

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):
 Pilot Environmental, Inc. and Modulus, PLLC

Contact for questions about data formatting. Include data preparer's name, telephone number and E-mail address:
 Name: Toby S. Benfield Phone: 336-310-4527 ext 106
 E-mail: TBenfield@PilotEnviro.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
Davidson County Phase II Landfill	1242 Old Highway 29, Thomasville, North Carolina, 27360	29-06	.1600	March 24 and 25, 2016

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.

Mr. Aric V. Geda, P.E. Principal Engineer 919-800-9093
 Facility Representative Name (Print) Title (Area Code) Telephone Number
 Signature Date 05/18/2016 Affix NC Licensed Professional Geologist Seal

216 Graham Road, Graham NC 27253
 Facility Representative Address

P-1176
 NC PE Firm License Number (if applicable effective May 1, 2009)





**MARCH 2016 SEMI-ANNUAL GROUNDWATER
MONITORING REPORT**

DAVIDSON COUNTY PHASE II LANDFILL
NORTH CAROLINA SOLIDWASTE PERMIT NUMER 29-06

PREPARED FOR:
DAVIDSON COUNTY INTEGRATED SOLID WASTE
1242 OLD HIGHWAY 29
THOMASVILLE, NORTH CAROLINA 27360-0024

PREPARED BY:
PILOT ENVIRONMENTAL, INC
743 PARKLAWN COURT
KERNERSVILLE, NORTH CAROLINA 27285

MAY 18, 2016
PEI PROJECT NO. 1762



May 18, 2016

Mr. Steven Sink
Davidson County Integrated Solid Waste
1242 Old Highway 29
Thomasville, NC 27360-0024

Reference: March 2016 Semi Annual Groundwater Monitoring Report
Davidson County Phase II Landfill
Lexington, North Carolina
North Carolina Solid Waste Permit Number 29-06
PEI Project 1762

Dear Mr. Sink:

Pilot Environmental, Inc. (PEI) is pleased to submit the 2016 Semi-Annual Groundwater Monitoring report for the above referenced site. Included in this report is a description of the field activities, the results obtained and our conclusions.

We appreciate the opportunity to provide our services to you. If you have any questions regarding our assessment of the subject site or our conclusions, please contact us at 336.310.4527.

Sincerely,

A handwritten signature in black ink, appearing to read "Toby Benfield", written over a horizontal line.

Toby S. Benfield
Project Manager

A handwritten signature in blue ink, appearing to read "Aric V. Geda", written over a horizontal line.

Aric V. Geda, P.E.
Principal Engineer
NC License # 035138



**Davidson County Phase I Lined Landfill
NC Solid Waste Permit No 29-06
March 2016 Groundwater Monitoring Report**

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1.0 INTRODUCTION

Pilot Environmental, Inc. (PEI) was contracted by Davidson County to conduct semi-annual groundwater monitoring at the Davidson County Phase I Lined Landfill, permit number 29-06 as required by 15A NCAC 13B .1600. Sampling was conducted on March 24 and 25, 2016. This report summarizes the sampling procedures, field and laboratory results and groundwater characterization as required by North Carolina Solid Waste Regulations. A potentiometric surface map, summary tables and laboratory analytical reports are included.

2.0 SITE GEOLOGY

The Davidson County Phase I Lined Landfill facility is located in the Piedmont Physiographic Province of North Carolina. The Piedmont Physiographic Province generally consists of hills and ridges which are dissected by a system of swales and streams. The Piedmont Physiographic Province is predominantly underlain by metamorphic rock (formed by heat, pressure and/or chemical action) and igneous rock (formed directly from molten material). The topography and relief of the Piedmont Physiographic Province has developed from differential weathering of the igneous and metamorphic rock. Ridges and hills have been developed in areas of less weathered rock. Because of the continued chemical and physical weathering, rock in the Piedmont Physiographic Province is generally covered with a mantle of soil that has weathered in place from the parent bedrock. These soils vary in thickness and are referred to as residuum or residual soils. The residuum is typically finer grained and has higher clay content near the surface because of the advanced weathering. Similarly, the soils typically become coarser grained with increasing depth because of decreased weathering. As the weathering decreases, the residual soils generally retain the overall appearance, texture and foliations of the parent rock.

According to the Geologic Map of North Carolina (USGS 1985), the site lies within the Carolina Slate Belt in an area of predominantly volcanic and sedimentary rocks of Late Proterozoic to Cambrian age that have been metamorphosed and intruded by numerous igneous plutons. The boundary zone between the Carolina Slate Belt and the adjacent Charlotte Belt is known as the Gold Hill/Silver Hill shear zone. The site and surrounding property appear to be underlain by volcanic rocks from the Flat Swamp Member of the CID Formation and metavolcanic rocks of the Battleground Formation. The encountered lithology includes sand, silts, partially weathered rock and hard rock (granite).

3.0 SAMPLING LOCATIONS

The groundwater monitoring network for the Davidson County Phase II Landfill includes nine monitoring wells (MW-1, MW-2, MW-3S, MW-4S, MW-5, MW-6S, MW-8, MW-9 and MW-10S), two surface water samples (SW-1 and SW-2) and one leachate location (leachate). Monitoring wells MW-3D, MW-4D and MW-10D are designated as water level locations and are not sampled as part of the groundwater monitoring program. Groundwater monitoring wells MW-6D and MW-7 along with surface water sample location SW-3 were removed from the groundwater

monitoring network in January of 2013. The background well for the Phase II Landfill is MW-1. A trip blank was submitted for quality control purposes. Sample locations are shown on Drawing 1. Available monitoring well logs are included in Appendix A.

4.0 SAMPLING PROCEDURES

Sampling procedures followed the protocols outlined in the Water Quality Monitoring Plan and the North Carolina Department of Environmental Quality (NCDEQ) Division of Waste Management Water Quality Monitoring Guidance Document for Solid Waste Facilities.

Prior to sampling, PEI personnel measured the depth to groundwater in each well. Following measurement of groundwater depth, each well was purged by removing three to five well volumes or until dry twice. Groundwater elevations are provided in Table 1.

Laboratory prepared containers were provided by Research and Analytical Laboratories, Inc. in Kernersville, North Carolina (North Carolina Laboratory Certification Number 34). After being filled, the sample containers were appropriately labeled, placed into a cooler containing ice to maintain temperature control and transported to the laboratory facility within the specified hold time for each analysis.

Sampling wells and surface water sample locations were inspected and observed to be in good condition and free of obstruction at the time of sampling.

5.0 RESULTS

5.1 FIELD RESULTS

Temperature, pH, specific conductance and turbidity were measured in the field at the time of sampling. The field parameter results are summarized in Table 2.

5.2 LABORATORY ANALYSIS

Samples were transported to R&A Laboratories where they were analyzed for metals using EPA Method 200.7 and Volatile Organic Compounds (VOCs) using EPA Method 8260B. The leachate sample was also sampled for BOD, COD, nitrate nitrogen, total phosphorus and sulfate via NCDEQ DWM Solid Waste Section (SWS) approved methods.

Analytical results were compared to the NCDEQ DWM SWS Quantitation Limits (SWSLs), 15A NCAC 2L.0200 Groundwater Quality Standards (2L Standards), SWS established Groundwater Protection Standards (GWP) and the Federal Maximum Contaminant Limits (MCLs). Analytical results of surface water samples were compared with the NCAC 2B Standard for Class C waters (2B Standards)

Most constituents were reported below the method detection limit (MDL) or at non-quantifiable values (J-value) defined by the laboratory as between the MDL and the SWL.

5.2.1 Inorganic Constituents

Laboratory analysis detected cobalt (MW-1 and MW-9), chromium (MW-1, MW-2, MW-6S, MW-8 and MW-10S) and vanadium (MW-1, MW-2, MW-6S, MW-9 and MW-10S) at concentrations above their respective 2L Standards. A summary of laboratory analytical results is provided in Table 3.

5.2.2 Organic Constituents

Laboratory analysis did not detect VOCs at concentrations above the method detection limits. A summary of laboratory analytical results is provided in Table 3.

5.2.3 Surface Water

Laboratory analysis of surface water samples did not detect constituents at concentrations above the 2B Standards. A summary of laboratory analytical results is provided in Table 3.

5.2.4 Leachate

Leachate samples were collected from the leachate collection system. A summary of constituents detected in the leachate sample is provided in Table 4.

6.0 STATISTICAL ANALYSIS

No statistical analyses were performed on the analytical data based on 15A NCAC 13B.1632 and .1633, effective April 1, 2011.

7.0 GROUNDWATER CHARACTERIZATION

A potentiometric surface map was prepared from groundwater elevation data collected during this sampling event. Based on groundwater elevation data measured during this sampling event, groundwater flow direction was determined to be to the northwest, consistent with historic groundwater flow patterns at the site. The potentiometric surface map is included as Drawing 1.

Groundwater flow velocities were also calculated for this sampling event. Groundwater flow velocities were calculated for monitoring wells using the equation:

$$V = Ki/n$$

Where: V = average velocity of groundwater flow

K = hydraulic conductivity

i = groundwater gradient

n = porosity

Groundwater velocities ranged from 0.1159 ft/day (MW-5) to 0.256 ft/day (MW-9) with an average of 0.0906 ft/day. A summary of the measurements and calculations are provided in Table 5.

8.0 CONCLUSIONS

Based on the results of the laboratory analysis, PEI concludes the following:

Laboratory analysis detected cobalt (MW-1 and MW-9), chromium (MW-1, MW-2, MW-6S, MW-8 and MW-10S) and vanadium (MW-1, MW-2, MW-6S, MW-9 and MW-10S) at concentrations above their respective 2L Standards. Organic constituents were not detected during this event.

The analytical results for the Phase II Lined Landfill are consistent with historic detections. Concentrations detected are likely due to variations in naturally occurring constituents and are not indicative of groundwater impact from the landfill.

9.0 QUALIFICATIONS OF REPORT

The activities and evaluative approaches used in this assessment are consistent with those normally employed in groundwater assessment projects of this type. Our evaluation of site conditions has been based on our understanding of the site project information and the data obtained during our field activities. This report was prepared for the express use of Davidson County Integrated Solid Waste.

DRAWINGS

Drawing 1 Potentiometric Map



MW-1
 TOC = 734.16
 DTW = 14.16
 GWE = 720.00

SW-1

MW-10S
 TOC = 668.58
 DTW = 16.35
 GWE = 652.28

MW-10D
 TOC = 668.76
 DTW = 16.48
 GWE = 652.28

MW-4S
 TOC = 673.82
 DTW = 19.70
 GWE = 654.12

MW-3S
 TOC = 660.73
 DTW = 8.35
 GWE = 652.38

Phase II
 Landfill

MW-2
 TOC = 664.06
 DTW = 11.41
 GWE = 652.65

MW-9
 TOC = 683.25
 DTW = 21.47
 GWE = 661.78

MW-5
 TOC = 687.31
 DTW = 28.52
 GWE = 658.79

MW-4D
 TOC = 673.54
 DTW = 18.77
 GWE = 654.77

Leachate

MW-3D
 TOC = 660.91
 DTW = 8.21
 GWE = 652.70

MW-8
 TOC = 711.14
 DTW = 47.58
 GWE = 663.56

MW-7

MW-6S
 TOC = 703.25
 DTW = 36.68
 GWE = 666.57

MW-6D

650

655

660

665

SW-2

LEGEND

-  Monitoring Well/Surface Water Sample
-  Waste Boundary
-  Groundwater Surface Contour

TOC = Top of Casing
 DTW = Depth to Water
 GWE = Groundwater Elevation

Monitoring wells MW-6D and MW-7 along with SW-3 were removed from the monitoring network in January 2013.

Drawing 1
 2015 Imagery from Google Earth
 Scale: 1" = 400'
 Date: May 12, 2016



Potentiometric Surface Map
 Davidson County Phase II Landfill
 Lexington, Davidson County,
 North Carolina
 PEI Project 1762

TABLES

Table 1	Groundwater Elevations
Table 2	Field Parameters
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Table 4	Leachate Analytical Data
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TABLE 1
Groundwater Elevations
Davidson County Phase II Landfill
3/24-25/2016

Monitoring Well	Well Installation Date	Latitude	Longitude	Well Diameter (Inches)	Total Well Depth (feet bgs)	Ground Surface Elevation (feet amsl)	TOC Elevation (feet amsl)	Depth to Water* (feet)	Groundwater Elevation (feet)	Screen Interval (feet bgs)	Screen Geology
MW-1	3/25/2008	35.85289	80.17643	2.0	20.0	730.65	734.16	14.16	720.00	10.0-20.0	sandy silt
MW-2	8/12/2008	35.84994	80.18351	2.0	14.5	661.05	664.06	11.41	652.65	9.5-14.5	sandy silt/granite
MW-3S	3/24/2008	35.84948	80.18486	2.0	18.0	657.87	660.73	8.35	652.38	8.0-18.0	clay and sand
MW-3D	3/26/2008	35.84948	80.18484	2.0	40.5	658.08	660.91	8.21	652.70	35.5-40.5	granite
MW-4S	3/24/2008	35.84953	80.18559	2.0	21.0	670.74	673.82	19.70	654.12	11.0-21.0	sandy silt with clay
MW-4D	3/26/2008	35.84952	80.18557	2.0	37.0	670.60	673.54	18.77	654.77	32.0-37.0	diorite
MW-5	3/24/2008	35.84863	80.18713	2.0	38.0	684.59	687.31	28.52	658.79	28.0-38.0	clayey silt
MW-6S	3/25/2008	35.84681	80.18525	2.0	40.0	700.00	703.25	36.68	666.57	30.0-40.0	sandy silt with gravel
MW-8	3/24/2008	35.84736	80.18404	2.0	58.6	708.21	711.14	47.58	663.56	48.6-58.6	diorite
MW-9	8/12/2008	35.84906	80.18614	2.0	30.5	683.68	683.25	21.47	661.78	20.5-30.5	diorite
MW-10S	9/21/2004	35.85083	80.18306	2.0	27.0	665.17	668.58	16.35	652.23	12.0-27.0	silty sand clay and gravel
MW-10D	9/21/2004	35.85082	80.18305	2.0	44.0	666.02	668.76	16.48	652.28	36.0-44.0	diabase

Notes:

amsl = above mean sea level

bgs = below ground surface

TOC = Top of casing

*Depth to water measured from TOC

TABLE 2
Field Parameters
Davidson County Phase II Landfill
3/24-25/2016

Monitoring Well	pH (Standard Units)	Conductivity (umhos)	Temperature (celsius)	Turbidity (NTU)
MW-1	6.26	285	17.5	184.4
MW-2	6.21	161	17.2	21.6
MW-3S	6.74	269	16.6	1.04
MW-4S	6.45	161	18.1	5.92
MW-5	6.36	129	19.4	21.78
MW-6S	6.45	575	18.8	272.8
MW-8	6.92	344	20.1	4.23
MW-9	6.56	271	20.3	24.34
MW-10S	6.37	302	16.9	61.5
SW-1	7.05	268	15.3	7.73
SW-2	7.01	184	15.8	5.79

Notes:

TABLE 3
Summary of Analytical Results
Davidson County Phase II Landfill
3/24-25/2016

Parameter	GROUNDWATER SAMPLING											Comparison Criteria					
	MW-1	MW-2	MW-3S	MW-4S	MW-5	MW-6S	MW-8	MW-9	MW-10S	SW-1	SW-2	MDL	MRL	SWSL	2L or GWP Standard	MCL	2B Standard
Volatile Organic Compounds																	
All Compounds	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--	--	--	--	--	--
Inorganic Constituents																	
antimony	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.9	5	6	1 [#]	6	640
arsenic	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.4	10	10	10	10	10
barium	209	31.9J	25.0J	15.8J	10.4J	288	3.48J	72.5J	25.9J	34.3J	27.2J	1.3	40	100	700	2,000	2,000,000
beryllium	0.435J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.4	1	1	4 [#]	4	6.5
cadmium	BDL	BDL	BDL	BDL	BDL	0.355J	0.330J	10.9	0.345J	BDL	BDL	0.3	1	1	2	5	2
cobalt	34.6	5.84J	BDL	BDL	1.84J	14.8	BDL	8.62J	6.06J	BDL	BDL	1.5	10	10	1 [#]	NE	270
copper	95	6.69J	BDL	BDL	1.77J	28.9	BDL	6.83J	6.92J	BDL	3.05J	1.1	10	10	1,000	1,300	7
chromium (total)	23	32	1.81J	2.30J	3.82J	16	12.4	9.87J	26.6	BDL	BDL	1.3	10	10	10	100	50
lead	BDL	BDL	2.31J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.71J	1.7	5	10	15	15	28
nickel	35.5J	9.77J	BDL	BDL	2.73J	11.8J	BDL	24.0J	10.4J	BDL	2.32J	1.7	10	50	100	NE	88
selenium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.5	10	10	20	50	5
silver	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.8	10	10	20	100	0.06
vanadium	140	36.8	8.66J	6.40J	11.7J	59.4	12.2J	37.5	29	BDL	BDL	1.8	10	25	0.3 [#]	NE	NE
zinc	96.3	26.6	21.6	16.3	18.4	71.7	22.7	70.9	30.2	21	11.9	2.9	2.9	10	1,000	5,000	50

Notes:

MDL = Method Detection Limit

MRL = Method Reporting Limit

SWSL = Solid Waste Section Quantitation Limits

2L = NCDEQ Groundwater Standards (15A NCAC 2L 0200)

GWP = Solid Waste Section Groundwater Protection Standards (noted by #)

MCL = Federal Maximum Contaminant Limit

2B = NCAC 2B Standards for Class C waters

NE = Standard Not Established

Results presented in ug/l, analogous to parts per billion (ppb)

BDL = Compound not detected at a concentration above the MDL

Bold denotes concentration exceeds the 2L or GWP Standard

J = Estimated concentration detected at concentration between the MDL and SWSL

TABLE 4
 Leachate Analytical Data
 Davidson County Phase II Landfill
 3/24-25/2016

Parameter	Unit	Leachate
BOD	mg/l	82.3
COD	mg/l	552
Total Suspended Residue	mg/l	54.4
Ammonia Nitrogen as N	mg/l	332
Total Phosphorus as P	mg/l	1.12
Sulfate	mg/l	50.6
Antimony	ug/l	BRL
Arsenic	ug/l	BRL
Barium	ug/l	248
Cobalt	ug/l	15.2
Chromium (Total)	ug/l	33.2
Copper	ug/l	1.24J
Lead	ug/l	1.79J
Nickel	ug/l	146
Selenium	ug/l	BRL
Vanadium	ug/l	33.7
Zinc	ug/l	25.2

Notes:

J = estimated concentrations between laboratory MDL and SWSL

mg/l = parts per million

ug/l = parts per billion

TABLE 5
Groundwater Velocity Calculations
Davidson County Phase II Landfill
3/24-25/2016

Monitoring Well	Aquifer	Conductivity (ft/day)	Conductivity (ft/min)	Assumed Porosity (n)	Gradient (i)	Velocity (ft/day)
MW-2	Sandy Silt	6.75E-02	4.69E-05	0.18	0.0783	0.0294
MW-3S	Sand	8.60E-02	5.97E-05	0.20	0.0374	0.0161
MW-4S	Sandy Silt	6.22E-02	4.32E-05	0.18	0.0400	0.0138
MW-5	Clayey Silt	4.31E-01	2.99E-04	0.18	0.0484	0.1159
MW-6S	Sand and Gravel	4.64E-01	3.22E-04	0.22	0.0125	0.0264
MW-8	Diorite	4.90E-01	3.40E-04	0.10	0.0360	0.1764
MW-9	Diorite	7.20E-01	5.00E-04	0.10	0.0356	0.2563

Notes:

Velocity calculated from $V=Ki/n$

V = Velocity

K= Hydraulic Conductivity

i= gradient

n= porosity

Hydraulic conductivity data from slug testing performed in 1994.

Porosity values assumed from Groundwater & Wells (Driscoll).

Gradient calculated from March 2016 potentiometric surface.

APPENDIX

Monitoring Well Logs

Laboratory Data Sheets and Chain of Custody Documents