



**THIS PAGE INTENTIONALLY LEFT BLANK**

# **Washington County C&D Landfill**

## **Ground Water Monitoring Report**

### **Spring 2012 Semi-annual Monitoring Event**

**Washington County C&D Landfill  
Washington, North Carolina  
NC Solid Waste Permit # 94-04 CDLF 1996**

Prepared for:  
**Washington County**  
P.O. Box 1007  
Plymouth, North Carolina 27962

**April 2012**



PRINTED ON 100% RECYCLED PAPER

**THIS PAGE INTENTIONALLY LEFT BLANK**

# Washington County C&D Landfill

## Semi-annual Ground Water Monitoring Report Spring 2012 Event

1.0 INTRODUCTION.....	1
2.0 REGIONAL GEOLOGY .....	1
3.0 SAMPLING PROCEDURES .....	1
4.0 FIELD AND LABORATORY DATA .....	1
4.1 Laboratory Analysis .....	1
4.2 Field and Laboratory Results .....	2
5.0 GROUND WATER CHARACTERIZATION.....	2
6.0 CONCLUSIONS.....	2

### **FIGURES**

Figure 1 – Washington County Landfill Site Map

### **TABLES**

Table 1 – Groundwater Elevations

Table 2 – Field Parameter Results

Table 3 – Detected Inorganic Constituents

### **APPENDICES**

Appendix A – Laboratory Analytical Report

**THIS PAGE INTENTIONALLY LEFT BLANK**

## **1.0 Introduction**

The Washington County C&D Landfill, operating under Solid Waste Permit #94-04-CDLF-1996, is required to perform semi-annual ground water monitoring in accordance with Solid Waste Section Rule 15A NCAC 13B.0500 (et. seq.). This report presents the semi-annual sampling results for the event conducted on March 1, 2012.

The Washington County Landfill is currently accepting C&D waste. The ground water monitoring network consists of four wells located around the landfill perimeter. This report includes summaries of the field procedures, laboratory analyses, and ground water characterization for the site.

## **2.0 Regional Geology**

The Washington County Landfill is located near Roper, North Carolina. According to the Geologic Map of North Carolina (*USGS, 1985*) this site is underlain by Quaternary surficial deposits including sand, gravel, clay and peat deposited in marine, fluvial, aeolian and lacustrine environments; typical for a coastal plain environment.

## **3.0 Sampling Procedures**

The sampling event, reportedly performed by Environment 1, Inc. on March 1, 2012, consisted of collecting samples from four ground water wells (CD-1 through CD-4) in accordance with the approved site Sampling and Analysis Plan.

Sampling methods followed the protocol outlined in the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities (North Carolina Department of Environment and Natural Resources, Division of Waste Management). The depth to water in each well was gauged prior to purging and sampling. Water table elevation data is included in **Table 1**. Field measurements for pH, specific conductivity, and temperature were recorded at each well.

Samples were collected in laboratory prepared containers for the specified analytical procedures. Ground water samples were properly preserved, placed on ice, and transported to the laboratory facility within the specified holding times for each analysis.

No surface water sampling locations are identified for this site.

## **4.0 Field & Laboratory Data**

### **4.1 Laboratory Analysis**

The ground water samples were transported to Environment 1, Inc., in Greenville, NC, a North Carolina certified laboratory (NC Wastewater ID #10). Samples were analyzed for the Appendix I VOCs per EPA Test Method 8260B, Appendix I and C&D metals via EPA Test Method 200.7 or 200.8, iron via Test Method SM3111B. Total alkalinity, chloride, total dissolved residue and sulfate were analyzed by the SWS approved method listed in the lab report. The laboratory analytical report is included as **Appendix A**.

## 4.2 Field and Laboratory Results

The field parameter results are included in **Table 2**. Constituents detected above the MDL are presented in **Table 3**.

The inorganic constituents barium (CD-3), beryllium (CD-1 and CD-2), cadmium (CD-1), cobalt (CD-1 and CD-2), iron (CD-1 through CD-4), manganese (CD-1 through CD-3) and zinc (CD-1 and CD-2) were detected above the SWSL. Of these, the following constituents were detected above the 2L/ground water standards:

- iron (CD-1, CD-2, CD-3 and CD-4);
- manganese (CD-1, CD-2 and CD-3);
- cobalt (CD-1 and CD-2); and
- beryllium (CD-1)

The indicator parameters alkalinity (CD-4), chloride (CD-1, CD-2 and CD-3) and sulfate (CD-1 and CD-2) were reported above the SWSL. Of these, two indicator parameters were reported above their 2L Standard:

- alkalinity (CD-4);
- sulfate (CD-1 and CD-2).

No volatile organic compounds (VOCs) were detected above the laboratory MDL.

Constituents reported between the MDL and the SWSL are denoted as “J” qualified values; which are not quantifiable values.

## 5.0 Ground Water Characterization

A single-day potentiometric surface map was prepared from ground water elevations based on data collected during this sampling event. Groundwater data from both the C&D landfill and the adjacent MSW landfill were used to prepare the potentiometric map. The data indicates that ground water flows generally in a north-northeastern direction. Hydraulic conductivity data is not available for these wells so ground water velocities could not be calculated. The potentiometric surface map is presented as **Figure 1**.

## 6.0 Conclusions

The data and analyses show relatively stable ground water quality at the Washington County C&D Landfill. The inorganic constituents detected are likely due to turbidity in the sample as these constituents are generally found to be naturally occurring in the soils across North Carolina.

The next ground water monitoring event is tentatively scheduled for September 2012. Results will be reported after receipt of laboratory analysis.

Figures

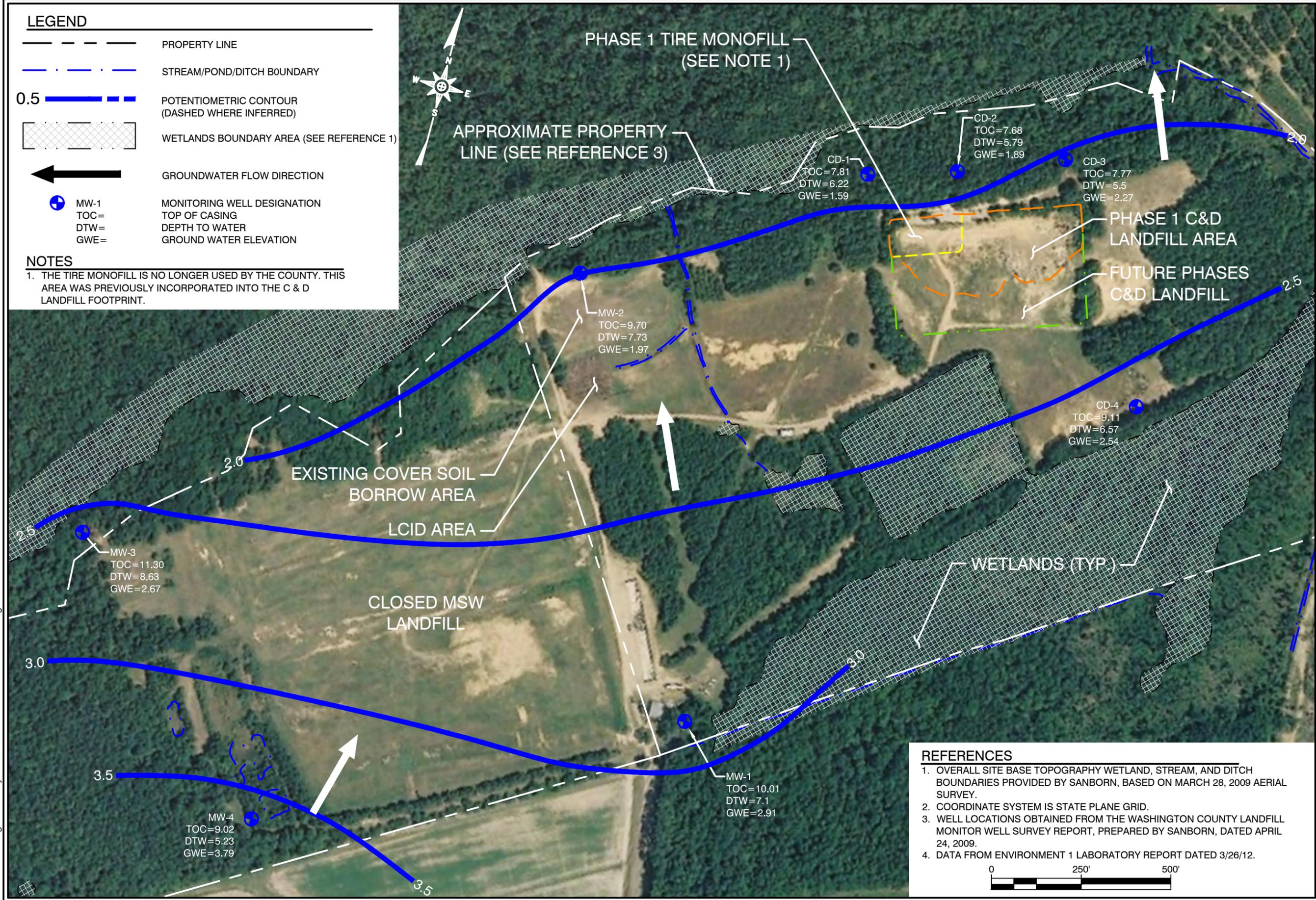
**THIS PAGE INTENTIONALLY LEFT BLANK**

**LEGEND**

-  PROPERTY LINE
-  STREAM/POND/DITCH BOUNDARY
-  0.5 POTENTIOMETRIC CONTOUR (DASHED WHERE INFERRED)
-  WETLANDS BOUNDARY AREA (SEE REFERENCE 1)
-  GROUNDWATER FLOW DIRECTION
-  MW-1 MONITORING WELL DESIGNATION  
 TOC=  
 DTW=  
 GWE=
-  MONITORING WELL DESIGNATION  
 TOP OF CASING  
 DEPTH TO WATER  
 GROUND WATER ELEVATION

**NOTES**

1. THE TIRE MONOFILL IS NO LONGER USED BY THE COUNTY. THIS AREA WAS PREVIOUSLY INCORPORATED INTO THE C & D LANDFILL FOOTPRINT.



PHASE 1 TIRE MONOFILL  
(SEE NOTE 1)

APPROXIMATE PROPERTY  
LINE (SEE REFERENCE 3)

PHASE 1 C&D  
LANDFILL AREA

FUTURE PHASES  
C&D LANDFILL

EXISTING COVER SOIL  
BORROW AREA

LCID AREA

CLOSED MSW  
LANDFILL

WETLANDS (TYP.)

**REFERENCES**

1. OVERALL SITE BASE TOPOGRAPHY WETLAND, STREAM, AND DITCH BOUNDARIES PROVIDED BY SANBORN, BASED ON MARCH 28, 2009 AERIAL SURVEY.
2. COORDINATE SYSTEM IS STATE PLANE GRID.
3. WELL LOCATIONS OBTAINED FROM THE WASHINGTON COUNTY LANDFILL MONITOR WELL SURVEY REPORT, PREPARED BY SANBORN, DATED APRIL 24, 2009.
4. DATA FROM ENVIRONMENT 1 LABORATORY REPORT DATED 3/26/12.



**RICHARDSON SMITH GARDNER & ASSOCIATES**  
NC LIC. NO. C-0028 (Engineering)  
 www.rsgengineers.com

ph: 919-826-0577  
 fax: 919-826-3899

14 N. Boylan Ave.  
 Raleigh, N.C. 27603

FIGURE NO.	1	FILE NAME	WASH-B0032
SCALE:	AS SHOWN	PROJECT NO.	WASH 08-2
CHECKED BY:	M.G.	DATE:	Apr. 2012
DRAWN BY:	W.R.B.		

**WASHINGTON COUNTY  
 MSW AND C&D LANDFILLS  
 POTENTIOMETRIC SURFACE MAP  
 SPRING 2012**

G:\CAD\Washington County\Wash 08-2\sheets\WASH-B0032.dwg - 4/26/2012 9:55 AM

THIS PAGE INTENTIONALLY LEFT BLANK

Tables

**THIS PAGE INTENTIONALLY LEFT BLANK**

**Table 1**  
**Groundwater Elevations**  
**Washington County C&D Landfill**  
**3/1/2012**

Well	Northing	Easting	TOC Elevation (feet)	Depth to Water (feet)	GW Elev (feet)
CD-1	799028.14	2691515.73	7.81	6.22	1.59
CD-2	799100.90	2691755.17	7.68	5.79	1.89
CD-3	799210.55	2692038.09	7.77	5.50	2.27
CD-4	798597.78	2692406.42	9.11	6.57	2.54

Lab data analyzed by Environmental 1, Inc. ID# 6030  
 measured from top of PVC casing.

Well locations and elevations provided by Sanborn, Charlotte, NC from field survey conducted on 4/8/09.

**Table 2**  
**Field Parameter Results**  
**Washington County C&D Landfill**  
**3/1/2012**

Well	pH (Std units)	Spec Cond (umhos/cm)	Temp (celsius)
CD-1	4.7	862	17
CD-2	4.2	1309	18
CD-3	5.1	409	18
CD-4	5.6	60	18

**Note:** Lab data analyzed by Environmental 1, Inc. ID# 6030

**Table 3**  
**Detected Inorganic Constituents**  
**Washington County C&D Landfill**  
**3/1/2012**

Parameter	SWSL	2L or GWP Standard	CD-1	CD-2	CD-3	CD-4
Alkalinity	NE	NE	ND	ND	ND	<b>6</b>
Chloride	5000	250000	<b>40000</b>	<b>113000</b>	<b>53000</b>	<5000
Sulfate	250000	250000	<b>367000</b>	<b>547000</b>	<b>26100 J</b>	10700 J
Arsenic	10	10	0.77 J	0.71 J	0.36 J	<0.10
Barium	100	700	17.3	34	<b>121</b>	12.2 J
Beryllium	1	4*	<b>4</b>	<b>2</b>	0.40 J	0.14
Cadmium	1	2	<b>1</b>	0.68 J	0.08 J	0.05 J
Cobalt	10	1*	<b>11</b>	<b>15</b>	<b>2.0 J</b>	<b>1.6 J</b>
Copper	10	1000	0.26	0.80 J	0.61 J	0.30 J
Total Chromium	10	10	0.63 J	0.86 J	0.50 J	0.11 J
Iron	300	300	<b>3926</b>	<b>11340</b>	<b>3752</b>	<b>902</b>
Manganese	50	50	<b>2116</b>	<b>2109</b>	<b>499</b>	47 J
Lead	10	15	0.38 J	0.55 J	1.5 J	0.30 J
Nickel	50	100	6.3 J	7.2 J	1.4 J	0.27 J
Selenium	10	20	4.5 J	1.9 J	<0.20	<0.20
Thallium	5.5	0.28*	0.05 J	0.13 J	<0.02	<0.02
Vanadium	25	0.3*	0.54 J	2.3 J	2.6 J	3.0 J
Zinc	10	1000	<b>14</b>	<b>42</b>	4.2 J	2.6 J

Note: Results are presented in ug/l (ppb).

- MDL - Method Detection Limit
- 2L - Groundwater Standard (15A NCAC 2L 0200)
- SWSL - Solid Waste Section Quantitation Limit
- ND - Not detected at or above the MDL
- Shading - Level above 2L Standard or no 2L Standard
- Bold Letters - Level above the SWSL or no SWSL
- J - Detected constituents between the MDL and the SWSL limit
- GWP - Groundwater Protection Standard (indicated with \*)
- NE - Not established

Note: Lab data analyzed by Environmental 1, Inc. ID# 6030  
GWP standard used if 2L Standard not established

THIS PAGE LEFT BLANK INTENTIONALLY

Appendix A

Laboratory Analytical Report

**THIS PAGE INTENTIONALLY LEFT BLANK**

# Environment 1, Incorporated

Drinking Water ID: 37715  
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE  
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208  
FAX (252) 756-0633

ID#: 6030

WASHINGTON CO. LANDFILL (C&D)  
MR. CARL CRITCHER  
P.O. BOX 1007  
PLYMOUTH ,NC 27962

DATE COLLECTED: 03/01/12  
DATE REPORTED : 03/26/12

REVIEWED BY: 

PARAMETERS	MDL	SWSL	CD-1	CD-2	CD-3	CD-4	Analysis		Method Code
							Date	Analyst	
PH (field measurement), Units			4.7	4.2	5.1	5.6	03/01/12	RJH	SM4500HB
Total Alkalinity, mg/l	1.0	1.0	--- U	--- U	--- U	6	03/02/12	TRB	SM2320B
Chloride, mg/l	5.0	5.0	40	113	53	---	U 03/06/12	HLB	SM4500-CLB
Total Dissolved Residue, mg/l	1.0	1.0	601	912	255	54	03/02/12	MEL	SM2540C
Sulfate, mg/l	5.0	250.0	367	547	26.1 J	10.7 J	03/06/12	TRB	SM426C
Antimony, ug/l	0.14	6.0	--- U	--- U	--- U	---	U 03/05/12	LFJ	EPA200.8
Arsenic, ug/l	0.10	10.0	0.77 J	0.71 J	0.36 J	---	U 03/05/12	LFJ	EPA200.8
Barium, ug/l	0.02	100.0	17.3 J	34.0 J	121	12.2 J	03/05/12	LFJ	EPA200.8
Beryllium, ug/l	0.02	1.0	4	2	0.40 J	0.14 J	03/05/12	LFJ	EPA200.8
Cadmium, ug/l	0.02	1.0	1	0.68 J	0.08 J	0.05 J	03/05/12	LFJ	EPA200.8
Cobalt, ug/l	0.03	10.0	11	15	2.0 J	1.6 J	03/05/12	LFJ	EPA200.8
Copper, ug/l	0.02	10.0	0.26 J	0.80 J	0.61 J	0.30 J	03/05/12	LFJ	EPA200.8
Total Chromium, ug/l	0.04	10.0	0.63 J	0.86 J	0.50 J	0.11 J	03/05/12	LFJ	EPA200.8
Iron, ug/l	15.9	300.0	3926	11340	3752	902	03/15/12	ADD	SM3111B
Manganese, ug/l	0.61	50.0	2116	2109	499	47 J	03/12/12	LFJ	EPA200.7
Lead, ug/l	0.02	10.0	0.38 J	0.55 J	1.5 J	0.30 J	03/05/12	LFJ	EPA200.8
Mercury, ug/l	0.05	0.20	--- U	--- U	--- U	---	U 03/05/12	LFJ	EPA200.8
Nickel, ug/l	0.04	50.0	6.3 J	7.2 J	1.4 J	0.27 J	03/05/12	LFJ	EPA200.8
Selenium, ug/l	0.20	10.0	4.5 J	1.9 J	---	---	U 03/05/12	LFJ	EPA200.8
Silver, ug/l	0.02	10.0	--- U	--- U	--- U	---	U 03/05/12	LFJ	EPA200.8
Thallium, ug/l	0.02	5.5	0.05 J	0.13 J	---	---	U 03/05/12	LFJ	EPA200.8
Vanadium, ug/l	0.14	25.0	0.54 J	2.3 J	2.6 J	3.0 J	03/05/12	LFJ	EPA200.8
Zinc, ug/l	0.24	10.0	14	42	4.2 J	2.6 J	03/05/12	LFJ	EPA200.8
Conductivity (at 25c), uMhos/cm	1.0	1.0	862	1309	409	60	03/01/12	RJH	SM2510B
Temperature, °C			17	18	18	18	03/01/12	RJH	SM2550B
Static Water Level, feet			6.22	5.79	5.50	6.57	03/01/12	RJH	
Well Depth, feet			22.90	19.90	21.45	20.67	03/01/12	RJH	

# Environment 1, Incorporated

Drinking Water ID: 37715  
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE  
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208  
FAX (252) 756-0633

CLIENT: WASHINGTON CO. LANDFILL (C&D)  
MR. CARL CRITCHER  
P.O. BOX 1007  
PLYMOUTH, NC 27962

CLIENT ID: 6030  
ANALYST: MAO  
DATE COLLECTED: 03/01/12  
DATE ANALYZED: 03/07/12  
DATE REPORTED: 03/26/12

Page: 1

REVIEWED BY: 

## VOLATILE ORGANICS EPA METHOD 8260B

PARAMETERS, ug/l	MDL	SWSL	CD-1	CD-2	CD-3	CD-4
1. Chloromethane	0.77	1.0	--- U	--- U	--- U	--- U
2. Vinyl Chloride	0.63	1.0	--- U	--- U	--- U	--- U
3. Bromomethane	0.67	10.0	--- U	--- U	--- U	--- U
4. Chloroethane	0.48	10.0	--- U	--- U	--- U	--- U
5. Trichlorofluoromethane	0.24	1.0	--- U	--- U	--- U	--- U
6. 1,1-Dichloroethene	0.17	5.0	--- U	--- U	--- U	--- U
7. Acetone	9.06	100.0	--- U	--- U	--- U	--- U
8. Iodomethane	0.26	10.0	--- U	--- U	--- U	--- U
9. Carbon Disulfide	0.23	100.0	--- U	--- U	--- U	--- U
10. Methylene Chloride	0.64	1.0	--- U	--- U	--- U	--- U
11. trans-1,2-Dichloroethene	0.23	5.0	--- U	--- U	--- U	--- U
12. 1,1-Dichloroethane	0.20	5.0	--- U	--- U	--- U	--- U
13. Vinyl Acetate	0.20	50.0	--- U	--- U	--- U	--- U
14. Cis-1,2-Dichloroethene	0.25	5.0	--- U	--- U	--- U	--- U
15. 2-Butanone	2.21	100.0	--- U	--- U	--- U	--- U
16. Bromochloromethane	0.27	3.0	--- U	--- U	--- U	--- U
17. Chloroform	0.25	5.0	--- U	--- U	--- U	--- U
18. 1,1,1-Trichloroethane	0.19	1.0	--- U	--- U	--- U	--- U
19. Carbon Tetrachloride	0.22	1.0	--- U	--- U	--- U	--- U
20. Benzene	0.24	1.0	--- U	--- U	--- U	--- U
21. 1,2-Dichloroethane	0.27	1.0	--- U	--- U	--- U	--- U
22. Trichloroethene	0.23	1.0	--- U	--- U	--- U	--- U
23. 1,2-Dichloropropane	0.21	1.0	--- U	--- U	--- U	--- U
24. Bromodichloromethane	0.21	1.0	--- U	--- U	--- U	--- U
25. Cis-1,3-Dichloropropene	0.24	1.0	--- U	--- U	--- U	--- U
26. 4-Methyl-2-Pentanone	1.19	100.0	--- U	--- U	--- U	--- U
27. Toluene	0.23	1.0	--- U	--- U	--- U	--- U
28. trans-1,3-Dichloropropene	0.28	1.0	--- U	--- U	--- U	--- U
29. 1,1,2-Trichloroethane	0.25	1.0	--- U	--- U	--- U	--- U
30. Tetrachloroethene	0.17	1.0	--- U	--- U	--- U	--- U
31. 2-Hexanone	1.57	50.0	--- U	--- U	--- U	--- U
32. Dibromochloromethane	0.24	3.0	--- U	--- U	--- U	--- U
33. 1,2-Dibromoethane	0.26	1.0	--- U	--- U	--- U	--- U
34. Chlorobenzene	0.30	3.0	--- U	--- U	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.22	5.0	--- U	--- U	--- U	--- U
36. Ethylbenzene	0.21	1.0	--- U	--- U	--- U	--- U
37. Xylenes	0.68	5.0	--- U	--- U	--- U	--- U
38. Dibromomethane	0.28	10.0	--- U	--- U	--- U	--- U
39. Styrene	0.19	1.0	--- U	--- U	--- U	--- U
40. Bromoform	0.20	3.0	--- U	--- U	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.26	3.0	--- U	--- U	--- U	--- U
42. 1,2,3-Trichloropropane	0.43	1.0	--- U	--- U	--- U	--- U
43. 1,4-Dichlorobenzene	0.39	1.0	--- U	--- U	--- U	--- U
44. 1,2-Dichlorobenzene	0.32	5.0	--- U	--- U	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.34	13.0	--- U	--- U	--- U	--- U
46. Acrylonitrile	2.72	200.0	--- U	--- U	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.42	100.0	--- U	--- U	--- U	--- U
48. Tetrahydrofuran	0.39	1.0	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

