

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):

S&ME, Inc. (Consultant)

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

Name: William M. Miller, PE

Phone: 828-687-9080 Ext 315

E-mail: wmiller@smeinc.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 Marshall Steam Station Ash Landfill	8320 East Hwy 150 Catawba County, NC 27009	18-04	.0500	August 10, 2009

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 Project Engineer

828-687-9080 Ext 315

Facility Representative Name (Print)

Title

(Area Code) Telephone Number

Signature

Date

Affix NC Licensed/ Professional Geologist Seal

44 Buck Shoals Rd Suite C-3, Arden NC 28704

Facility Representative Address

F-0176

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

Revised 6/2009



**DUKE ENERGY
MARSHALL STEAM STATION
DRY ASH LANDFILL PERMIT #18-04
GROUNDWATER MONITORING REPORT
AUGUST 2009 SAMPLING EVENT**
S&ME Project No. 11411-09-047

Prepared For:



Prepared By:



S&ME, Inc.
44 Buck Shoals Road Suite C-3
Arden, North Carolina 28704

October 15, 2009



October 15, 2009

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

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

Dear Ms. Drummond:

On behalf of Duke Energy, attached is the groundwater monitoring report for the Marshall Steam Station Dry Ash Landfill (Permit # 18-04). Groundwater sampling for the landfill was performed on August 10, 2009.

The Groundwater Monitoring Report for the sampling event includes a summary of the analytical results, a figure showing groundwater contours at the site, and the preliminary analyses of values in excess of the NC 2L groundwater standards. Also attached is the Environmental Monitoring Reporting Form. An EXCEL file containing the laboratory results in the Electronic Data Deliverable format will be sent to you by e-mail.

If you have questions or require additional information, please contact me by at 828-687-9080.

Sincerely,


William M. Miller, P.E.
Senior Project Engineer





Larry Armstrong, P.E.
Senior Engineer/Vice President

TABLE OF CONTENTS

	<u>Page</u>
1. PROJECT INFORMATION.....	1
2. SCOPE OF WORK	1
3. RESULTS	2
3.1 Site Groundwater Flow	2
3.2 Groundwater Analytical Results	2

TABLES

Table 1:	Summary of Field and Analytical Results
Table 2	Field Parameters

FIGURES

Figure 1:	Groundwater Contours August 2009
-----------	----------------------------------

Chain of Custody Form

1. PROJECT INFORMATION

Marshall Steam Station is owned and operated by Duke Energy Carolinas (Duke). Marshall Steam Station is located in Catawba County, on Highway NC 150, just west of Lake Norman. The Marshall plant generates 2090 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 a million homes.

The plant is located 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.

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 and the wells is shown on **Figure 1**.

Two dry fly ash fills are permitted under this permit; the larger fill has an area of approximately 47 acres and is adjacent to the Marshall Ash Basin. Monitoring wells MW-2, MW-3, and MW-5 are located adjacent to this fill. The smaller fill is located adjacent to the Marshall Ash Basin and is approximately 14.5 acres in area. Monitoring well MW-1 and observation well OB-1 are located adjacent to this 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. SCOPE OF WORK

To complete the scope of work, S&ME completed the following tasks:

- Received information provided by Duke on field sampling and measurement of groundwater elevations (performed by Duke) for monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, and observation well OB-1. This sampling was conducted on August 10, 2009.
- Review of laboratory analytical results for samples. These analyses were performed by a North Carolina certified laboratory, using State approved methods. These results were provided in both in paper format and in the form of an EXCEL file. The EXCEL file was manipulated to conform to the format requirements of the NCDENR Electronic Data Deliverable template.

- Develop a groundwater flow contour map using map data and groundwater elevation data supplied by Duke.
- Develop a preliminary analysis of the cause and significance of values exceeding NC 2L groundwater standards.
- Prepared and submitted this Groundwater Monitoring Report to Duke and to NCDENR.

3. RESULTS

3.1 Site Groundwater Flow

Groundwater flow contours for the site are shown on **Figure 1**. These contours were developed using the measured groundwater elevations in the wells from the August 10, 2009 sampling and from 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 in 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 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 acres landfill) appears to be from the ash basin (Elev. 790 feet) towards the arm of Lake Norman (Elev. 760 feet) located east of wells OB-1 and MW-1.

3.2 Groundwater Analytical Results

The results of the laboratory analyses for the groundwater monitoring well samples are summarized in **Table 1**.

Results from the five monitoring wells were below the corresponding NCAC 2L groundwater quality standards with the exceptions noted below. The preliminary analyses of the causes of these exceptions are provided below:

- pH – pH values below 6.5 were measured at all five wells (MW-1, MW-2, MW-3, MW-4, MW-5). Values for pH ranged from 5.81 at MW-1 to 4.78 measured at MW-3. A pH value of 5.64 was measured in monitoring well MW-4. Well MW-4 is considered to be the background well and should not be impacted by effects from the landfill or the ash basin.

The values for pH in wells MW-1 (5.81) and MW-2 (5.27) are potentially influenced by groundwater from the landfill areas and the water quality in the ash basin. Values for pH in wells MW-3 (4.78) and MW-5 (5.57) could be influenced by the landfill and by the adjacent former portions of the ash basin.

- Boron – Concentrations of boron in excess of 315 ug/L were measured in wells MW-1 (680 ug/L) and MW-2 (2720 ug/L). The concentration of boron in these wells is likely from the water quality in the ash basin. As described in Section 3.1, these two wells are likely influenced by water levels and flow in the ash basin.
- Manganese – Concentrations of manganese in excess of 50 ug/L were measured in wells MW-3 (66.5 ug/L) and MW-5 (124 ug/L). These wells are located adjacent to areas that are former portions of the ash basin. The manganese concentrations observed in these wells could be caused by either the landfill or the former ash basin areas located adjacent to these wells.

In addition to the compounds and wells listed above, the groundwater analytical results for the compounds at the following wells and surface water sample locations were equal to or above the corresponding Solid Waste Section Limits (SWSL):

- Barium in excess of the SWSL of 100 ug/L was measured in well MW-3.
- Selenium in excess of the SWSL of 10 ug/L was measured in well MW-2.
- Nitrogen, as Nitrate in excess of the SWSL of 1000 ug/L was measured in well MW-3.
- Zinc in excess of the SWSL of 10 ug/L was measured in well MW-3.

**TABLE 1 - FIELD AND ANALYTICAL RESULTS
DUKE ENERGY MARSHALL STEAM STATION
FLY ASH LANDFILL - PERMIT #18-04
GROUNDWATER MONITORING REPORT
S&ME PROJECT 1411-09-047**

10/15/009

Page 1 of 1

Facility: Marshall Steam Station Dry Fly-Ash Landfill #18-04
Sample Date: August 10, 2009 (Field and Geochemistry Data)

Field sampling performed by Duke Energy

Parameter	SW ID	Units	Certificate Codes	Monitoring Well Identification						Field Blank	SWSL	15A NCAC 2L*
				1804-MW-1	1804-MW-2	1804-MW-3	1804-MW-4	1804-MW-5	1804-OB-1			
Field pH	320	Std. Units	5193	5.81	5.27	4.78	5.64	5.57				6.5-8.5
Field Spec. Conductance	323	umho/cm	5193	150	308	104	47	43				
Temperature	325	C	5193	17.67	16.95	16.06	17.28	17.54				
Top Casing	328	feet		823.70	797.22	813.07	867.38	822.69	825.85			
Depth to Water	318	feet		50.74	7.02	6.68	38.93	25.43	45.49			
Water Elevation	319	feet		772.96	790.20	806.39	828.45	797.26	780.36			
Well Depth	41	feet		78.75	35.10	28.15	50.20	30.71	65.50			
Arsenic	14	ug/L	12	ND	ND	ND	ND	ND		ND U	10	50
Barium	15	ug/L	12	78.1 J	66.1 J	368	47.2 J	46.6 J		ND U	100	2000
Boron	316	ug/L	12	680	2720	57.6	48.3	23.8		21.5	NE	315
BOD, 5 day	NE	mg/L	12	ND	ND	ND	ND	ND		ND U	NE	NE
Cadmium	34	ug/L	12	ND	ND	ND	ND	ND		ND U	1.0	1.75
Chemical Oxygen Demand	317	ug/L	12	ND	ND	ND	ND	ND		ND U	NE	NE
Chloride	301	ug/L	12	ND	5440	11200	ND	ND		ND U	NE	250000
Chromium	51	ug/L	12	8.6 J	ND	1.3 J	1.2 J	0.87 J		ND U	10	50
Copper	54	ug/L	12	ND	ND	ND	ND	ND		ND U	10	1000
Fluoride	312	ug/L	12	ND	ND	ND	ND	ND		ND U	2000	2000
Iron	340	ug/L	12	67.2 J	ND	137 J	42.8 J	200 J		ND U	300	300
Lead	131	ug/L	12	ND	ND	ND	ND	ND		ND U	10	15
Manganese	342	ug/L	12	7.3 J	10.6 J	66.5	2.7 J	124		ND U	50	50
Mercury	132	ug/L	12	ND	ND	ND	ND	ND		ND U	0.20	1.05
Nickel	152	ug/L	12	ND	ND	3.5 J	ND	ND		ND U	50	100
Nitrogen, Nitrate	303	ug-N/L	12	121 J	431 J	7150	ND	ND		ND U	1000	10000
Selenium	183	ug/L	12	ND	27.6	ND	ND	ND		ND U	10	50
Silver	184	ug/L	12	0.72 J	1.6 J	0.12 J	0.17 J	0.26 J		ND U	10	17.5
Sulfate	315	ug/L	12	45300 J	93700 J	ND	ND	ND		ND U	250000	250000
Total Dissolved Solids	311	ug/L	12	180000	268000	106000	78000	364000			NE	500000
Total Organic Carbon	357	ug/L	12	1260	3500	10700	1530	1820		ND U	NE	NE
Total Organic Halide	396	ug/L	12	50	50	50	30	20		ND U	NE	NE
Zinc	213	ug/L	12	2.3 J	1.2 J	18.4	0.88 J	1.7 J		1.9 U	10	1050

* Maximum Contaminant Level (MCL)

Notes:

15A NCAC 2L = 15A NCAC 2L .0200, Groundwater Quality Standards for Class GA groundwater

BOLD VALUES indicate a values that attain or exceed the 15A NCAC 2L MCL.

Values in gray cells indicate values that equal or exceed the SWSL.

ND = Not detected by Lab at or above adjusted reporting limit.

J = Parameters are estimated values greater than Method Detection Limit (MDL) but less than the SWSL

NC SWSL = North Carolina Solid Waste Section Limit

NE = Not established

TABLE 2 - FIELD PARAMETERS
DUKE ENERGY MARSHALL STEAM STATION
FLY ASH LANDFILL - PERMIT #18-04
GROUNDWATER MONITORING REPORT
S&ME PROJECT 1411-09-047

October 15, 2009

Page 1 of 1

DATE	WELL NO.	WELL DEPTH (feet)	DEPTH TO WATER (feet)	WATER ELEV. (feet)	ODOR	Purge Method	AVG * PMP RATE (ml/min)	WELL VOL (gal)	EVAC VOL (gal)	EVAC (yes/no)	TEMP (deg C)	SPECIFIC CONDUCTANCE (umho/cm)	pH (units)	TURBIDITY (NTU)	ORP (mV-NHE)	DO (mg/l)
8/10/2009	MW-1	87.75	50.74	772.96	NA	CP	N/A	4.57	15.00	NO	17.7	150	5.8	13.1	N/A	N/A
8/10/2009	MW-2	35.10	7.02	790.20	NA	CP	N/A	4.58	14.25	NO	17.0	308	5.3	7.3	N/A	N/A
8/10/2009	MW-3	28.15	6.68	806.39	NA	CP	N/A	3.50	10.50	NO	16.1	104	4.8	9.4	N/A	N/A
8/10/2009	MW-4	50.20	38.93	828.45	NA	CP	N/A	1.84	2.50	YES	17.3	47	5.6	6.9	N/A	N/A
8/10/2009	MW-5	30.71	25.43	797.26	NA	CP	N/A	0.86	3.00	NO	17.5	43	5.6	15.8	N/A	N/A
8/10/2009	OB-1	65.50	45.49	780.36	NA	CP	N/A	3.26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

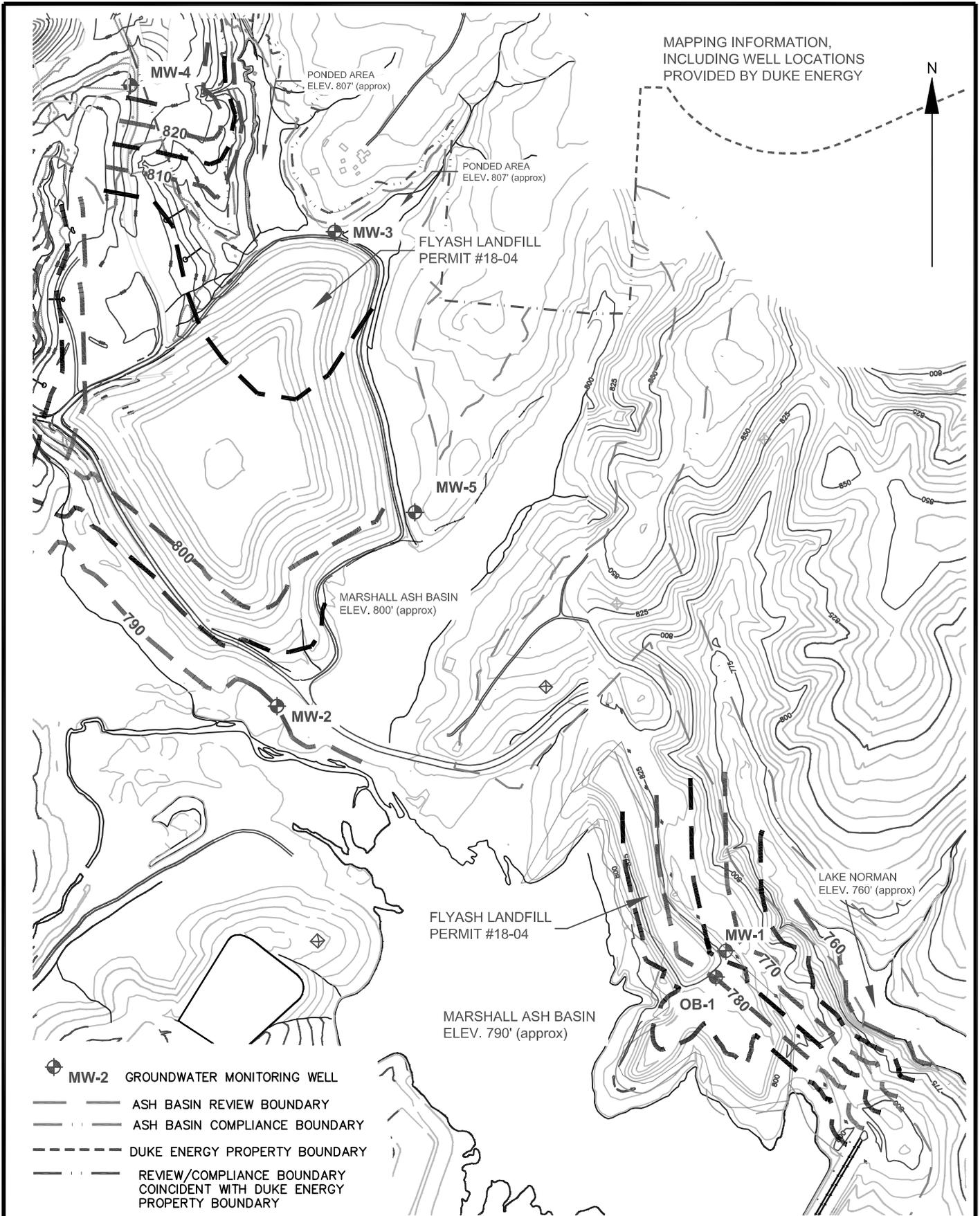
Purge Methods

LF = Low Flow

CP = Coventional Purge (3 to 5 well vol)

BP = No Purge (HydraSleeve)

Sampling performed by Duke Energy





For Detailed Instructions, see:
http://www.wssenvi.com

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM
Duke Energy Analytical Lab Services
Mail Code MGO3A2 (Building 7405)
13338 Hagers Ferry Rd
Huntersville, N.C. 28078
(704) 875-5245
Fax: (704) 875-5039

Customer must Complete

1) Project Name MARSHALL DRY ASH LANDFILL	2) Phone No: 875-5287
3) Client LDC / TSH / Ed Sullivan	4) Fax No: 875-5248
5) Business Unit: 20035	6) Process: ENWWT
7) Project ID:	7) Resp. To: MS00
8) Activity ID:	10) Mail Code: MGO3A3

Customer to complete appropriate columns to right

11) Lab ID	12) Chem Desktop No.	13) Sample Description or ID	14) Collection Information		17) Comp.	18) Grab	19) Analytes Required	20) Total # of Containers
			Date	Time				
290187666	0950550	MW-1	8/10/09	1330		X	Alk, SO4, lab pH, NO3, Cl, Fluoride, TOC, Hg, METALS (Ag, As, B, Ba, Ca, Cd, Cr, K, Mg, Na, Ni, Pb, Se, Cu, Fe, Mn, Zn), COD, TOX, BOD, TDS, Chlorine (ppm)	8
290187667	000	MW-2	8/10/09	1030		X		8
290187668	095	MW-3	8/10/09	0920		X		8
290187669	001	MW-4	8/10/09	0800		X		8
29018770	605	MW-5	8/10/09	1200		X		8
29018771	002	QC SAMPLE (WELL # MW3)	8/10/09	0920		X		1
29018772	006	FIELD BLANK	8/10/09	1335		X		6

Customer to sign & date below

21) Requested By: <i>[Signature]</i>	8-10-09	14:55	Accepted By: <i>[Signature]</i>	8-10-09	14:55
22) Requested By: <i>[Signature]</i>	8-11-09	9:40	Accepted By: <i>[Signature]</i>	8-11-09	9:40
23) Requested By: <i>[Signature]</i>	8-11-09	7:50	Accepted By: <i>[Signature]</i>	8-11-09	7:50

Customer, important please indicate required turnaround

22) Requested Turnaround

8-24

Analytical Laboratory Use Only

Lab # **09-JUL-0339** Sample Class **GWATER**

Issued By: **PACE** Date & Time: **07/21/09 8:07**

Vendor: **PACE**

PO # **ISW01341**

Preserv: 1-HCL, 2-H2SO4, 3-HNO3, 4-None, 5-None

Sample Originating SC: **MS00**

Sample Program: **GROUNDWATER**

Drinking Water: **NO**

USE: **NO**

ROFA Waste: **NO**

19) Page 1 of 1
DISTRIBUTION
ORIGINAL TO LAB,
COPY TO CLIENT

39

Patricia
Send pdf and excel
spreadsheet of vendor results to:
labcustomer@duke-energy.com



For Detailed Instructions, see:
http://demwww/essen/vloc/

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

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

Customer must Complete

1) Project Name MARSHALL DRY ASH LANDFILL	2) Phone No: 878-5267
3) Client LDC / TSH / Ed Sullivan	4) Fax No: 878-4349
5) Business Unit: 20035	6) Process: ENVWT
7) Project ID:	7) Resp. To: MS00
8) Activity ID:	10) Mail Code: MGO3A3

LAB USE ONLY	11) Lab ID
	290187666
	290187667
	290187668
	290187669
	29018770
	29018771
	29018772

Customer to complete appropriate columns to right

12) Chem Desktop No.	13) Sample Description or ID
	MMW-1
	MMW-2
	MMW-3
	MMW-4
	MMW-5
	OC SAMPLE (WELL # MW3
	FIELD BLANK

Customer to sign & date below

27) Relinquished By: <i>[Signature]</i>	Date/Time: 8-10-09 14:55
Relinquished By: <i>[Signature]</i>	Date/Time: 8-11-09 9:40
Relinquished By: <i>[Signature]</i>	Date/Time: 8-1-09 7:50

Accepted By: <i>[Signature]</i>	Date/Time: 8-10-09 14:55
Accepted By: <i>[Signature]</i>	Date/Time: 8-11-09 9:40
Sealed/Lock Opened By: <i>[Signature]</i>	Date/Time: 8-11-09 9:40

Analytical Laboratory Use Only

LIMS # **09-JUL-0339** Sample Class **GWATER**

Logged By: **EBBC** Date & Time: **07/21/09 8:07**

VENDOR: **PAGE**

PO # **ISW01.341**

15) Preserve: 1=HCL, 2=H2SO4, 3=HNO3, 4=Ice, 5=None

16) Cooler Temp (C): **4/1 < 30**

17) Samples Go To: **PAGE**

Customer to complete all appropriate NON-SHADED areas.

14) Collection Information	Date	Time	Signature
	8/10/09	1330	<i>[Signature]</i>
	8/10/09	1030	<i>[Signature]</i>
	8/10/09	0920	<i>[Signature]</i>
	8/10/09	0800	<i>[Signature]</i>
	8/10/09	1200	<i>[Signature]</i>
	8/10/09	0920	<i>[Signature]</i>
	8/10/09	1335	<i>[Signature]</i>

17) Comp.	18) Grab	16) Analyses Required	19) Sample Originating From	20) Total # of Containers
	X	Alk, SO4, lab pH, NO3, Cl, Fluoride	4	4
	X	TOC	2, 4	4
	X	Hg	3	4
	X	METALS (Ag, As, B, Ba, Ca, Cd, Cr, K, Mg, Na, Ni, Pb, Se, Cu, Fe, Mn, Zn)	3	4
	X	COD	2, 4	4
	X	TOX	2, 4	4
	X	BOD	4	4
	X	TDS	4	4
	X	Chlorine (ppm)		n/a
	X			6

Customer, important please indicate desired turnaround

22) Requested Turnaround

14 Days _____

*7 Days _____

.48 Hr _____

*Other Add. Cost Will Apply