		1			1	3
2012024309		BC-30	11/26/12	0940	VDC	6	X	1		1			1	3
2012024310		BC-31	11/26/12	0830	RW	6	X	1		1			1	3
2012024311		SW-1	11/26/12	1315	VDC	6	X	1		1			1	3
2012024312		LEACHATE	11/26/12	1020	RW	6	X	1		1			1	3
2012024313		FIELD BLANK	11/26/12	1440	RW	5	X	1		1				2

Customer to complete appropriate columns to right

Customer to sign & date below

21)Relinquished By: LD Gulley	Date/Time: 11/27/12 0645	Accepted By: Cindy K Mok	Date/Time: 11-27-12 0645
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: Regulatory Agency : NCDENR/DWM -SW Section - State EDD Format Required / Permit # 85-05
Use indicated or comparible analytical methods

Customer, important please indicate desired turnaround

[22]Requested Turnaround

- 14 Days √
- *7 Days ___
- *48 Hr ___
- *Other ___

* Add. Cost Will Apply