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):

SHIELD ENGINEERING, INC.

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

Name: J. David Wallace, P.E. Phone: (704)-971-4149

E-mail: dwallace@shieldengineering.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
CITY OF ALBEMARLE LANDFILL	40592-B STONY GAP ROAD ALBEMARLE NORTH CAROLINA, 28001	84-01	.1600	July 6 - 7, 2015

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) East Plume Site (CAER - MNA)
☐ 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.

J. DAVID WALLACE, P.E. SENIOR ENGINEER (704)-971-4149

Facility Representative Name (Print) Title (Area Code) Telephone Number

J. David Wallace 10/2/15

Signature Date

Affix NC Licensed/ Professional Geologist Seal

NORTH CAROLINA PROFESSIONAL SEAL 20055 ENGINEER J. DAVID WALLACE

4301 TAGGART CREEK ROAD, CHARLOTTE, NC 28208

Facility Representative Address

F-0856

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

Revised 6/2009

SHIELD ENGINEERING, INC.

October 2, 2015

Mr. Ervin Lane,
Solid Waste Section
Division of Waste Management
NCDENR
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Subject: **City of Albemarle Landfill**
MNA Sampling Update – East Plume
DSWM Permit No. 84-01
Shield Project 1110192

Dear Mr. Lane:

As per our meeting of June 26, 2013, concerning the monitored natural attenuation (MNA) sampling at the City of Albemarle Landfill, we have completed the first biannual MNA sampling for the East Plume at the site. The purpose of this letter is to convey these MNA results to the Solid Waste Section (SWS) and review these data in the context of previous data collected for this plume, as per our agreement outlined in the SWS letter dated July 16, 2013.

Background

As you are aware, two plume areas (i.e., West Plume and the East Plume) had been previously identified in the vicinity of the active C&D and the closed MSWLF site at the City of Albemarle Landfill. This letter and data presented herein pertain to the East Plume. The West Plume is not due for MNA sampling for another two years. However, for completeness, the available data for the West Plume are included in the tables discussed below. The East Plume consists of the three monitoring wells (i.e., MW-3, MW-9, and MW-10: see Figure 1). The Corrective Action Plan for this plume had already been prepared and approved by the Solid Waste Section (SWS). As part of the monitoring for the East Plume, natural attenuation was evaluated, and a baseline MNA sampling consisting of four quarterly sampling events for the East Plume was completed in 2011.

4301 Taggart Creek Road
Charlotte, NC 28208

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Telephone 704.394.6913
Fax 704.394.6968

These MNA baseline analytical laboratory data were submitted to the SWS in a subsequent Corrective Action Effectiveness Report (CAER) dated April 21, 2011. Within this CAER the MNA analytical data were presented in several tables. Additionally, within this CAER a proposed long-term MNA sampling schedule was presented to the SWS for each of the two plumes (i.e., East and West Plumes). This sampling schedule consisted of different MNA parameters being analyzed with different frequencies. In response to this proposed long-term MNA sampling schedule, the SWS responded with an alternate sampling schedule for both of these two plumes in a letter dated July 11, 2011.

Shortly after the SWS letter of July 2011, Shield Engineering, Inc. (Shield) started conducting the groundwater monitoring at the City of Albemarle Landfill. The first sampling event using the long-term MNA sampling schedule following this letter was conducted in July 2012. This July 2012 sampling event was conducted as presented in the above referenced documents (i.e., CAER of April 21, 2011; and, the SWS letter dated July 11, 2011) and as a result did not include the full MNA parameter data set as presented by the United States Environmental Protection Agency (EPA) in their publication *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water*, dated September 1998 (EPA/600/R-98/128). Within this publication EPA had also presented a numeric weighting system for assessing the rate at which anaerobic degradation was occurring in each monitoring well. This weighting system provides a basis for evaluating changes in the degree of anaerobic degradation over time within the hydrogeologic system underlying the area of interest – the East Plume.

As a result the MNA data sets acquired from the July 2012 sampling event were incomplete (e.g., methane, ethane, ethene, hydrogen, volatile fatty acids, carbon dioxide were not performed as per the agreed sampling plan) precluding an effective comparison of the rate of degradation for the July 2012 sampling event with the baseline degradation rates.

Hence, in a letter dated April 25, 2013 Shield revisited the long-term MNA sampling requirements outlined in previous documents. In so doing, Shield prepared a composite

evaluation of the MNA parameters from the four baseline sampling events previously performed using the numeric weighting tools presented by the EPA (EPA, 1998). The weighting scores assigned to each MNA parameter are cumulated into a composite score. These composite scores were presented to SWS in the April 25, 2013 letter and were later revised in an e-mail to Brain Wootton of SWS dated June 17, 2013. In the same e-mail, tables with the supporting laboratory data for these weighting scores were also submitted. In so doing, a revised sampling schedule was proposed to SWS with full MNA parameter sampling proposed with a biannual schedule for the East Plume, rather than partial MNA parameter sampling events at more frequent intervals. Similarly, the West Plume sampling schedule was established using a four-year frequency. Even though the purpose of this letter is to report on the East Plume, the baseline data for the West Plume are also included in the attached tables for completeness.

In a meeting in Raleigh on June 26, 2013, SWS agreed to the revised MNA sampling schedule, and this agreement was confirmed in a letter from SWS dated July 16, 2013.

MNA Analytical Data and Methodology – July 2015

The analytical laboratory data reports for the biannual MNA sampling of the East Plume have already been submitted to the SWS both in a portable document format and as an Microsoft Excel file format with the July 2015 Groundwater Monitoring Report, submitted to the SWS by e-mail on September 9, 2015. At the June 26, 2013 meeting Shield was also requested to resubmit the same tables previously sent to the SWS by e-mail on June 17, 2013, when sending the next submittal for the MNA sampling reporting. Therefore, these three updated tables are attached with this letter.

Table 1 exhibits the analytical data for the MNA parameters and Table 2 exhibits the weighting scores for the analytical data presented on the corresponding page number of Table 1. The weighting scores were developed from guidance presented in Table 2.3 of the EPA publication *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water*, dated September 1998 (EPA/600/R-98/128). Some of the MNA parameters (e.g., alkalinity, chloride, and carbon dioxide) are compared to background concentrations and these

average background (i.e., MW-1) concentrations from the four baseline values are shown in the lower left corner of the last two pages of Table 2 (pages 5 and 6). Table 3 is a summary of the cumulative weighting scores for each well for all of the sampling events for both plumes. This EPA scoring methodology provides a basis for assessing the ongoing status of anaerobic degradation within the underlying subsurface environment in the East Plume. Though the MNA sampling in July 2012 did not include all of the MNA parameters, for completeness these analytical data and the partial weighting scores are included in Tables 1 through 4.

Review of MNA Data

Together these MNA weighting scores show that the anaerobic biodegradation processes became more evident within the subsurface environment in the vicinity of Monitoring Well MW-3 during the baseline sampling event (i.e., July 2009 through January 2011). Based on the most recent weighting score the evidence indicates that there is strong evidence of anaerobic degradation processes in this area of the East Plume. The most recent weighting score for Monitoring Well MW-9 (i.e., 22) is larger than the previous weighting scores for this well. Similarly, this score indicates that there is strong evidence of anaerobic degradation processes in the vicinity of Monitoring Well MW-9. The weighting score for Monitoring Well MW-10 is similar to some of the previous weighting scores, though it is appreciably higher than the last complete weighting score (i.e., 7 for January 2011) shown for this well.

As before, evidence of anaerobic biodegradation remains strong in both Monitoring Wells MW-3 and MW-9. Additionally, the degree of anaerobic degradation had improved in Monitoring Well MW-10 since the last sampling event. In general, these MNA weighting scores correlate with the presence of total volatile organic constituents (VOCs) in these same wells (see Table 4). Both Monitoring Wells MW-3 and MW-9 had total VOC concentrations of 14.94 and 28.55 μg/l, whereas the total VOC for Monitoring Well MW-10 was 0.56 μg/l.

For the total VOC concentration data shown in Table 4 (excluding data from July 2012), for example, those wells exhibiting "strong evidence of anaerobic degradation" on Table 3 (i.e., shown as red cells, with MNA weighting scores above 20), the average total VOC concentration

is about 16.5 µg/l, whereas for those dates and wells that exhibit yellow and green cells on Tables 3 and 4, the average total VOC concentrations are 4.5 and 12.7 µg/l, respectively. (Note: The latter average of 12.7 µg/l is skewed by one elevated concentration of 115 µg/l for total VOCs in MW-10 [July 2009]). Hence, with the continued sampling and analysis for VOCs in these same wells, and the strong correlation with anaerobic biodegradation processes, the semi-annual sampling events for VOCs is a good indicator of changing subsurface anaerobic conditions.

Closing

The weighting scores indicate that for those wells with elevated total VOC concentrations (i.e., MW-3 and MW-9) there is strong evidence of the anaerobic degradation processes continuing to exhibit a presence within the subsurface environment of the East Plume. The anaerobic biodegradation processes continue to be strongest within the subsurface environment in the vicinity of Monitoring Well MW-3. The most recent weighting scores for the other two wells improved compared to the previous weighting scores, and the score for Monitoring Well MW-10 is appreciably higher than the last score shown for this well (i.e., 7). Hence, the degree of anaerobic degradation had improved in Monitoring Well MW-10 since the last sampling event. Based on the good correlation of total VOCs with anaerobic biodegradation processes, the analytical data from the semi-annual sampling events for VOCs continues to be a good indicator of changing subsurface anaerobic conditions. The most recent weighting scores provide strong evidence that anaerobic degradation processes are continuing to be evident in this area of the East Plume.

If you should have any questions please do not hesitate to contact David Wallace either by e-mail at dwallace@shieldengineering.com or by phone at 704-394-6913.

Sincerely,
SHIELD ENGINEERING, INC.

J. David Wallace, P.E.
Senior Engineer

NORTH CAROLINA PROFESSIONAL SEAL 20055 10-2-15 ENGINEER J. DAVID WALLACE

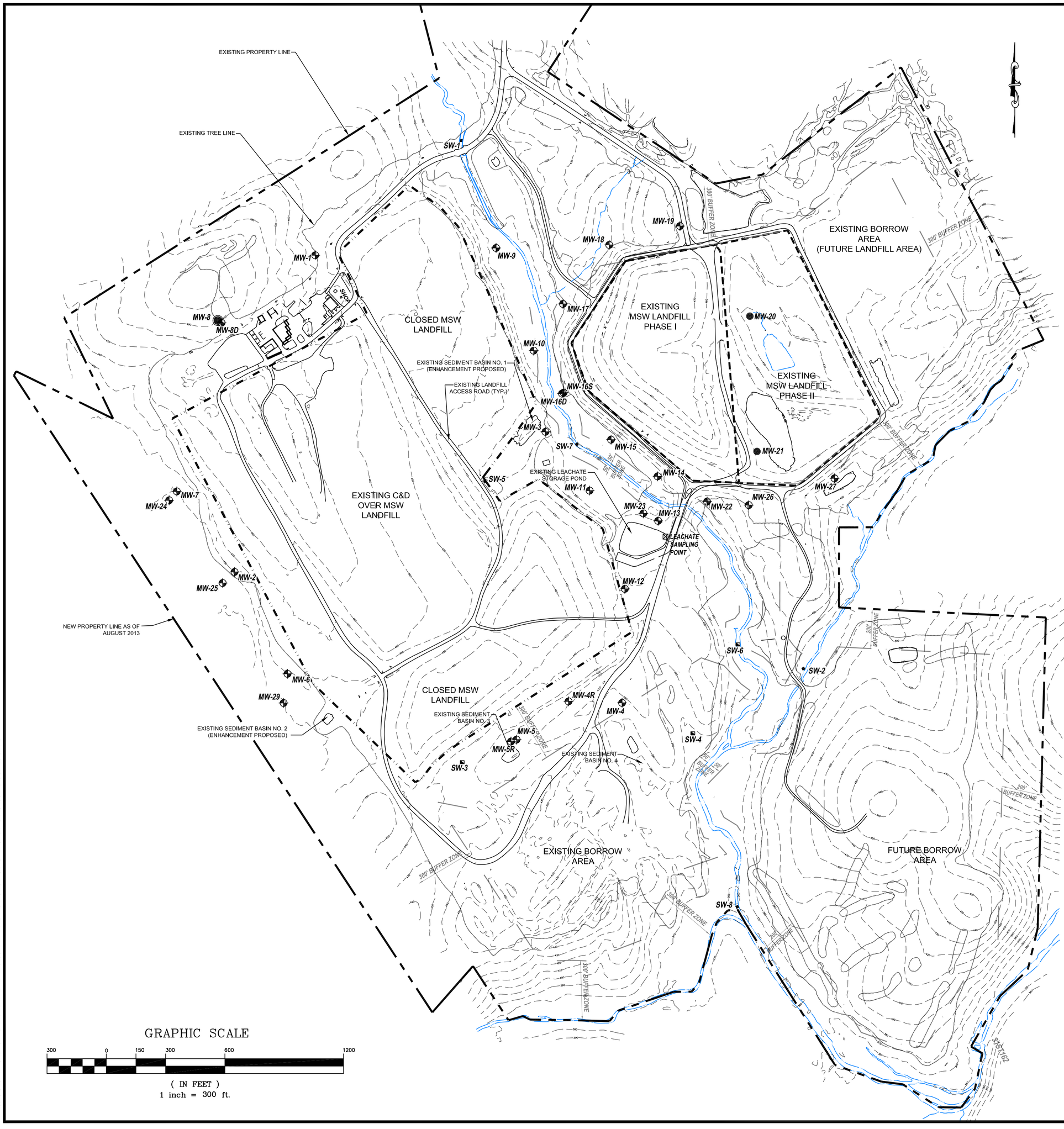
Keith A. Anthony, P.E.
Chief Engineer

JDW/KAA

SHIELD ENGINEERING, INC.

Attachments: Figure 1 Water Quality Sampling Locations
Table 1 Monitored Natural Attenuation Data (2009-2015)
Table 2 Monitored Natural Attenuation Scores (2009-2015)
Table 3 Summary of Natural Attenuation Data (2009-2015)
Table 4 Summary of Total Volatile Organic Compounds (2009-2015)

cc: Ms. Nina Underwood, Public Works Director
Mr. Darren Preslar, Assistant Public Works Director



LEGEND

- 2013 CONTOURS
- PROPERTY LINE
- ROAD
- WATER
- CLOSED MSWLF SANITARY UNIT
- EXISTING MSWLF SANITARY UNIT
- BUFFER ZONE
- SW-1 SURFACE WATER SAMPLING LOCATION
- MW-4 MONITORING WELL
- SW-3 ABANDONED SURFACE WATER SAMPLING LOCATION
- MW-21 ABANDONED MONITORING WELL
- LEACHATE SAMPLING POINT
- > < CULVERT PIPE
-] (CULVERT HEADWALL

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WATER QUALITY SAMPLING LOCATIONS

CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA
SHIELD PROJECT # 1110192-02

DATE:	3/5/15	DRAWN BY:	RBS
SCALE:	AS SHOWN	FIGURE:	1

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TABLE 1
MONITORED NATURAL ATTENUATION DATA (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	GROUNDWATER SAMPLE IDENTIFICATION								
			MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			7/28/2009	7/29/2009	7/28/2009	7/29/2009	7/29/2009	7/28/2009	7/28/2009	7/29/2009	7/29/2009
VOLATILE ORGANIC COMPOUNDS											
Benzene	µg/l	1	ND	ND	ND	ND	**1.9**	ND	ND	ND	ND
Cis-1,2-Dichloroethene	µg/l	70	ND	ND	ND	ND	**1**	**0.69**	ND	ND	ND
Chlorobenzene	µg/l	50	ND	ND	ND	**0.38**	**5**	ND	ND	ND	ND
1,1-Dichloroethane	µg/l	6	ND	ND	ND	**2.4**	**2.6**	**0.74**	ND	ND	ND
1,4-Dichlorobenzene	µg/l	6	ND	ND	ND	**0.34**	**1.9**	ND	ND	ND	ND
Trans-1,2-Dichloroethene	µg/l	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/l	0.7	ND	ND	ND	**1**	ND	**0.83**	ND	ND	ND
Toluene	µg/l	600	ND	**0.72**	**0.31**	ND	ND	ND	**115**	ND	ND
Trichloroethene	µg/l	3	ND	ND	ND	ND	ND	**0.7**	ND	ND	ND
Vinyl Chloride	µg/l	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	µg/l	500	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organic Compounds			**0**	**0.72**	**0.31**	**4.12**	**12.4**	**2.96**	**115**	**0**	**0**
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE	**17.7**	**29.9**	**119**	**37.6**	**176**	**58.6**	**673**	**97.4**	**47.6**
Methane	µg/l	NE	**42**	**240**	**12**	**39**	**240**	**7.6**	**1.6**	**0.62**	**3.1**
Ethane	µg/l	NE	**0.002**	**0.059**	**0.002**	**0.004**	**0.061**	**0.008**	**0.003**	**0.002**	**0.21**
Ethene	µg/l	NE	**0.006**	**0.006**	**0.006**	**0.031**	**0.003**	**0.008**	**0.011**	**0.009**	**0.17**
Nitrate	mg/l	10	**0.201**	**3.2**	**23**	**10**	**<0.1**	**0.283**	**2.7**	**<0.1**	**1.68**
Sulfide	µg/l	NE	**<31**	**<31**	**<31**	**<31**	**<31**	**<31**	**<31**	**<31**	**<31**
COD	mg/l	NE	**56.3**	**84.4**	**46.8**	**26.7**	**<25**	**25.2**	**113**	**99.6**	**71.5**
BOD	mg/l	NE	**2.7**	**56.7**	**2.7**	**<2**	**5.1**	**2.7**	**11.7**	**2.1**	**5.7**
Total Chloride	mg/l	250	**17.4**	**<5**	**35.3**	**15.1**	**95.8**	**53.8**	**265**	**36.6**	**34.2**
Total Iron	mg/l	0.3	**39.1**	**2.68**	**0.207**	**1.09**	**0.0943**	**3.01**	**1.77**	**2.18**	**3.77**
Total Organic Carbon	mg/l	NE	**12.5**	**37.6**	**19.9**	**6.7**	**17.3**	**6.4**	**39.3**	**31.6**	**18.4**
Total Sulfate	mg/l	250	**10.6**	**80.5**	**189**	**8.73**	**<5**	**15.2**	**10.7**	**29.3**	**32.1**
Hydrogen	nM	NE	**0.96**	**0.62**	**0.84**	**1.1**	**0.49**	**0.85**	**0.82**	**0.73**	**0.78**
Acetic Acid	mg/l	NE	ND	**0.14**	**0.022**	ND	ND	ND	**0.65**	**0.035**	**0.016**
Butyric Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lactic Acid	mg/l	NE	**0.18**	**0.057**	**0.11**	**0.09**	**0.14**	**0.054**	**0.45**	**0.09**	**0.092**
Propionic Acid	mg/l	NE	ND	**0.094**	ND	ND	ND	ND	**0.18**	ND	ND
Pyruvic Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5	5.38	6.21	6.08	5.81	6.31	6.4	6.79	6.66	6.01
Temperature	°C	NE	20.1	19.3	20.4	18.1	17.2	18.4	18.6	18.2	17.2
Conductivity	µS/cm	NE	570	1200	1100	200	1000	700	370	480	330
Dissolved Oxygen	mg/l	NE	0.8	1.3	2.4	1.3	0.8	1.8	0.9	1.9	1.3
Carbon Dioxide - Dissolved	mg/l	NE	30	>100	>100	90	>100	>100	30	30	70
Turbidity	NTU	NE	7.19	11.7	5.39	14.4	7.92	69.6	18.1	8.81	9.82
Oxidation Reduction Potential	mV	NE	156	61	113	224	38	98	106	105	42

NOTES: 1) Standards were taken from the North Carolina Administrative Code, Title 15A, Chapter 2L, Section .0202 Groundwater Quality Standards (NC 2L Standards).
2) µg/l - micrograms per liter
3) mg/l - milligrams per liter
4) s.u - standard units
5) °C - degrees Celsius
6) µs/cm - microSiemens per Centimeter
7) NTU - nephelometric turbidity unit
8) mV - millivolt
9) J - The analyte was positively identified but the value is estimated below the laboratory reporting limit.
10) ND - Not detected at or above laboratory method detection limits.
11) NE - Not established

East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 1
MONITORED NATURAL ATTENUATION DATA (2009-2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	GROUNDWATER SAMPLE IDENTIFICATION								
			MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			1/20/2010	1/21/2010	1/20/2010	1/21/2010	1/21/2010	1/20/2010	1/20/2010	1/21/2010	1/21/2010
VOLATILE ORGANIC COMPOUNDS											
Benzene	µg/l	1	ND	ND	ND	ND	**2.5**	ND	ND	ND	ND
Cis-1,2-Dichloroethene	µg/l	70	ND	ND	ND	ND	**1.4**	ND	ND	ND	ND
Chlorobenzene	µg/l	50	ND	ND	ND	ND	**5.4**	ND	ND	ND	ND
1,1-Dichloroethane	µg/l	6	ND	ND	ND	ND	**3.4**	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/l	6	ND	ND	ND	ND	**1.9**	ND	ND	ND	ND
Trans-1,2-Dichloroethene	µg/l	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/l	0.7	ND	ND	ND	ND	**0.54**	ND	ND	ND	ND
Toluene	µg/l	600	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/l	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/l	0.03	ND	ND	ND	ND	**0.45**	ND	ND	ND	ND
Xylenes	µg/l	500	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organic Compounds			**0**	**0**	**0**	**0**	**15.59**	**0**	**0**	**0**	**0**
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE	ND	**100**	**180**	**13**	**150**	**30**	**630**	**54**	**41**
Methane	µg/l	NE	**2.8**	**1100**	**24**	**9.5**	**360**	**0.26**	ND	**1.4**	**11**
Ethane	µg/l	NE	ND	**0.056**	ND	ND	**0.041**	ND	ND	ND	ND
Ethene	µg/l	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrate	mg/l	10	**0.06**	**0.26**	**2.1**	**14**	**0.038**	**0.17**	**10**	**190**	**0.18**
Sulfide	µg/l	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
COD	mg/l	NE	**18**	**55**	**61**	**25**	**3.1**	**100**	**190**	**5.3**	**14**
BOD	mg/l	NE	ND	ND	**8.2**	ND	ND	ND	**43**	ND	**2.4**
Total Chloride	mg/l	250	**3.7**	**43**	**34**	**6.4**	**86**	**44**	**290**	**35**	**52**
Total Iron	mg/l	0.3	**2.74**	**8.8**	**2.96**	**1.26**	**0.0201**	**8.45**	**1.33**	**2.4**	**4.67**
Total Organic Carbon	mg/l	NE	**9.3**	**12**	**21**	**6.3**	**7.4**	**3.9**	**51**	**5**	**7.6**
Total Sulfate	mg/l	250	**7.3**	**60**	**150**	**31**	**5.4**	**11**	**8.7**	**50**	**47**
Hydrogen	nM	NE	**0.77**	**0.87**	**1.1**	**1.2**	**0.94**	**2**	**0.66**	**1.1**	**1.1**
Acetic Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	**0.41**	ND	ND
Butyric Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lactic Acid	mg/l	NE	ND	ND	ND	**0.12**	ND	ND	**0.34**	ND	**0.16**
Propionic Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	**0.1**	ND	ND
Pyruvic Acid	mg/l	NE	ND	ND	ND	**0.11**	**0.24**	ND	**0.1**	ND	ND
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5	5.75	5.82	6.44	5.62	6.32	6.42	6.81	6.91	5.79
Temperature	°C	NE	15.4	11.5	14.5	12.7	9.9	12.8	12.1	10.5	9.8
Conductivity	µS/cm	NE	73	470	722	228	960	626	366	1341	382
Dissolved Oxygen	mg/l	NE	0.9	0.5	0.3	0.9	0.8	1.3	0.9	0.4	0.5
Carbon Dioxide - Dissolved	mg/l	NE	30	>100	>100	90	>100	>100	30	60	60
Turbidity	NTU	NE	9.86	12.3	6.36	16.2	8.88	68.3	23.2	10.2	9.86
Oxidation Reduction Potential	mV	NE	183	155	53	232	21	63	89	123	194

NOTES:
1) Standards were taken from the North Carolina Administrative Code, Title 15A, Chapter 2L, Section .0202 Groundwater Quality Standards (NC 2L Standards).
2) µg/l - micrograms per liter
3) mg/l - milligrams per liter
4) s.u - standard units
5) °C - degrees Celsius
6) µs/cm - microSiemens per Centimeter
7) NTU - nephelometric turbidity unit
8) mV - millivolt
9) J - The analyte was positively identified but the value is estimated below the laboratory reporting limit.
10) ND - Not detected at or above laboratory method detection limits.
11) NE - Not established

East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 1
MONITORED NATURAL ATTENUATION DATA (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	GROUNDWATER SAMPLE IDENTIFICATION								
			MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			7/21/2010	7/22/2010	7/21/2010	7/22/2010	7/21/2010	7/22/2010	7/21/2010	7/21/2010	7/21/2010
VOLATILE ORGANIC COMPOUNDS											
Benzene	µg/l	1	ND	ND	ND	ND	**2.8**	ND	ND	ND	ND
Cis-1,2-Dichloroethene	µg/l	70	ND	ND	ND	ND	**2.1**	**3.2**	ND	ND	ND
Chlorobenzene	µg/l	50	ND	**0.59**	ND	**0.41**	**5.4**	**1.2**	ND	ND	ND
1,1-Dichloroethane	µg/l	6	ND	ND	ND	**1.9**	**3.5**	**2.2**	ND	ND	**0.55**
1,4-Dichlorobenzene	µg/l	6	ND	ND	ND	ND	**2**	**0.65**	ND	ND	ND
Trans-1,2-Dichloroethene	µg/l	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/l	0.7	ND	ND	ND	**0.64**	**0.65**	**2.4**	ND	ND	ND
Toluene	µg/l	600	**8**	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/l	3	ND	ND	ND	ND	ND	**1.8**	ND	ND	ND
Vinyl Chloride	µg/l	0.03	ND	ND	ND	ND	**0.42**	**0.5**	ND	ND	ND
Xylenes	µg/l	500	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organic Compounds			**8**	**0.59**	**0**	**2.95**	**16.87**	**11.95**	**0**	**0**	**0.55**
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE	**19**	**180**	**420**	**40**	**560**	**110**	**690**	**99**	**80**
Methane	µg/l	NE	**220**	**120**	**210**	**55**	**630**	**99**	**310**	**0.96**	**34**
Ethane	µg/l	NE	ND	**0.038**	ND	ND	**0.096**	**0.1**	ND	ND	ND
Ethene	µg/l	NE	ND	**0.014**	ND	ND	ND	**0.012**	ND	ND	ND
Nitrate	mg/l	10	**<0.025**	**<0.025**	**0.034**	**10**	**<0.025**	**<0.025**	**3.9**	**0.07**	**<0.025**
Sulfide	µg/l	NE	**<31**	**<31**	**<31**	**<31**	**<31**	**<31**	**<31**	**<31**	**<31**
COD	mg/l	NE	**68**	**68**	**150**	**2.8**	**14**	**16**	**130**	**18**	**66**
BOD	mg/l	NE	**2.9**	**<2**	**5.6**	**<2**	**<2**	**<2**	**17**	**<2**	**<2**
Total Chloride	mg/l	250	**4.7**	**36**	**150**	**11**	**130**	**78**	**320**	**35**	**51**
Total Iron	mg/l	0.3	**21**	**25.5**	**1.33**	**0.668**	**0.248**	**25.5**	**5.8**	**4.64**	**13.2**
Total Organic Carbon	mg/l	NE	**8.4**	**14**	**49**	**--**	**5.4**	**--**	**35**	**4**	**7.2**
Total Sulfate	mg/l	250	**11**	**100**	**3.7**	**8**	**3.7**	**13**	**9**	**24**	**26**
Hydrogen	nM	NE	**1.7**	**1**	**0.89**	**1.6**	**1.3**	**0.88**	**1**	**0.91**	**1.1**
Acetic Acid	mg/l	NE	ND	ND	**0.084**	ND	ND	ND	**0.16**	ND	ND
Butyric Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lactic Acid	mg/l	NE	ND	**2**	**3**	ND	ND	ND	ND	ND	ND
Propionic Acid	mg/l	NE	ND	ND	**0.074**	ND	ND	ND	ND	ND	ND
Pyruvic Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5	5.63	5.96	6.51	5.6	6.96	6.45	6.93	6.88	5.91
Temperature	°C	NE	18.2	17.8	18	17.5	19.1	18	20.2	18.2	18
Conductivity	µS/cm	NE	77	443	710	201	883	303	342	1070	380
Dissolved Oxygen	mg/l	NE	0.8	0.4	0.4	0.7	0.8	1.1	0.9	0.6	0.5
Carbon Dioxide - Dissolved	mg/l	NE	30	>100	>100	80	>100	>100	30	60	60
Turbidity	NTU	NE	103	12.7	18.2	19.1	7.9	73.2	68.1	13.2	9.98
Oxidation Reduction Potential	mV	NE	163	137	48	201	38	60	81	119	168

NOTES: 1) Standards were taken from the North Carolina Administrative Code, Title 15A, Chapter 2L, Section .0202 Groundwater Quality Standards (NC 2L Standards).
2) µg/l - micrograms per liter
3) mg/l - milligrams per liter
4) s.u - standard units
5) °C - degrees Celsius
6) µs/cm - microSiemens per Centimeter
7) NTU - nephelometric turbidity unit
8) mV - millivolt
9) J - The analyte was positively identified but the value is estimated below the laboratory reporting limit.
10) ND - Not detected at or above laboratory method detection limits.
11) NE - Not established

East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 1
MONITORED NATURAL ATTENUATION DATA (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	GROUNDWATER SAMPLE IDENTIFICATION								
			MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			1/18/2011	1/18/2011	1/19/2011	1/19/2011	1/19/2011	1/19/2011	1/19/2011	1/19/2011	1/19/2011
VOLATILE ORGANIC COMPOUNDS											
Benzene	µg/l	1	ND	ND	ND	**0.4**	**2.6**	ND	ND	ND	ND
Cis-1,2-Dichloroethene	µg/l	70	ND	ND	**0.62**	ND	**1.7**	ND	ND	ND	ND
Chlorobenzene	µg/l	50	ND	**0.51**	**2.8**	**0.74**	**5.4**	ND	ND	ND	ND
1,1-Dichloroethane	µg/l	6	ND	ND	**1.1**	**2.7**	**3.1**	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/l	6	ND	ND	**0.65**	**0.66**	ND	ND	ND	ND	ND
Trans-1,2-Dichloroethene	µg/l	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/l	0.7	ND	ND	ND	**1.4**	**0.64**	ND	ND	ND	ND
Toluene	µg/l	600	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/l	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	µg/l	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	µg/l	500	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organic Compounds			**0**	**0.51**	**5.17**	**5.9**	**13.44**	**0**	**0**	**0**	**0**
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE	**8.2**	**66**	**490**	**29**	**600**	**24**	**220**	**170**	**18**
Methane	µg/l	NE	**0.38**	**100**	**258**	**500**	**140**	**6.3**	**5.3**	**1.5**	**1.6**
Ethane	µg/l	NE	ND	**0.038**	**0.031**	**0.017**	**0.029**	ND	ND	ND	ND
Ethene	µg/l	NE	**0.024**	ND	ND	**0.12**	ND	ND	ND	ND	ND
Nitrate	mg/l	10	**0.051**	**<.025**	**<.025**	**2.3**	**<.025**	**0.23**	**170**	**<.025**	**1.2**
Sulfide	µg/l	NE	**<10**	**<10**	**<10**	**<10**	**<10**	**<10**	**<10**	**<10**	**<10**
COD	mg/l	NE	**59**	**70**	**70**	**5.3**	**31**	**31**	**100**	**31**	**74**
BOD	mg/l	NE	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**
Total Chloride	mg/l	250	**4.1**	**42**	**100**	**11**	**140**	**51**	**580**	**21**	**25**
Total Iron	mg/l	0.3	**11**	**11**	**1.26**	**0.543**	**0.703**	**1.35**	**0.565**	**4.3**	**7.43**
Total Organic Carbon	mg/l	NE	**12**	**13**	**19**	**2.2**	**7.1**	**3.7**	**15**	**2.9**	**7**
Total Sulfate	mg/l	250	**26**	**190**	**150**	**4.3**	**4.1**	**14**	**17**	**6.6**	**35**
Hydrogen	nM	NE	**0.78**	**0.96**	**1.44**	**1.3**	**1.1**	**1.2**	**0.82**	**0.98**	**1.2**
Acetic Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	ND	**0.076**	ND
Butyric Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lactic Acid	mg/l	NE	**0.14**	ND	ND	**0.2**	**0.16**	**0.13**	**0.21**	ND	ND
Propionic Acid	mg/l	NE	ND	ND	ND	ND	ND	ND	ND	**0.076**	ND
Pyruvic Acid	mg/l	NE	ND	ND	ND	ND	**0.29**	ND	**0.21**	ND	ND
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5	4.89	5.99	6.8	5.6	6.38	6.47	6.87	6.79	6.11
Temperature	°C	NE	12.7	16.1	15.4	15	15.2	10.5	12.8	15.3	14.6
Conductivity	µS/cm	NE	130	468	1247	181	1197	318	346	367	2.21
Dissolved Oxygen	mg/l	NE	0.9	0.4	0.5	0.6	0.8	1.6	0.8	0.4	0.8
Carbon Dioxide - Dissolved	mg/l	NE	30	>100	>100	90	>100	>100	30	50	60
Turbidity	NTU	NE	72.1	136	19.1	20.3	12.8	96.1	73.6	19.8	80.7
Oxidation Reduction Potential	mV	NE	231	121	-112	416	396	124	71	381	156

NOTES: 1) Standards were taken from the North Carolina Administrative Code, Title 15A, Chapter 2L, Section .0202 Groundwater Quality Standards (NC 2L Standards).
2) µg/l - micrograms per liter
3) mg/l - milligrams per liter
4) s.u - standard units
5) °C - degrees Celsius
6) µs/cm - microSiemens per Centimeter
7) NTU - nephelometric turbidity unit
8) mV - millivolt
9) J - The analyte was positively identified but the value is estimated below the laboratory reporting limit.
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East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 1
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CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	GROUNDWATER SAMPLE IDENTIFICATION								
			MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
				7/18/2012	7/18/2012	7/18/2012	7/18/2012	7/18/2012	7/18/2012		
VOLATILE ORGANIC COMPOUNDS											
Benzene	µg/l	1	NS	ND	ND	ND	**2**	ND	ND	ND	ND
Cis-1,2-Dichloroethene	µg/l	70	NS	ND	**0.72**	ND	**1.2**	**5.3**	ND	ND	ND
Chlorobenzene	µg/l	50	NS	**1.1**	**7.6**	**0.53**	**6.8**	**1.8**	ND	ND	ND
1,1-Dichloroethane	µg/l	6	NS	ND	**2.5**	**1.4**	**1.6**	**2.9**	**0.55**	ND	ND
1,4-Dichlorobenzene	µg/l	6	NS	**0.49**	**2**	**0.42**	**2.5**	**1.1**	ND	ND	ND
Trans-1,2-Dichloroethene	µg/l	100	NS	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/l	0.7	NS	ND	**0.52**	**0.79**	ND	**7.2**	ND	ND	ND
Toluene	µg/l	600	NS	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/l	3	NS	ND	**0.69**	ND	ND	**4.6**	ND	ND	ND
Vinyl Chloride	µg/l	0.03	NS	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	µg/l	500	NS	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organic Compounds			**0**	**1.59**	**14.03**	**3.14**	**14.1**	**22.9**	**0.55**	**0**	**0**
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE	NS	**260**	**440**	**31**	**490**	**210**	**490**	NA	NA
Methane	µg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	µg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	mg/l	10	NS	**0.13**	**0.04**	**9**	**0.033**	**<.025**	**14**	NA	NA
Sulfide	µg/l	NE	NS	**<10**	**<10**	**<10**	**<10**	**<10**	**<10**	NA	NA
COD	mg/l	NE	NS	**300**	**36**	**19**	**34**	**25**	**67**	NA	NA
BOD	mg/l	NE	NS	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	NA	NA
Total Chloride	mg/l	250	NS	**66**	**140**	**11**	**140**	**120**	**320**	NA	NA
Total Iron	mg/l	0.3	NS	**54.6**	**0.629**	**0.33**	**0.0373**	**0.362**	**0.124**	NA	NA
Total Organic Carbon	mg/l	NE	NS	**19**	**5.7**	**2.8**	**7.6**	**3.4**	**12**	NA	NA
Total Sulfate	mg/l	250	NS	**150**	**18**	**9.8**	**5.1**	**8.4**	**13**	NA	NA
Hydrogen	nM	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Acetic Acid	mg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Butyric Acid	mg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Lactic Acid	mg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid	mg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Pyruvic Acid	mg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5	NS	5.82	6.65	5.48	6.25	6.47	6.64	6.42	5.86
Temperature	°C	NE	NS	20.1	22.7	18.3	18.7	20.6	18.8	19	18.8
Conductivity	µS/cm	NE	NS	1038	1232	224.4	1339	874	2067	397.4	260.6
Dissolved Oxygen	mg/l	NE	NS	0.52	0.1	1.29	0.92	0.24	0.92	0.1	3.14
Carbon Dioxide - Dissolved	mg/l	NE	NS	NA	NA	NA	NA	NA	NA	NA	NA
Turbidity	NTU	NE	NS	10000	11	20	11	160	6.9	8.7	390
Oxidation Reduction Potential	mV	NE	NS	1	25	98	120	94	34	164	6

NOTES: 1) Standards were taken from the North Carolina Administrative Code, Title 15A, Chapter 2L, Section .0202 Groundwater Quality Standards (NC 2L Standards).
2) µg/l - micrograms per liter
3) mg/l - milligrams per liter
4) s.u - standard units
5) °C - degrees Celsius
6) µs/cm - microSiemens per Centimeter
7) NTU - nephelometric turbidity unit
8) mV - millivolt
9) J - The analyte was positively identified but the value is estimated below the laboratory reporting limit.
10) ND - Not detected at or above laboratory method detection limits.
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East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 1
MONITORED NATURAL ATTENUATION DATA (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	GROUNDWATER SAMPLE IDENTIFICATION								
			MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			7/7/2015	7/7/2015	7/7/2015	7/7/2015	7/7/2015	7/7/2015	7/7/2015	7/7/2015	7/7/2015
VOLATILE ORGANIC COMPOUNDS											
Benzene	µg/l	1	ND	ND	ND	ND	**2.1**	**0.51**	ND	ND	ND
Cis-1,2-Dichloroethene	µg/l	70	ND	ND	**0.8**	ND	**1.1**	**7.3**	ND	ND	ND
Chlorobenzene	µg/l	50	ND	**1.2**	**8.4**	**0.44**	**9.3**	**3**	ND	ND	ND
1,1-Dichloroethane	µg/l	6	ND	ND	**3.4**	**1.2**	**1.7**	**4.1**	**0.56**	ND	ND
1,4-Dichlorobenzene	µg/l	6	ND	**0.82**	**1.5**	ND	**3.1**	**1.5**	ND	ND	ND
Trans-1,2-Dichloroethene	µg/l	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/l	0.7	ND	ND	**0.41**	**0.62**	ND	**7**	ND	ND	ND
Toluene	µg/l	600	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/l	3	ND	ND	**0.43**	ND	ND	**4.8**	ND	ND	ND
Trichlorofluoromethane			ND	ND	ND	**3.5**	ND	ND	ND	ND	ND
Vinyl Chloride	µg/l	0.03	ND	ND	ND	ND	ND	**0.64**	ND	ND	ND
Xylenes	µg/l	500	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organic Compounds			**0**	**2.02**	**14.94**	**5.76**	**17.3**	**28.85**	**0.56**	**0**	**0**
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE	NA	**240**	**480**	**37**	**610**	**350**	**660**	**100**	**20**
Methane	µg/l	NE	NA	NA	**639**	NA	NA	**271**	**6.72**	NA	NA
Ethane	µg/l	NE	NA	NA	ND	NA	NA	ND	ND	NA	NA
Ethene	µg/l	NE	NA	NA	ND	NA	NA	ND	ND	NA	NA
Nitrate	mg/l	10	NA	NA	**<.025**	NA	NA	**<.025**	**4.2**	NA	NA
Sulfide	µg/l	NE	NA	NA	ND	NA	NA	ND	ND	NA	NA
Total Chloride	mg/l	250	**5.4**	**53**	**170**	**14**	**160**	**170**	**360**	**35**	**11**
Total Iron	mg/l	0.3	**10.6**	**10.5**	**0.143**	**0.203**	**0.0273**	**0.528**	**0.246**	**0.641**	**21.3**
Ferrous Iron	mg/l		NA	NA	**0.2**	NA	NA	**0.2**	ND	NA	NA
Total Organic Carbon	mg/l	NE	NA	NA	**4.9**	NA	NA	**3.9**	**17**	NA	NA
Total Sulfate	mg/l	250	**9.5**	**120**	**14**	**13**	**8.2**	**6.6**	**11**	**29**	**26**
Hydrogen	nM	NE	NA	NA	**5.8**	NA	NA	**4.6**	**4.8**	NA	NA
Acetic Acid	mg/l	NE	NA	NA	**6.3**	NA	NA	**4.2**	**4.7**	NA	NA
Butyric Acid	mg/l	NE	NA	NA	ND	NA	NA	ND	ND	NA	NA
Lactic Acid	mg/l	NE	NA	NA	ND	NA	NA	ND	ND	NA	NA
Propionic Acid	mg/l	NE	NA	NA	**0.41**	NA	NA	ND	**2.8**	NA	NA
Pyruvic Acid	mg/l	NE	NA	NA	ND	NA	NA	ND	ND	NA	NA
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5	5.11	5.42	7.09	5.56	6.14	6.58	7.1	6.06	5.41
Temperature	°C	NE	21.36	18.67	23.9	18.91	19.93	18.7	23.1	19.06	18.39
Conductivity	µS/cm	NE	117	757	1380	228	1350	1020	2200	374	166
Dissolved Oxygen	mg/l	NE	1.19	1.12	0.71	3.07	0.96	0.91	0.67	0.86	1.63
Carbon Dioxide - Dissolved	mg/l	NE	--	--	131	--	--	131	136	--	--
Turbidity	NTU	NE	4000	700	0	36.1	69.2	22	1.5	445	1600
Oxidation Reduction Potential	mV	NE	170	83	-24	288	251	41	59	268	258

NOTES: 1) Standards were taken from the North Carolina Administrative Code, Title 15A, Chapter 2L, Section .0202 Groundwater Quality Standards (NC 2L Standards).
2) µg/l - micrograms per liter
3) mg/l - milligrams per liter
4) s.u - standard units
5) °C - degrees Celsius
6) µs/cm - microSiemens per Centimeter
7) NTU - nephelometric turbidity unit
8) mV - millivolt
9) J - The analyte was positively identified but the value is estimated below the laboratory reporting limit.
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East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 2
MONITORED NATURAL ATTENUATION SCORES (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			7/28/2009	7/29/2009	7/28/2009	7/29/2009	7/29/2009	7/28/2009	7/28/2009	7/29/2009	7/29/2009
VOLATILE ORGANIC COMPOUNDS											
BTEX	µg/l	1							2		
Cis-1,2-Dichloroethene	µg/l	70					2	2			
Chlorobenzene	µg/l	50									
1,1-Dichloroethane	µg/l	6				2	2	2			
1,4-Dichlorobenzene	µg/l	6									
Trans-1,2-Dichloroethene	µg/l	100									
Tetrachloroethene	µg/l	0.7									
Trichloroethene	µg/l	3						2			
Vinyl Chloride	µg/l	0.03									
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE			1	1	1	1	1	1	1
Methane	µg/l	NE									
Ethane	µg/l	NE									
Ethene	µg/l	NE									
Nitrate	mg/l	10	2				2	2		2	
Sulfide	µg/l	NE									
Total Chloride	mg/l	250	2		2	2	2	2	2	2	
Total Iron	mg/l	0.3	3	3		3		3	3	3	3
Total Organic Carbon	mg/l	NE		2	2				2	2	
Total Sulfate	mg/l	250	2			2	2	2	2		
Hydrogen	nM	NE				3					
Volatile Fatty Acids	µg/l	NE	2	2	2		2		2	2	2
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5									
Temperature	°C	NE	1		1						
Dissolved Oxygen	mg/l	NE									
Carbon Dioxide - Dissolved	mg/l	NE		1	1	1	1	1			1
Oxidation Reduction Potential	mV	NE					1				1
		∑	12	8	9	14	15	17	14	12	8

NOTES: Monitoring Well MW-1 is background well

	SCORE FOR ASSESSING ANAEROBIC DEGRADATION	**WELLS AT LANDFILL SITE**
<6	Inadequate evidence for anaerobic degradation	None
6 - 14	Limited evidence for anaerobic degradation	**MW-2, MW-3, MW-6, MW-10, MW-24 MW-25**
15 - 20	Adequate evidence for anaerobic degradation	**MW-7, MW-9**
>20	Strong evidence for anaerobic degradation	

East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 2
MONITORED NATURAL ATTENUATION SCORES (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			1/20/2010	1/21/2010	1/20/2010	1/21/2010	1/21/2010	1/20/2010	1/20/2010	1/21/2010	1/21/2010
VOLATILE ORGANIC COMPOUNDS											
BTEX	µg/l	1									
Cis-1,2-Dichloroethene	µg/l	70					2				
Chlorobenzene	µg/l	50									
1,1-Dichloroethane	µg/l	6					2				
1,4-Dichlorobenzene	µg/l	6									
Trans-1,2-Dichloroethene	µg/l	100									
Tetrachloroethene	µg/l	0.7									
Trichloroethene	µg/l	3									
Vinyl Chloride	µg/l	0.03					2				
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE		1	1		1	1	1	1	1
Methane	µg/l	NE		3							
Ethane	µg/l	NE									
Ethene	µg/l	NE									
Nitrate	mg/l	10	2	2			2	2			2
Sulfide	µg/l	NE									
Total Chloride	mg/l	250		2	2		2	2	2	2	2
Total Iron	mg/l	0.3	3	3	3	3		3	3	3	3
Total Organic Carbon	mg/l	NE			2				2		
Total Sulfate	mg/l	250	2				2	2	2		
Hydrogen	nM	NE			3	3		3		3	3
Volatile Fatty Acids	mg/l	NE				2	2		2		2
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5									
Temperature	°C	NE									
Dissolved Oxygen	mg/l	NE		3	3					3	3
Carbon Dioxide - Dissolved	mg/l	NE		1	1	1	1	1		1	1
Oxidation Reduction Potential	mV	NE					1				
		∑	7	15	15	9	17	14	12	13	17

NOTES: Monitoring Well MW-1 is background well

	SCORE FOR ASSESSING ANAEROBIC DEGRADATION	WELLS AT LANDFILL SITE
<6	Inadequate evidence for anaerobic degradation	None
6 - 14	Limited evidence for anaerobic degradation	**MW-6, MW-9, MW-10, MW-24**
15 - 20	Adequate evidence for anaerobic degradation	**MW-2, MW-3, MW-7, MW-25**
>20	Strong evidence for anaerobic degradation	None

East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 2
MONITORED NATURAL ATTENUATION SCORES (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			7/21/2010	7/22/2010	7/21/2010	7/22/2010	7/21/2010	7/22/2010	7/21/2010	7/21/2010	7/21/2010
VOLATILE ORGANIC COMPOUNDS											
BTEX	µg/l	1									
Cis-1,2-Dichloroethene	µg/l	70					2	2			
Chlorobenzene	µg/l	50									
1,1-Dichloroethane	µg/l	6				2	2	2			2
1,4-Dichlorobenzene	µg/l	6									
Trans-1,2-Dichloroethene	µg/l	100									
Tetrachloroethene	µg/l	0.7									
Trichloroethene	µg/l	3						2			
Vinyl Chloride	µg/l	0.03					2	2			
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE		1	1	1	1	1	1	1	1
Methane	µg/l	NE					3				
Ethane	µg/l	NE									
Ethene	µg/l	NE									
Nitrate	mg/l	10	2	2	2		2	2		2	2
Sulfide	µg/l	NE									
Total Chloride	mg/l	250		2	2		2	2	2	2	2
Total Iron	mg/l	0.3	3	3	3			3	3	3	3
Total Organic Carbon	mg/l	NE			2				2		
Total Sulfate	mg/l	250	2		2	2	2	2	2		
Hydrogen	nM	NE	3	3		3	3		3		3
Volatile Fatty Acids	mg/l	NE		2	2				2		
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5									
Temperature	°C	NE							1		
Dissolved Oxygen	mg/l	NE		3	3						3
Carbon Dioxide - Dissolved	mg/l	NE		1	1	1	1	1		1	1
Oxidation Reduction Potential	mV	NE			1		1				
		∑	10	17	19	9	21	19	16	9	17

NOTES: Monitoring Well MW-1 is background well

	SCORE FOR ASSESSING ANAEROBIC DEGRADATION	**WELLS AT LANDFILL SITE**
<6	Inadequate evidence for anaerobic degradation	None
6 - 14	Limited evidence for anaerobic degradation	**MW-6, MW-24**
15 - 20	Adequate evidence for anaerobic degradation	**MW-2, MW-3, MW-9, MW-10, MW-25**
>20	Strong evidence for anaerobic degradation	**MW-7**

East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 2
MONITORED NATURAL ATTENUATION SCORES (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
			1/18/2011	1/18/2011	1/19/2011	1/19/2011	1/19/2011	1/19/2011	1/19/2011	1/19/2011	1/19/2011
VOLATILE ORGANIC COMPOUNDS											
BTEX	µg/l	1									
Cis-1,2-Dichloroethene	µg/l	70			2		2				
Chlorobenzene	µg/l	50									
1,1-Dichloroethane	µg/l	6			2	2	2				
1,4-Dichlorobenzene	µg/l	6									
Trans-1,2-Dichloroethene	µg/l	100									
Tetrachloroethene	µg/l	0.7									
Trichloroethene	µg/l	3									
Vinyl Chloride	µg/l	0.03									
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE		1	1	1	1	1	1	1	
Methane	µg/l	NE				3					
Ethane	µg/l	NE									
Ethene	µg/l	NE									
Nitrate	mg/l	10	2	2	2		2	2		2	
Sulfide	µg/l	NE									
Total Chloride	mg/l	250		2	2		2	2	2	2	2
Total Iron	mg/l	0.3	3	3	3			3		3	3
Total Organic Carbon	mg/l	NE									
Total Sulfate	mg/l	250				2	2	2	2	2	
Hydrogen	nM	NE			3	3	3	3			3
Volatile Fatty Acids	mg/l	NE	2			2	2	2	2	2	
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5	-2								
Temperature	°C	NE									
Dissolved Oxygen	mg/l	NE		3	3					3	
Carbon Dioxide - Dissolved	mg/l	NE		1	1	1	1	1			1
Oxidation Reduction Potential	mV	NE			2						
		∑	5	12	21	14	17	16	7	15	9

NOTES: Monitoring Well MW-1 is background well

	SCORE FOR ASSESSING ANAEROBIC DEGRADATION	**WELLS AT LANDFILL SITE**
<6	Inadequate evidence for anaerobic degradation	None
6 - 14	Limited evidence for anaerobic degradation	**MW-2, MW-10, MW-25**
15 - 20	Adequate evidence for anaerobic degradation	**MW-6, MW-7, MW-9, MW-24**
>20	Strong evidence for anaerobic degradation	**MW-3**

East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 2
MONITORED NATURAL ATTENUATION SCORES (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	GROUNDWATER SAMPLE IDENTIFICATION								
			MW-1	MW-2	MW-3	MW-6	MW-7	MW-9	MW-10	MW-24	MW-25
				7/18/2012	7/18/2012	7/18/2012	7/18/2012	7/18/2012	7/18/2012		
VOLATILE ORGANIC COMPOUNDS											
BTEX	µg/l	1									
Cis-1,2-Dichloroethene	µg/l	70			2		2	2			
Chlorobenzene	µg/l	50									
1,1-Dichloroethane	µg/l	6									
1,4-Dichlorobenzene	µg/l	6									
Trans-1,2-Dichloroethene	µg/l	100									
Tetrachloroethene	µg/l	0.7									
Trichloroethene	µg/l	3			2			2			
Vinyl Chloride	µg/l	0.03									
NATURAL ATTENUATION INDICATORS											
Alkalinity	mg/l	NE		1	1	1	1	1	1		
Methane	µg/l	NE									
Ethane	µg/l	NE									
Ethene	µg/l	NE									
Nitrate	mg/l	10		2	2		2	2			
Sulfide	µg/l	NE									
Total Chloride	mg/l	250		2	2		2	2	2		
Total Iron	mg/l	0.3		3							
Total Organic Carbon	mg/l	NE									
Total Sulfate	mg/l	250			2	2	2	2	2		
Hydrogen	nM	NE									
Volatile Fatty Acids	mg/l	NE									
FINAL FIELD MEASUREMENTS											
pH	s.u.	6.5-8.5									
Temperature	°C	NE		1	1			1			
Conductivity	µS/cm	NE									
Dissolved Oxygen	mg/l	NE			3			3			
Carbon Dioxide - Dissolved	mg/l	NE									
Turbidity	NTU	NE									
Oxidation Reduction Potential	mV	NE		1	1				1		
		Σ		10	16	3	9	15	6		

NOTES: Monitoring Well MW-1 is background well

Background Data from Baseline MW-1 Data
Carbon Dioxide = 30 mg/L
Alkalinity = 11.2 mg/L
Chloride = 7.5 mg/L

SCORE FOR ASSESSING ANAEROBIC DEGRADATION		**WELLS AT LANDFILL SITE***
<6	Inadequate evidence for anaerobic degradation	**MW-6**
6 - 14	Limited evidence for anaerobic degradation	**MW-2, MW-7, MW-10**
15 - 20	Adequate evidence for anaerobic degradation	**MW-3, MW-9**
>20	Strong evidence for anaerobic degradation	

East Plume at LANDFILL
West Plume at LANDFILL

* Weighting Scores are for incomplete analytical data sets.

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 2
MONITORED NATURAL ATTENUATION SCORES (2009 - 2015)
CITY OF ALBEMARLE LANDFILL
STONY GAP ROAD
ALBEMARLE, NORTH CAROLINA

PARAMETER	UNITS	NC 2L Groundwater Standards	GROUNDWATER SAMPLE IDENTIFICATION		
			MW-3	MW-9	MW-10
			7/7/2015	7/7/2015	7/7/2015
VOLATILE ORGANIC COMPOUNDS					
Benzene	µg/l	1			
Cis-1,2-Dichloroethene	µg/l	70	**2**	**2**	
Chlorobenzene	µg/l	50			
1,1-Dichloroethane	µg/l	6	**2**	**2**	**2**
1,4-Dichlorobenzene	µg/l	6			
Trans-1,2-Dichloroethene	µg/l	100			
Tetrachloroethene	µg/l	0.7			
Toluene	µg/l	600			
Trichloroethene	µg/l	3	**2**	**2**	
Vinyl Chloride	µg/l	0.03		**2**	
Xylenes	µg/l	500			
Total Volatile Organic Compounds					
NATURAL ATTENUATION INDICATORS					
Alkalinity	mg/l	NE	**1**	**1**	**1**
Methane	µg/l	NE	**3**		
Ethane	µg/l	NE			
Ethene	µg/l	NE			
Nitrate	mg/l	10	**2**	**2**	
Sulfide	µg/l	NE			
Total Chloride	mg/l	250	**2**	**2**	**2**
Total Iron	mg/l	0.3			
Ferrous Iron	mg/l				
Total Organic Carbon	mg/l	NE			
Total Sulfate	mg/l	250	**2**	**2**	**2**
Hydrogen	nM	NE	**3**	**3**	**3**
Acetic Acid	mg/l	NE	**2**	**2**	**2**
Butyric Acid	mg/l	NE			
Lactic Acid	mg/l	NE			
Propionic Acid	mg/l	NE			
Pyruvic Acid	mg/l	NE			
FINAL FIELD MEASUREMENTS					
pH	s.u.	6.5-8.5			
Temperature	°C	NE	**1**		**1**
Conductivity	µS/cm	NE			
Dissolved Oxygen	mg/l	NE			
Carbon Dioxide - Dissolved	mg/l	NE	**1**	**1**	**1**
Turbidity	NTU	NE			
Oxidation Reduction Potential	mV	NE	**1**	**1**	
		∑	**24**	**22**	**14**

NOTES: Monitoring Well MW-1 is background well

Background Data from Baseline MW-1 Data
Carbon Dioxide = 30 mg/L
Alkalinity = 11.2 mg/L
Chloride = 7.5 mg/L

	SCORE FOR ASSESSING ANAEROBIC DEGRADATION	WELLS AT LANDFILL SITE
<6	Inadequate evidence for anaerobic degradation	None
6 - 14	Limited evidence for anaerobic degradation	**MW-10**
15 - 20	Adequate evidence for anaerobic degradation	**MW-9**
>20	Strong evidence for anaerobic degradation	**MW-3**

East Plume at LANDFILL
West Plume at LANDFILL

Prepared/Date: J.D. Wallace 8/11/15
Checked/Date: J. Cato 8/18/15

TABLE 3
SUMMARY OF NATURAL ATTENUATION DATA (2009-2015)
CITY OF ALBEMARLE LANDFILL
ALBEMARLE, NORTH CAROLINA

Well Grouping	Well ID / Date	ANAEROBIC BIODEGRADATION SCORES					
		Jul-09	Jan-10	Jul-10	Jan-11	Jul-12 *	Jul-15
Background Well	**MW-1**	12	7	10	5		
WEST PLUME	**MW-2**	8	15	17	12	10	
	MW-6	14	9	9	14	3	
	MW-7	15	17	21	17	9	
	MW-24	12	13	9	15		
	MW-25	8	17	17	9		
EAST PLUME	**MW-3**	9	15	19	21	16	24
	MW-9	17	14	19	16	15	22
	MW-10	14	12	16	7	6	14

Reference: *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water,* September 1998 (EPA/600/R-98/128)

TOTAL SCORE FOR ASSESSING ANAEROBIC BIODEGRADATION

<6	Inadequate evidence for anaerobic degradation
6 - 14	Limited evidence for anaerobic degradation
15 - 20	Adequate evidence for anaerobic degradation
>20	Strong evidence for anaerobic degradation

* NOTE: Anaerobic Degradation Scores for July 2012 are incomplete due to incomplete data sets. Hence the color coding used for assessing anaerobic biodegradation was not used in this table for July 2012.

Prepared/Date: J.D. Wallace 8/11/15

Checked/Date: J. Cato 8/18/15

TABLE 4
SUMMARY OF TOTAL VOLATILE ORGANIC COMPOUNDS (2009-2015)
CITY OF ALBEMARLE LANDFILL
ALBEMARLE, NORTH CAROLINA

Well Grouping	Well ID / Date	TOTAL VOC CONCENTRATIONS (µg/L)					
		Jul-09	Jan-10	Jul-10	Jan-11	Jul-12 *	Jul-15
Background Well	**MW-1**	10	7	10	5		
WEST PLUME	**MW-2**	74.3	0	0.59	0.51	7.49	2.02
	MW-6	8.22	0.95	6.56	9.19	8	5.76
	MW-7	12.4	15.59	17.3	13.44	14.1	17.3
	MW-24	0	0	0	0	0	0
	MW-25	0	0	0.55	0	0	0
EAST PLUME	**MW-3**	0.31	0	4.8	5.17	14.03	14.94
	MW-9	2.96	0	11.95	0	22.9	28.55
	MW-10	115	0	0	0	0.55	0.56

Note: The above total VOC concentrations are for **all** VOC's identified in each well, and not just the organic compounds associated with degradation evaluation shown in Table 1.

Reference: *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water,* September 1998 (EPA/600/R-98/128)

TOTAL SCORE FOR ASSESSING ANAEROBIC BIODEGRADATION

<6	Inadequate evidence for anaerobic degradation
6 - 14	Limited evidence for anaerobic degradation
15 - 20	Adequate evidence for anaerobic degradation
>20	Strong evidence for anaerobic degradation

* NOTE: Anaerobic Degradation Scores for July 2012 are incomplete due to incomplete data sets. Hence the color coding used for assessing anaerobic biodegradation was not used in this table for July 2012.

Prepared/Date: J.D. Wallace 8/11/15

Checked/Date: J. Cato 8/18/15