2013 MID-YEARPROGRESS REPORT

USEPA PROJECT XL

Buncombe County Bioreactor Project

Buncombe County
Solid Waste Management Facility

Alexander, North Carolina

July 2013

CDM Smith

Table of Contents

Section 7 – Recommendations

Figures

Tables

Appendices

Executive Summary

Under the United States Environmental Protection Agency's Project XL, Buncombe County, North Carolina is operating a combined leachate recirculation and gas recovery system at its Subtitle D landfill. The purpose of the project is to determine if liquid addition has any adverse effects on alternative liner systems. The County is also monitoring the effects of liquids addition on waste density to determine if it is increasing the life of the landfill.

The Buncombe County Solid Waste Management Facility is located in the mountains of western North Carolina, approximately nine miles north of the city of Asheville. The 557-acre solid waste management facility opened in 1997 with a Subtitle D landfill disposal area that comprises approximately 100 acres.

This project differs from other Project XL projects in that it is a full-scale project that is being operated over an extended period of time.

The retrofit system, which refers to the shallow, wetting/gas collection trenches that were installed in Cells 1-5 after they were filled to capacity has been in operation since April 2007.

A build-as-you-go wetting system, which means that the infrastructure is installed as the waste is being placed, will provide better wetting of the waste and earlier capture of landfill gas. The first stage of the build-as-you-go system was installed in Cell 6 in July 2012 and is expected to be operational in early 2014.

The first stage included installation of five trenches ranging in length from 700 to 950-ft. Six temperature sensors were installed in various locations between the trenches to monitor the extent of wetting and the impact of cold weather wetting on the biological processes. Readings from the sensors are recorded by a datalogger installed at the Cell 6 pump station control panel. If decomposition is determined to be unaffected by cold weather recirculation then the operators will move to a year-round wetting program that will further reduce the amount of leachate hauled to the WWTP.

The last stakeholder meeting that was held in September 2012 at the Buncombe County landfill involved discussions on the project goals. Section 6 has an update on the progress of the action items established during that meeting.

This project was granted regulatory flexibility to apply liquids other than leachate to the waste and to apply leachate to the waste in landfill cells with alternative liners. To date, only leachate has been used since there has been adequate leachate available onsite to meet the needs of the project. This may change when the build-as-you-go system of the project is activated since the quantities of liquid addition will increase.

In November 2011, the County completed construction of a 1.4 MW landfill gas-to-energy (LFGTE) project at the site. The project construction included the installation of 25 vertical gas wells in Cells 1-5. After these wells were put into operation the gas collection component of the retrofit system was deactivated. Portions of the retrofit system may be re-activated to collect gas as deemed beneficial by the site operator.

To date, the cells equipped with alternative liner systems are functioning at a comparable level to those with prescriptive Subtitle D liner systems. While liquids have been observed in the leak detection zones in nearly all of the landfill cells, testing of the liquids indicate it is groundwater. Modifications will be made to the leak detection zones of the future cells to address groundwater intrusion.

Approximately 2.97 million gallons of leachate has been recirculated since the program began, resulting in 593 less truck trips to the wastewater treatment plant (WWTP). That has provided a savings of $227,185 in avoided hauling and treatment costs. With the expansion of the leachate recirculation system into Cell 6, the largest cell of the landfill, the amount of leachate that can be recirculated will be significantly increased. It is anticipated that hauling of leachate will not be required outside of the winter season once the leachate recirculation in the Cell 6 system is operational.

Buncombe County has received a record amount of rainfall during the first half of 2013. The landfill has already received 28 inches of rainfall, resulting in double the amount of leachate generated compared to first half of 2012. This has significantly reduced the ability to recirculate leachate due to saturation of waste in the retrofit area of the bioreactor.

The landfill is approved by the Climate Action Reserve to register carbon credits for the capture and destruction of methane emitted from the landfill. The County has registered 28,784 carbon credits in 2012 which is equivalent to offsetting gas emissions from 5,997 passenger vehicles.

Section 1
Introduction

The Buncombe County Solid Waste Management Facility is a host site for a research project being conducted under the USEPA Project XL Program. The purpose of this report is to present the data collected in the first six months of 2013. This report was prepared by Kristy Smith - Buncombe County Bioreactor Manager, Christopher Gabel – CDM Smith and Ravi Kadambala – CDM Smith.

1.1 Site Description

The Buncombe County Solid Waste Management Facility is located in the mountains of western North Carolina, approximately nine miles north of the City of Asheville. The 557-acre solid waste management facility (refer to **Figure 1-1**) opened in 1997 and comprises a Subtitle D landfill, construction and demolition (C&D) landfill, wood waste mulching facility, convenience center for residential drop-off, a household hazardous waste (HHW) facility, and a white goods and tires holding facility.

The Subtitle D landfill is 95 acres and consists of 10 disposal cells that are being constructed sequentially over the estimated 30+ year life of the facility. Cells 1 and 2 were constructed with a prescriptive RCRA Subtitle D liner system consisting of a 24" soil barrier layer with a maximum permeability of $1x10^{-7}$cm/sec, a 60-mil high density polyethylene (HDPE) liner and a 24-inch rock drainage layer. Cells 3-6 were constructed with an alternative liner system that uses an 18-inch soil barrier layer with a maximum permeability of $1x10^{-5}$cm/sec, a geosynthetic clay liner (GCL), a 60-mil HDPE liner and a 24" rock drainage layer.

Cells 1-5 are filled to capacity and Cell 6 has been the active disposal cell since 2006. Based on current waste flows Cell 7 is expected to begin operation in 2015.

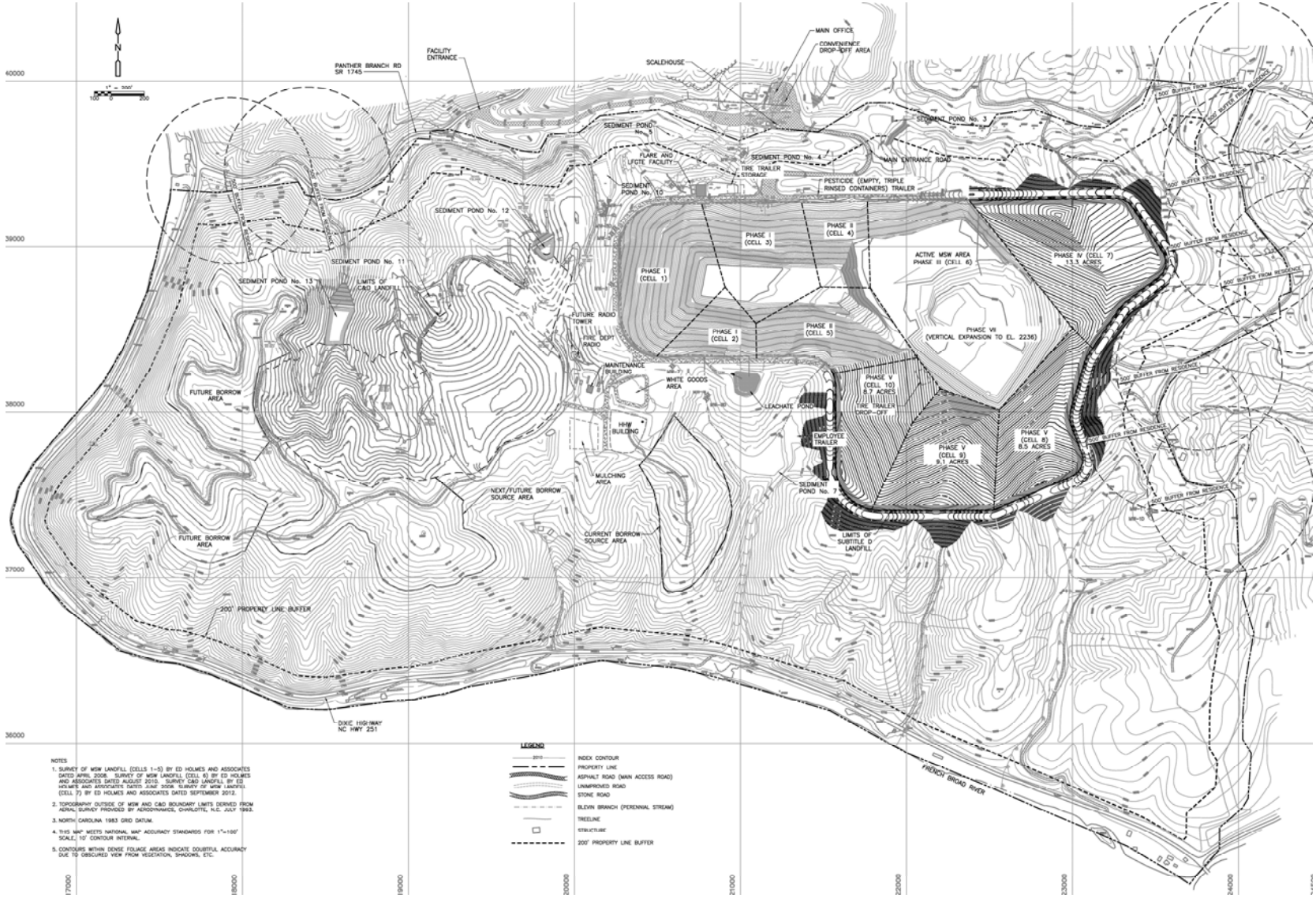

Figure 1-1 Buncombe County Solid Waste Management Facility

1.2 Project Goals

In spite of increasing rates of recycling, landfills remain the primary means of managing solid waste in the US, receiving 54% of the waste generated in 2008 (EPA-530-F-009-021). Municipal solid waste (MSW) landfills in the United States are designed in accordance with the technical guidelines provided in Subtitle D of the Resource Conservation and Recovery Act (RCRA) which requires that landfills be equipped with impermeable base liners and caps. While this requirement has been very successful in preventing groundwater contamination it has also led to the dry entombment of waste at many landfill sites. Some concern has been raised regarding the long term containment of undecomposed waste and the potential for leachate releases after the post-monitoring period ends (typically 30-years) and the liner systems fail.

One proposed solution is to operate MSW landfills as bioreactors. A bioreactor landfill uses controlled methods of liquids addition to increase waste moisture content as a means for promoting decomposition of waste. The goal of a bioreactor operation is to achieve a stabilized condition while the landfill is still being monitored. Liquids addition has been applied at numerous landfill sites in the US with favorable results.

Federal regulations governing solid waste management restrict liquids addition to only those landfills equipped with prescriptive Subtitle D liner systems. The Buncombe County Bioreactor Project seeks to determine what impact, if any; liquids addition has on alternative liner systems by comparing the performance of the prescriptive Subtitle D liner system in Cells 1 and 2 to the alternative liner systems in Cells 3-10. The data obtained from this project may provide support for modifying federal regulations to allow liquids addition in MSW landfills equipped with alternative liner systems. A Final Project Agreement (FPA) was issued by the USEPA under the Project Excellence and Leadership Program (Project XL) approving Buncombe County's proposal to incorporate a liquids addition process as an integral part of their landfill operation. This document, which is provided in **Appendix A**, provides the design, execution, and monitoring framework developed for the project.

1.3 Public Awareness

Public awareness has been an important part of the County's solid waste program since the siting of the facility in the early 1990's. To increase public awareness of the bioreactor project the County staff have given presentations to various groups, led tours for local area colleges and high schools, and performed a live interview at the bioreactor site for Buncombe County Television. The County also has a website that is available to the public to learn about the project. The website is updated semi-annually with new monitoring data and other information and is accessible at: http://www.buncombebioreactor.com/index.html.

Buncombe County convenes periodic meetings of stakeholders to obtain comments on the Project as well as to report on the progress during the duration of the XL Agreement. Stakeholders include any individuals, government organizations, neighborhood organizations, academic centers, and companies with an interest in the progress of the Buncombe County Solid Waste Management Facility Bioreactor Project. The first stakeholders meeting was held in August 2008 and the second stakeholders meeting was held on September 20th, 2012. The stakeholder meeting was attended by Western North Carolina Regional Air Quality Agency, EPA by teleconference, NCDENR, University of Florida, Buncombe County management, and CDM Smith engineers.

Section 2
Project Description

This project was granted regulatory flexibility under Project XL to add liquids to cells with alternative liner systems and to apply liquids other than leachate to the waste mass. To date, only leachate has been used since there has been adequate leachate available onsite to meet the needs of the project. This may change when the build-as-you-go portion of the project is operational since the quantities of liquids addition will increase significantly. Leachate recirculation is not performed during the winter months due to concern of the adverse impacts of cold leachate on decomposition. The project team, in consultation with the project academic advisors, Dr. Morton Barlaz of North Carolina State University, Dr. Timothy Townsend of University of Florida and Dr. Debra Reinhart of University of Central Florida, established a minimum temperature of 50 degrees F for the recirculation operation as measured at the leachate pond.

2.1 Retrofit Bioreactor

2.1.1 Leachate Recirculation

Cells 1-5 had nearly reached capacity when the project began, prompting the need to install a retrofit system. The retrofit system is equipped to recirculate leachate using a combination of horizontal injection trenches (HIT) and surficial gravity trenches (SGT) as shown in **Figure 2-1**.

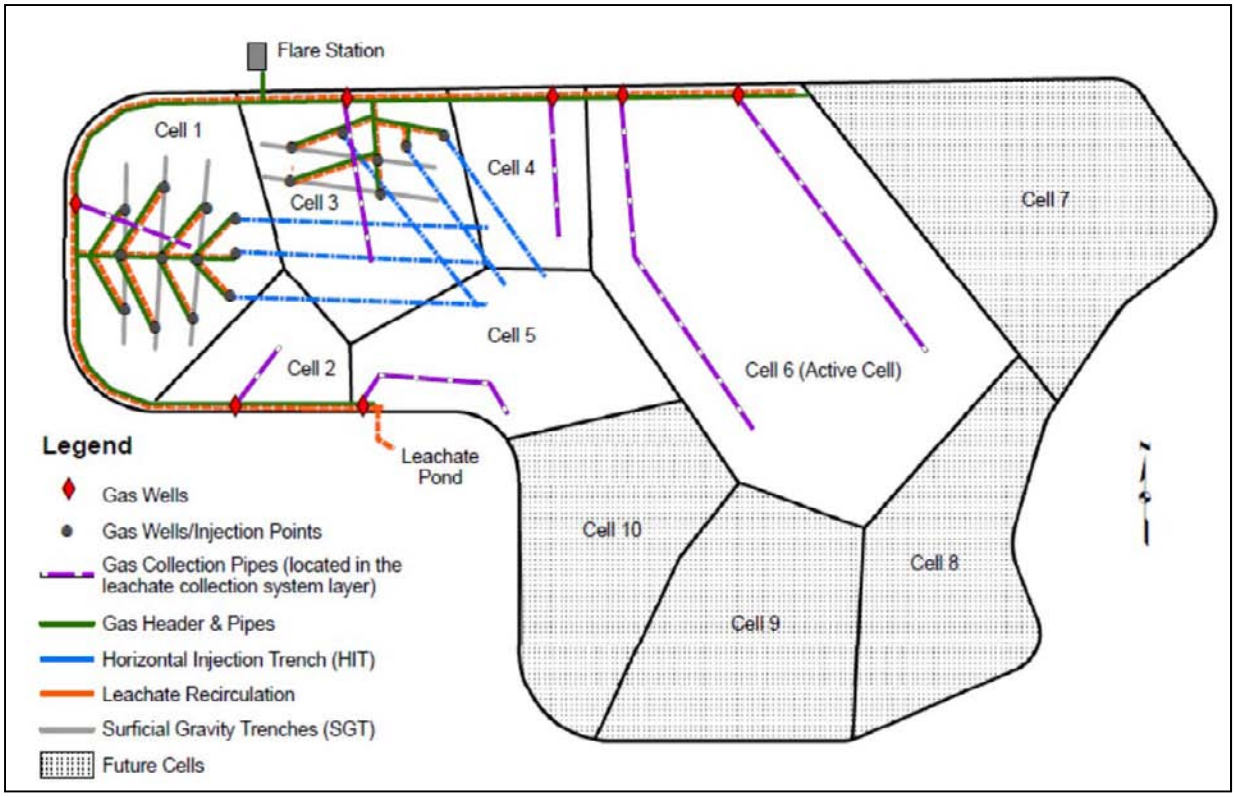

Figure 2-1 Retrofit Bioreactor System

Six horizontal injection trenches (HIT) were installed in the retrofit area. The first three HIT were installed in anticipation of the project being approved when the top of waste was at Elevation 2040. They extend approximately 400-ft south into the waste mass and are spaced 100-ft apart. Three more HIT were installed at Elevation 2080 using the same spacing and extend approximately 800-ft east in the waste. Due to the longer length of these HIT, two pipes were used in each of the trenches to provide more uniform distribution of leachate. This is achieved by using a short pipe that wets the first 400-ft of the trench and a long pipe that wets the latter half of the trench.

Five surficial gravity trenches (SGT) ranging in length from 450 to 600-ft were installed on the side slopes at Elevations 2030 (SGT 1), 2050 (SGT 2 and 4) and 2070 (SGT 3 and 5). The trenches were excavated 11-ft into the waste and capped with a clayey soil to provide containment of the recirculated leachate and allow gas collection without air intrusion. Due to their shallowness the SGT are operated differently than the HIT. The HIT are allowed to be pressurized up to 10 psi while recirculating leachate to provide greater lateral distribution while the SGT are operated as a gravity-feed system to avoid leachate seeps.

Construction details of the HIT and SGT are shown in **Figures 2-2** and **2-3**.

All future trenches will be installed during the operational phase of the cells to provide earlier implementation and more thorough wetting.

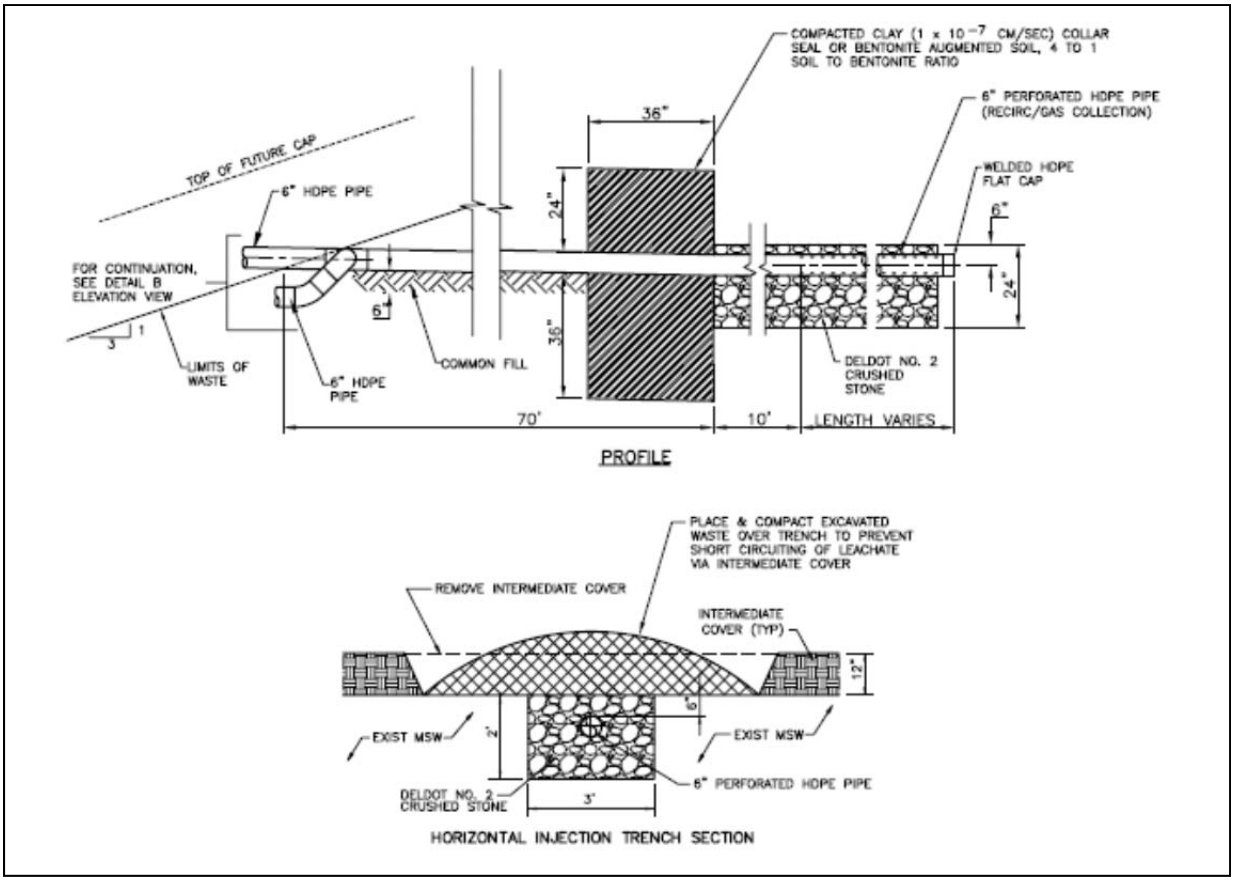

Figure 2-2 Horizontal Injection Trench Detail

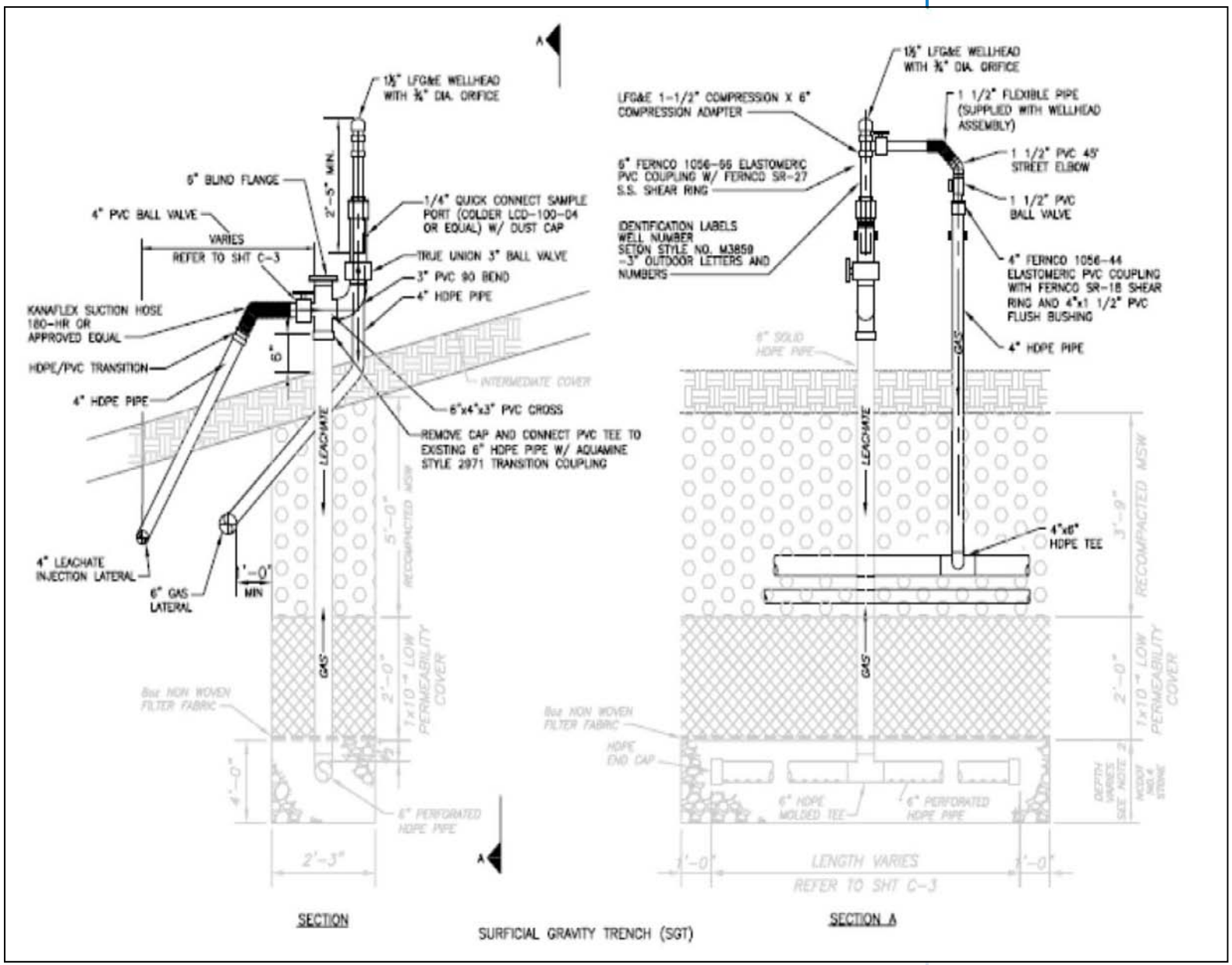

Figure 2-3 Surficial Gravity Trench Detail

2.1.2 Gas Collection

Twenty five (25) vertical gas collection wells were installed in Cells 1-5 as shown in **Figure 2-4**. At the time of the new well field installation the gas collection component of the HIT and SGT was de-activated. Landfill gas is also collected from the cleanouts of the leachate collection system of each cell.

The gas collection system is collecting 350-400 scfm of LFG from Cells 1-5. Based on the LandGEM model, the peak flow rate for the site is estimated to be 1,500 scfm in 2030 as shown in **Figure 2-5**. Gas flow to the LFGTE facility will increase over time and will experience an incremental increase once the Cell 6 Phase 1 HIT go online in 2013. A second generator may be added to the LFGTE facility when the flow rate exceeds 900 scfm.

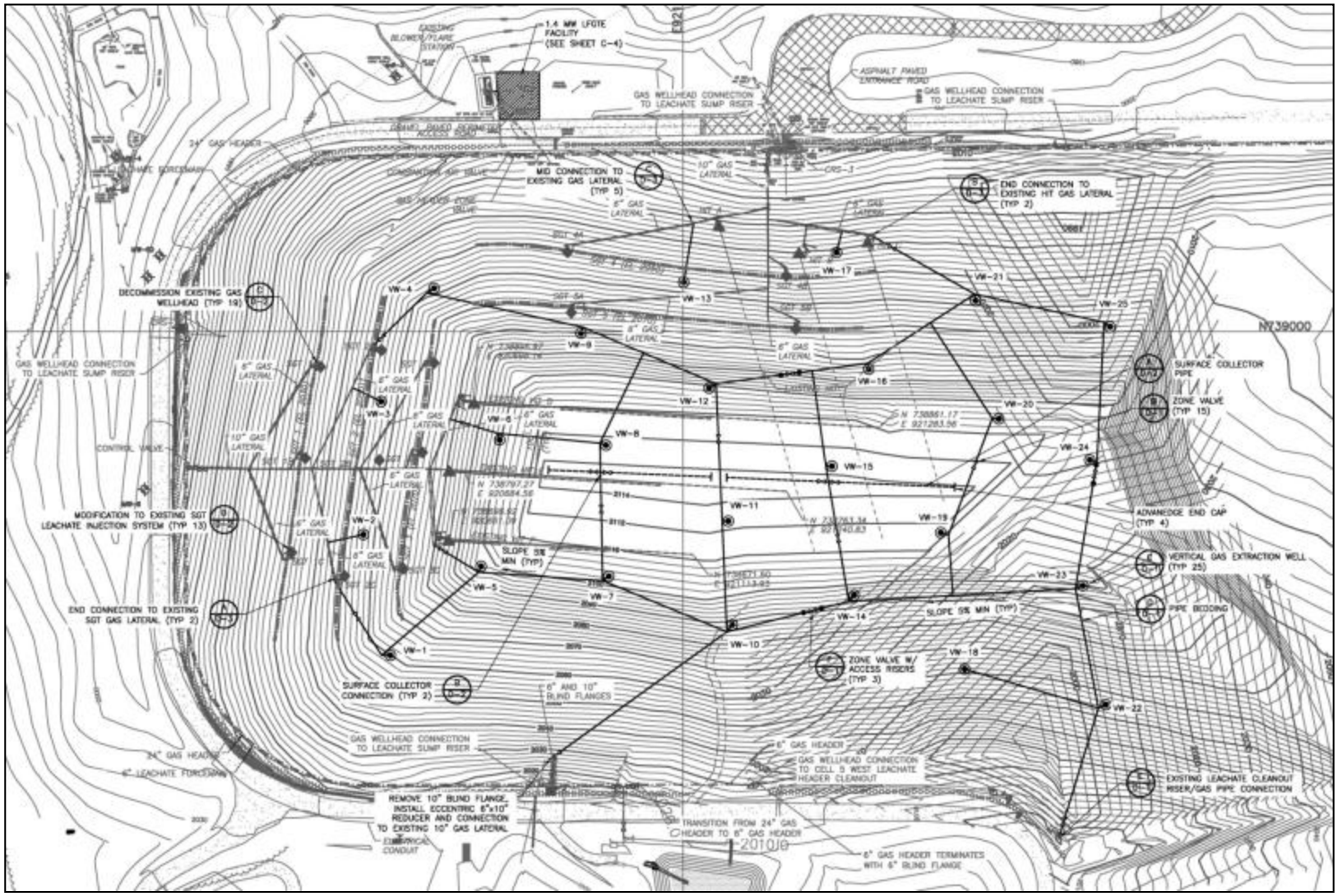

Figure 2-4 Vertical Gas Well Collection System in the Retrofit Area

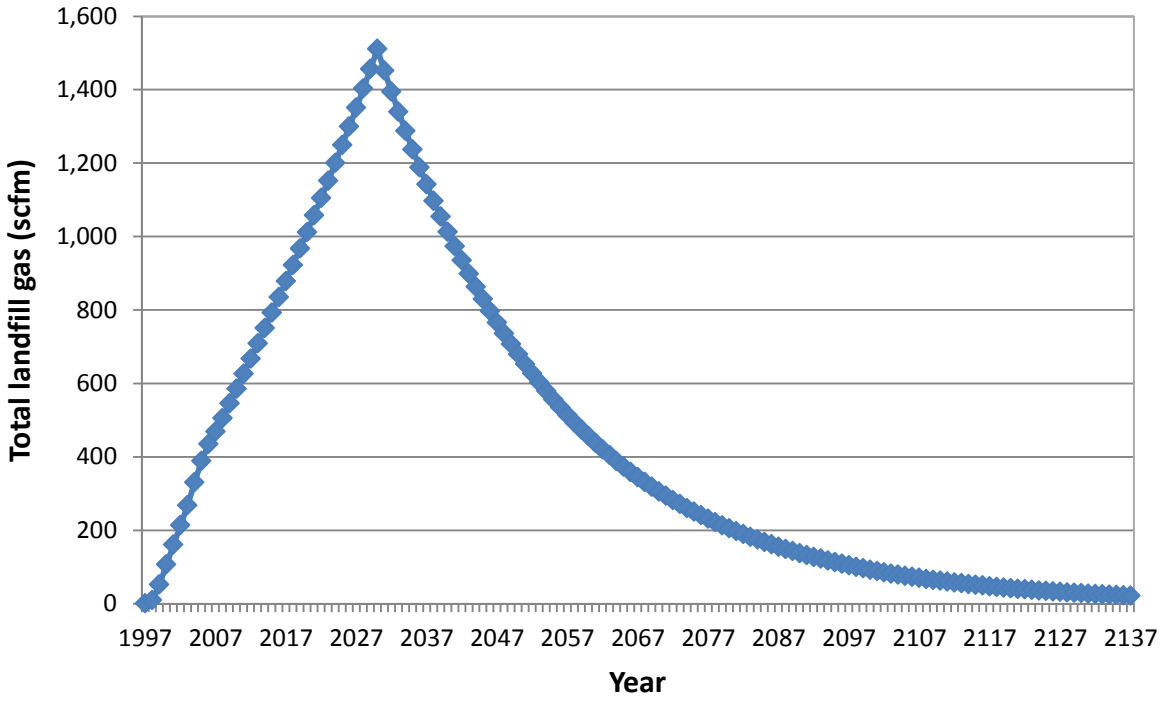

Figure 2-5 Landfill Gas Projections Using LandGEM Model

2.2 Build-As-You-Go Bioreactor

Phase 2 is a build-as-you-go bioreactor system which means that the infrastructure is installed in stages as the waste is being placed. The build-as-you-go approach will provide a more extensive wetting of the waste and earlier capture of landfill gas. The first stage of the Phase 2 system was installed in Cell 6 in 2012.

2.2.1 Leachate Recirculation and Gas Collection

The first phase of installation in Cell 6 was completed in July 2012. This includes six HITs for both leachate recirculation and gas collection as shown in **Figure 2-6 and 2-7**. The 100-ft solid section of piping of each HIT is sloped at 3% to drain towards the outer slope of the landfill. A gravity drain was installed from the head of each HIT down the slope to the leachate sump riser pipe to allow excess recirculated leachate to be removed from the HIT after injection events. This is intended to prolong gas collection capability of the system.

The liquids addition process typically takes between 2 to 6 hours per event and is continuously supervised by the Bioreactor Manager. A rotation schedule is used to allow time between injection events for leachate to drain from the trenches. The rotation schedule is adjusted as needed to account for the varying rates of drainage of the HIT and SGT. Leachate recirculation is reduced or suspended during periods of rainfall until the area dries out sufficiently. The landfill side slopes are carefully inspected during and after each injection event for leachate seeps. The plan for recirculating leachate and collecting gas is described in Section 6.

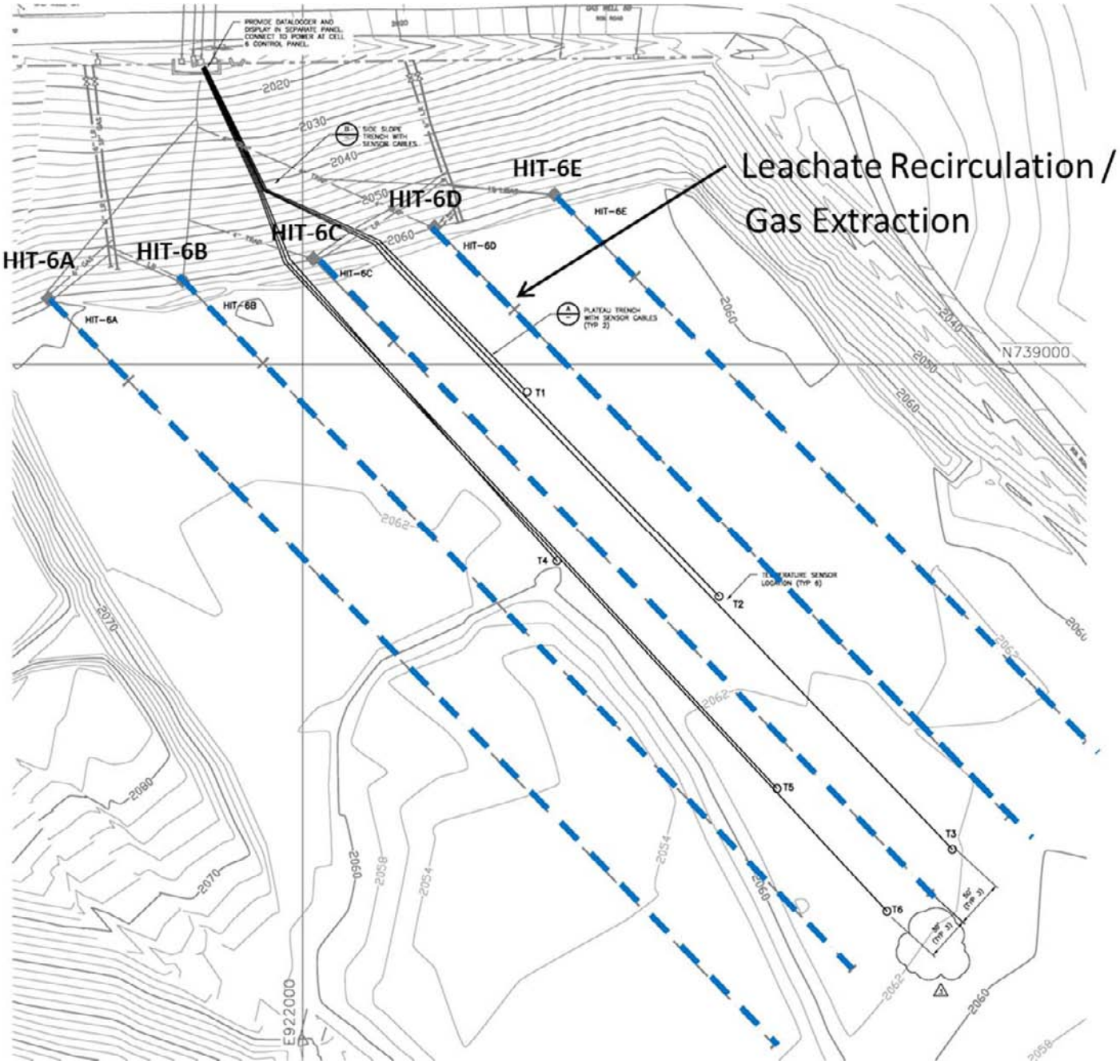

Figure 2-6 Build-As-You-Go Bioreactor System

Figure 2-7 Horizontal Injection Trenches in Cell 6

2.2.2 Temperature Probes

Thermocouples were installed in six (6) locations around the Cell 6 HIT in July 2012 as shown in **Figure 2-8**. These thermocouples consist of a stainless steel temperature sensor with a lead cable as shown in **Figure 2-9**. These thermocouples were placed in 4-inch perforated PVC pipe packed with concrete sand. The cable end of the pipe was left open to allow cable movement and leachate to contact the sensor. The sensors transmit temperature data to a datalogger installed near the Cell 6 pump station control panel that will be downloaded periodically. Temperature readings will be used to monitor decomposition as mesophilic bacteria typically range between 80 and 115°F. The sensors will be helpful in assessing the impacts of leachate temperature during injection. As ambient air temperatures drop in the winter the leachate in the pond will get colder.

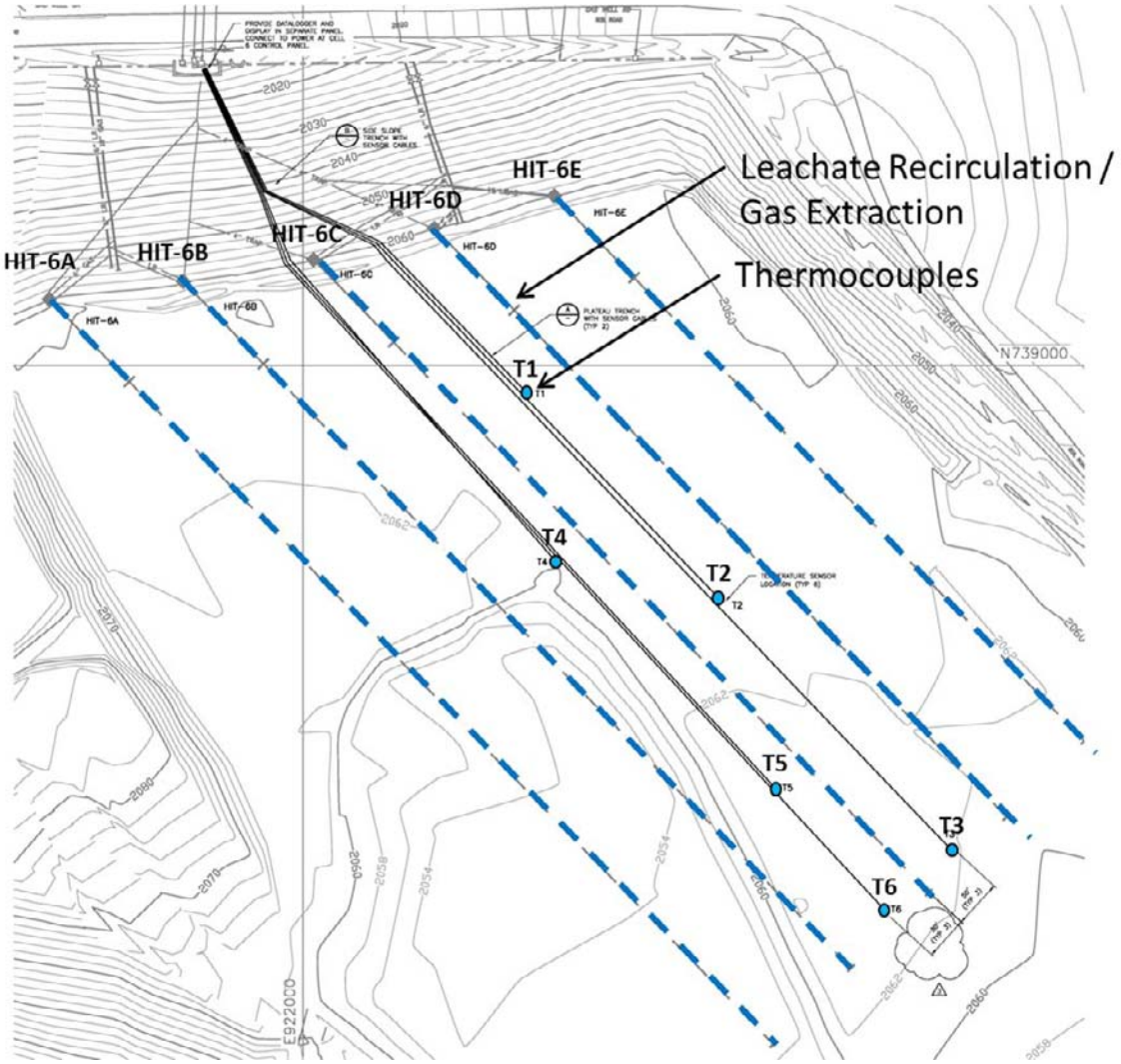

Figure 2-8 Temperature Sensors in Cell 6

Figure 2-9 Installation of Thermocouples in Cell 6

2.3 Landfill-Gas-To-Energy

Buncombe County built a landfill gas-to-energy (LFGTE) facility at its bioreactor landfill to take advantage of the accelerated gas generation. A request for proposals (RFP) was advertised to evaluate private sector interest. At the same time, CDM Smith developed project cost and revenue estimates under a scenario where the County would self-finance the project.

Comparison of nine energy developer proposals to the self-financing option showed that the net revenue would be substantially more if the County self-financed the project. The County elected to proceed without a developer. CDM Smith designed and permitted the LFGTE facility which includes a 1.4-MW generator set, gas conditioning system, and a well field consisting of 25 vertical wells. CDM Smith completed design and permitting of the facility under a fast track approach to reach "shovel-ready" status for ARRA funding. After successfully demonstrating the project's merits, the County was awarded a $3 million grant. The County completed construction of the LFGTE facility in November 2011. The inaugural ribbon cutting ceremony in May 2012 is shown in **Figure 2-10**

Figure 2-10 Inaugural Ribbon Cutting Ceremony

Section 3
Monitoring Program

3.1 Program Overview

The monitoring program was developed with assistance from the project academic advisors, Dr. Debra Reinhart and Dr. Morton Barlaz. **Table 3-1** shows the monitoring parameters and frequency of data collection for the project.

As part of facility operation, Buncombe County performs semi-annual testing of the leak detection zones (LDZ), groundwater monitoring wells, leachate pond, and stormwater collection points for the 2L groundwater standards established by North Carolina Department of Environment and Natural Resources. This data is also being used in assessment of the alternative liner system performance.

Table 3-1 Monitoring Parameters and Frequencies

Parameter	Frequency
Leak Detection Quantity	Quarterly
Leak Detection Quality	Quarterly
Leachate Quality	Quarterly
Leachate Quantity	Weekly
Leachate Recirculation Quantity	Ongoing
Gas Composition	Ongoing
Gas Volume and Flow Rates	Ongoing
Settlement	Quarterly
Waste Density	Quarterly
Waste Temperature	Ongoing

3.2 Leak Detection

The landfill cells and leachate pond are equipped with a leak detection zone (LDZ) located beneath the leachate collection system sumps. The LDZ, as shown in Figure 5-1, are approximately 1 acre in size and consist of a 60 mil HDPE geomembrane and a 24-inch rock drainage layer located 3-ft below the bottom of the liner system. The geomembrane is sloped to direct liquid to a collection pipe located directly below the leachate sumps. For Cells 3-6, liquid captured in the LDZ is pumped out through vertical stand pipes located along the perimeter berm. Cells 1 and 2 drain liquid through gravity pipes that protrude

from the outer slope of the landfill perimeter access road. The drain pipes are equipped with gate valves that the operator opens to check for liquid. Quantity data is not recorded for Cells 1 as it appears to be impacted by a steady supply of groundwater from an underground spring. Further investigation of flow from the Cell 1 LDZ was discussed at the stakeholders meeting held on September 20th, 2012 and is presented in Section 6.

If liquid is present in the LDZ, samples are tested onsite using a Horiba U-22 water quality meter for:

- ORP (oxidation reduction potential)

In addition, liquid samples are collected in sample bottles and sent to Pace Analytical for analysis of:

- BOD5 (Biological Oxygen Demand)
- pH
- COD (Chemical Oxygen Demand)
- Ammonia
- Specific Conductance

The sampling process is dated and recorded in a monitoring log by the Bioreactor Manager.

3.3 Leachate

The quantity of leachate collected is also tracked separately for each cell on a weekly basis. Each cell has a dedicated leachate pump system equipped with a flowmeter that allows the Bioreactor Manager to monitor the number of operating hours for the pumps, the quantity of leachate pumped, and the leachate level in the sumps at the time of monitoring. This data is recorded onto a field form by the Bioreactor Manager.

Leachate quality sampling occurs every quarter. Samples are collected from the leachate pond and from Cells 1-6. The samples are taken from sampling ports located in the valve vaults of the leachate pump stations. Leachate samples are collected in sample bottles and sent to Pace Analytical for analysis of:

- BOD5
- pH
- COD
- Ammonia
- Specific Conductance

On-site analysis of the leachate is also performed using a Horiba U-22 water quality meter. The Horiba unit tests for:

- ORP
- TDS

The sampling process is dated and recorded in a monitoring log by the Bioreactor Manager.

3.4 Leachate Recirculation

The quantity of leachate recirculated is recorded for each injection event using the magnetic flow meter installed at the leachate pond pump station. The Bioreactor Manager records the quantity of leachate injected and identifies the specific HIT/SGT used for the injection event.

3.5 Landfill Gas

The gas collection component of the Retrofit System has been replaced with a gas to energy system and has been in operation since November 2011. Gas composition and flow data is being continually monitored and recorded.

3.6 Landfill Settlement

Settlement plates were installed in 10 locations within the retrofit area. The plates are surveyed quarterly to monitor the rate of waste settlement.

3.7 Landfill Temperature

To date, no leachate below 50°F has been allowed to be recirculated for fear of impacting decomposition. Some colder leachate will be injected into Cell 6 HIT to see if it causes any significant drop in temperature. If the results are favorable then the project team will consider allowing leachate colder than 50°F to be used on a regularly basis. Temperature is being monitored in Cell 6 since July 2012 to a get background data prior to leachate recirculation.

3.8 Effective Waste Density

Since settlement plates are difficult to maintain in active cells, effective waste density is being added to the monitoring program for Cell 6 to assess the impact of wetting on landfill capacity. A topographic survey of Cell 6 is used to compute the volume of waste and cover soil in Cell 6 on a quarterly basis. Waste tonnage records are used to calculate the effective density of the waste which is defined as: the weight of disposed waste/the combined volume of waste and cover soil. Effective density is not the actual density since cover soils are not weighed prior to placement.

Section 4
Collected Data

The monitoring data collected from 2007 through June 2013 are presented below in summary graphs and tables. A complete compilation of all data collected to date is provided in **Appendix B**.

4.1 Leak Detection

Table 4-1 shows the annual quantity of liquid collected from the leak detection zone (LDZ). Liquids have been observed in the Cell 1LDZ but the project team is unable to measure the quantity due to the remote location of the discharge. A method to measure quantity from Cell 1 was discussed during the second stakeholders meeting and is presented in Section 6.

Table 4-1 Liquid Collected from LDZ

Sample Year	Cell 1 (gallons)	Cell 2 (gallons)	Cell 3 (gallons)	Cell 4 (gallons)	Cell 5 (gallons)	Cell 6 (gallons)	Leachate Pond (gallons)
	Subtitle D Liner		Alternative Liner				Subtitle D Liner
2007	NA	NA	427	0	0	340	0
2008	NA	NA	3,105	25	2,925	10,475	0
2009	NA	NA	1,375	0	3,300	5,500	0
2010	NA	NA	1,040	0	6,465	3,835	0
2011	NA	93	555	0	3,800	2,015	0
2012	NA	115	530	0	1,850	1,220	3
Jan.-Jun. 2013	NA	60	275	0	400	500	1
Cumulative	NA	268	7,307	26	18,740	23,885	4

NA – Unable to measure quantity.

Figure 4-1 shows the monthly quantities of liquid collected from the LDZ. **Figures 4-2** through **4-7** show qualitative data from testing of the liquid. The parameters are pH, conductance, ORP, BOD5, COD and ammonia.

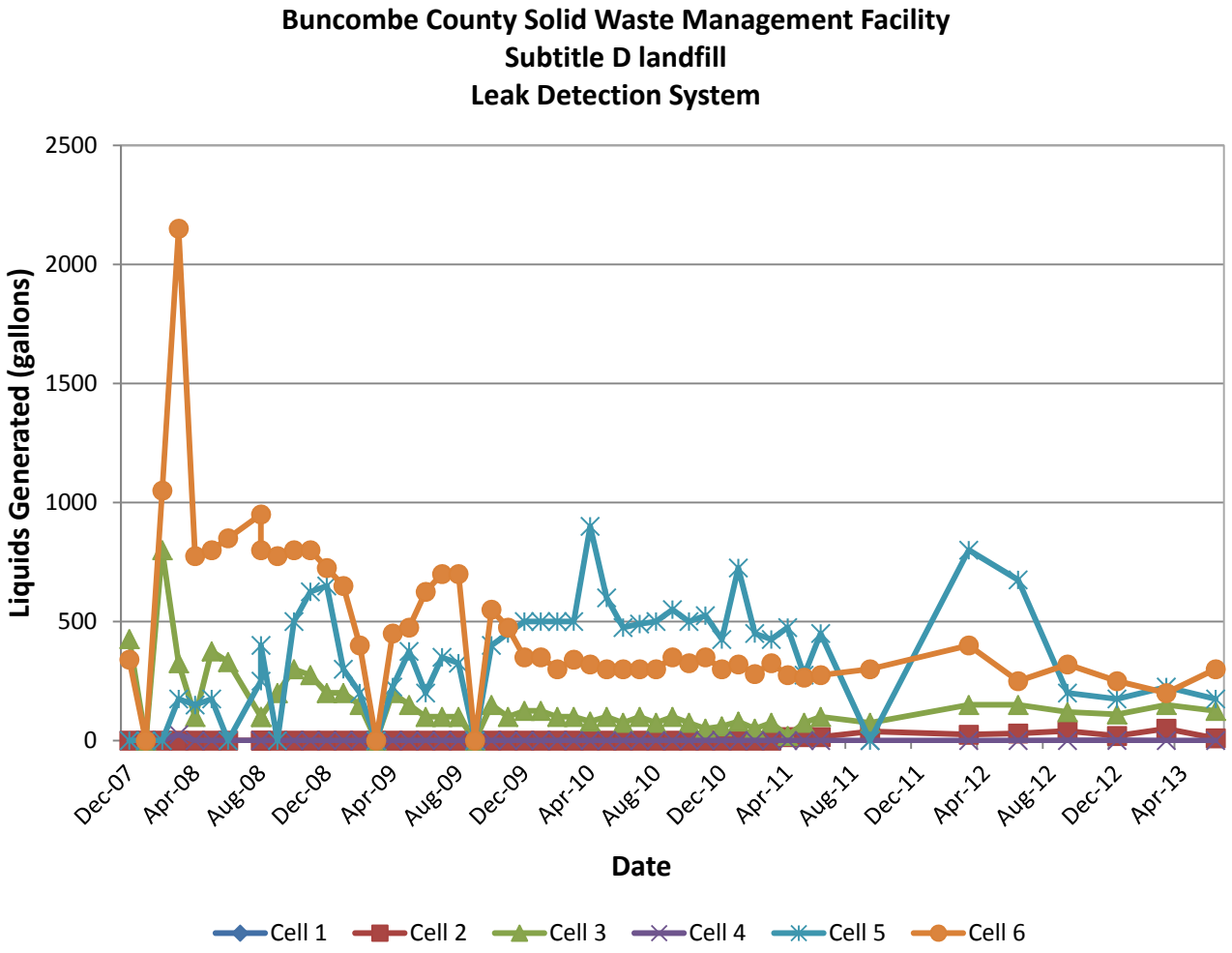

Figure 4-1 Monthly Leak Detection Volumes

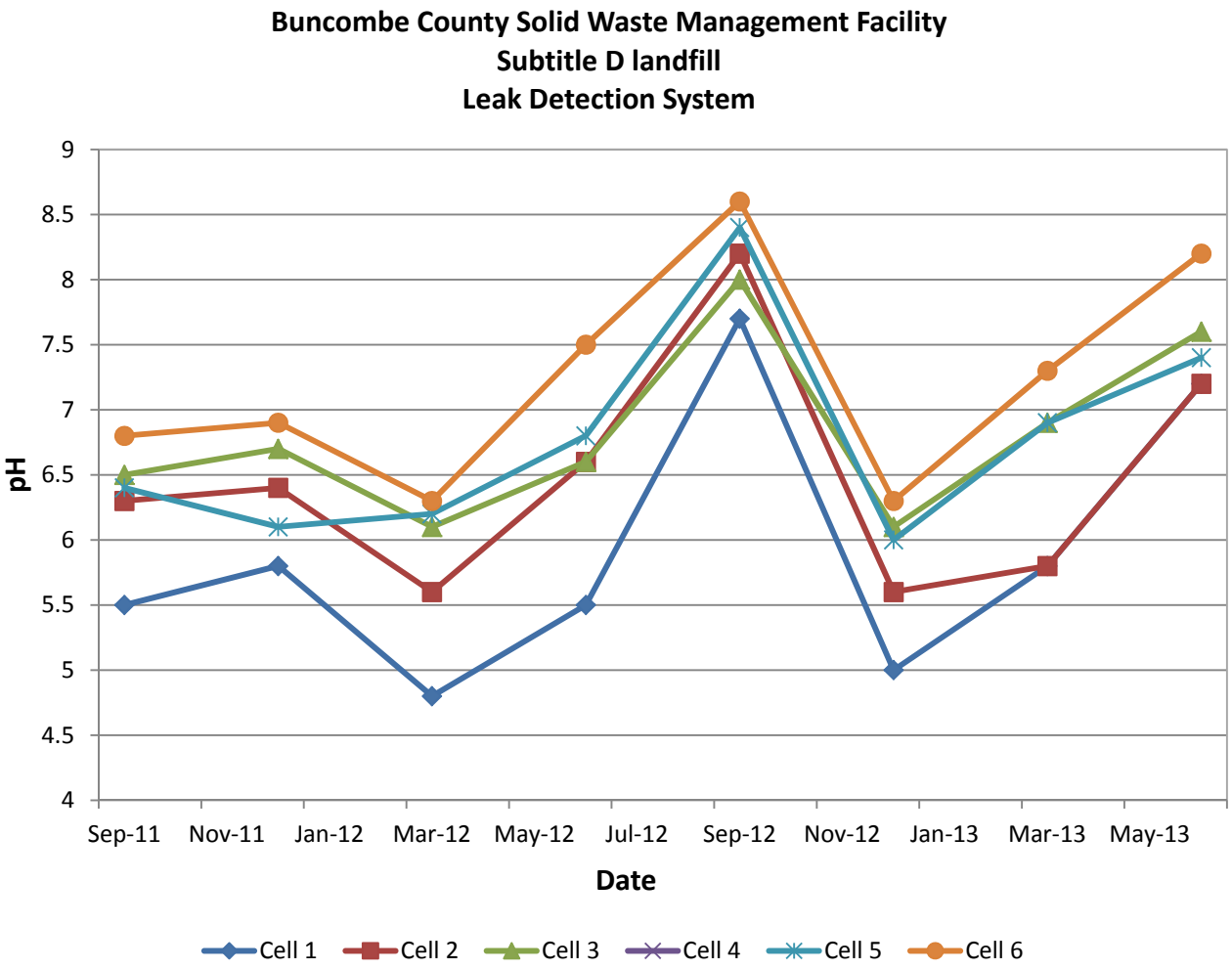
Buncombe County Solid Waste Management Facility
Subtitle D landfill
Leak Detection System
pH
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Mar-13
May-13
Date
Cell 1
Cell 2
Cell 3
Cell 4
Cell 5
Cell 6

Figure 4-2 pH

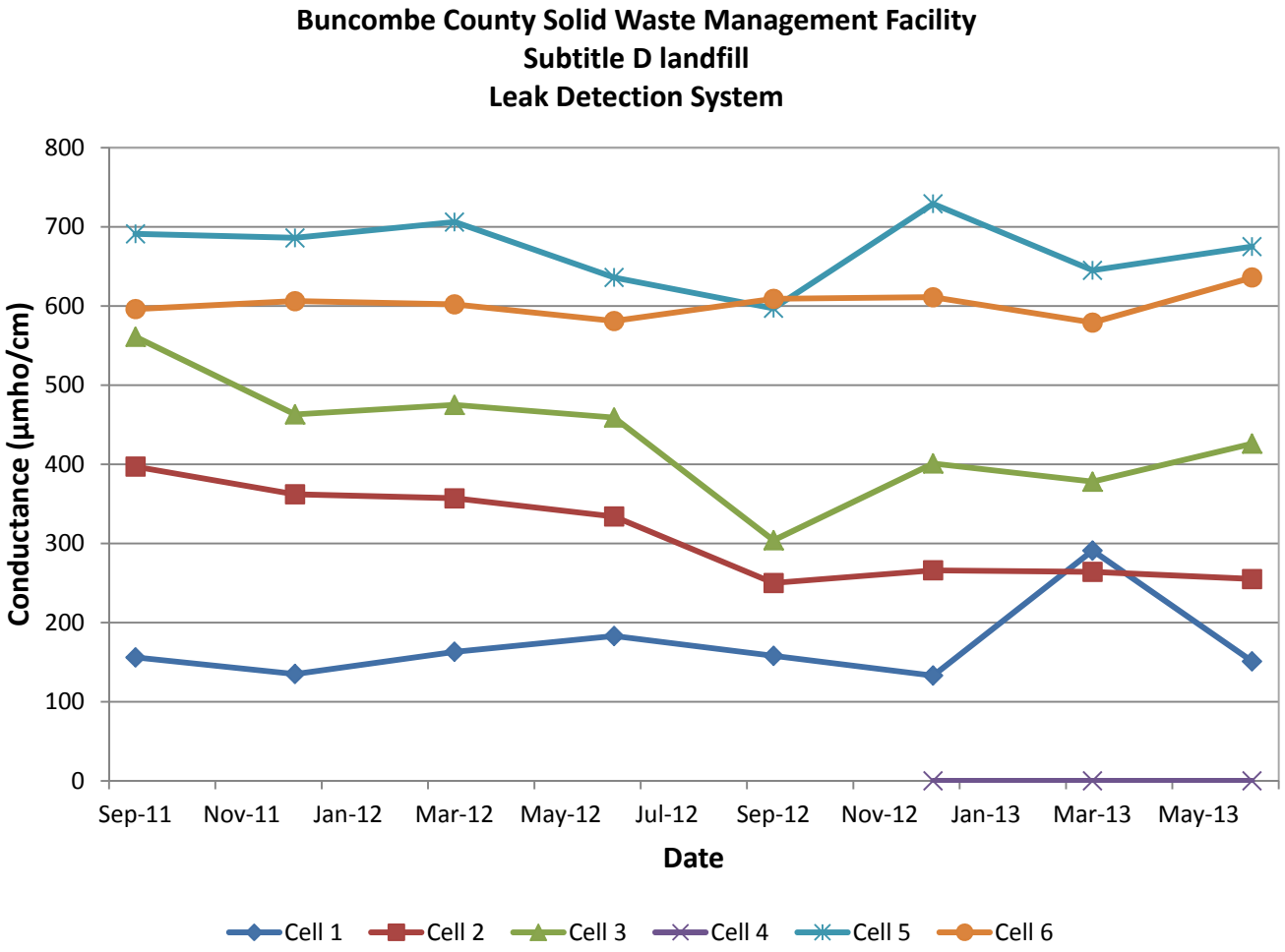

Figure 4-3 Specific Conductance

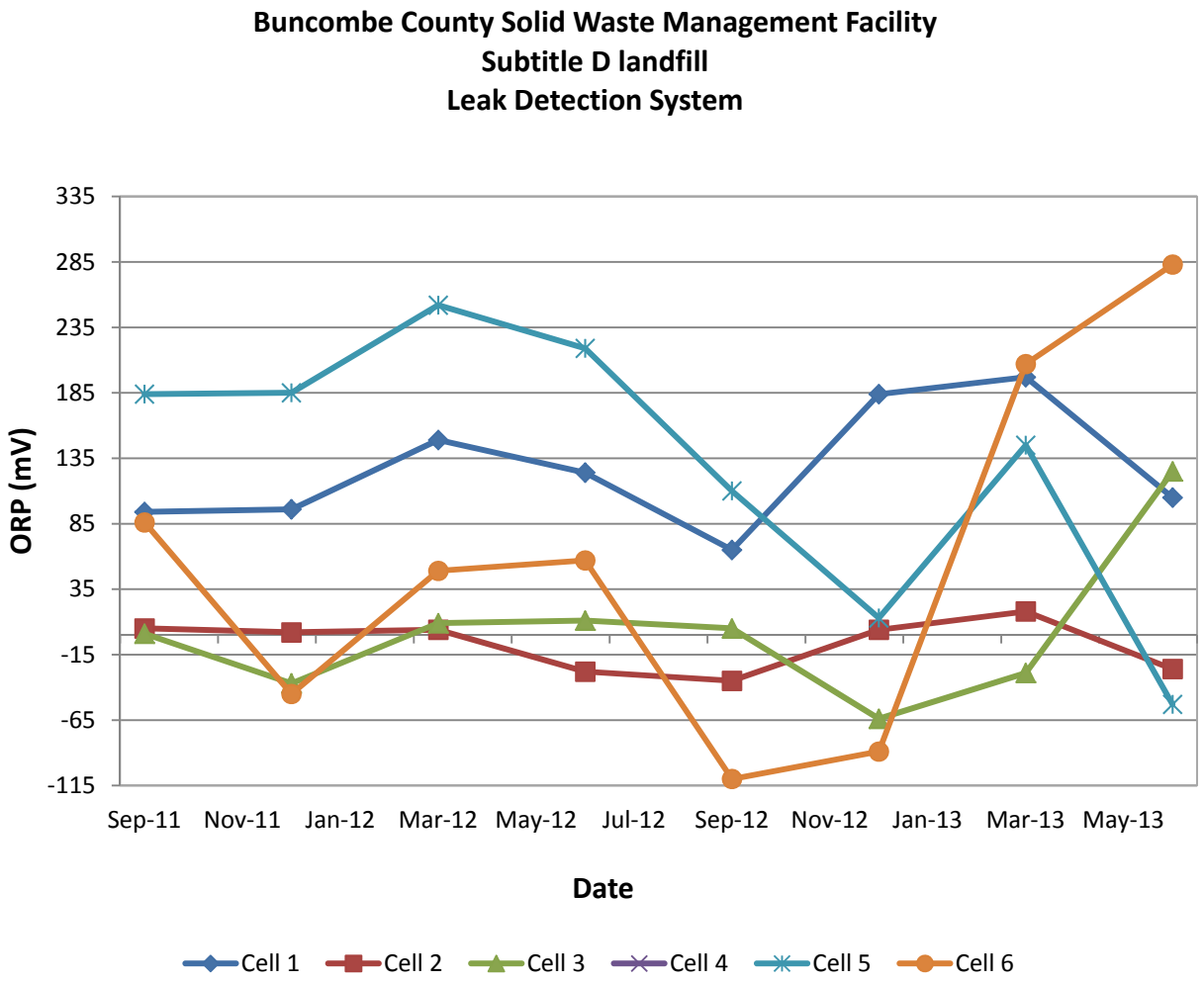

Figure 4-4 Oxidation Reduction Potential

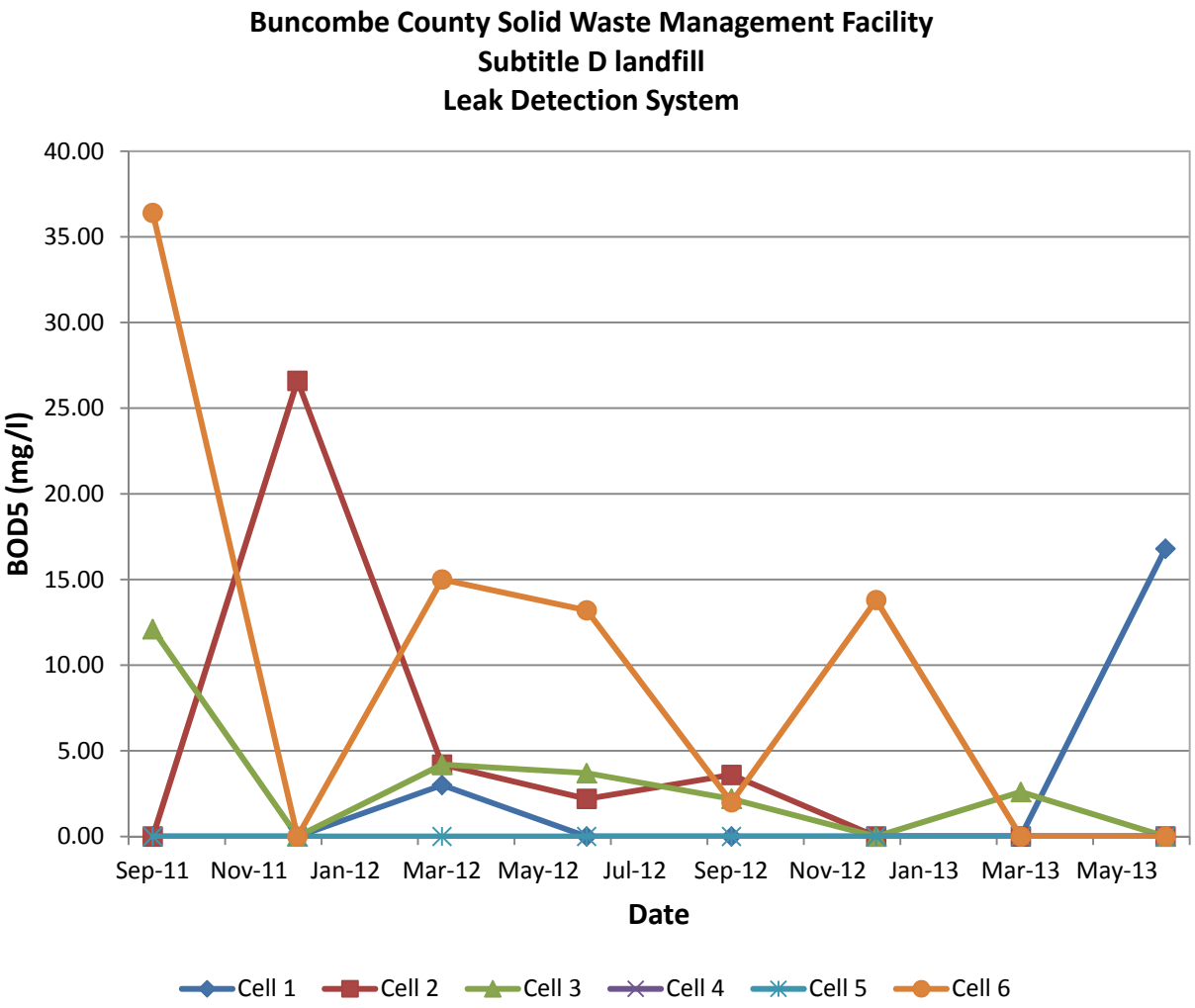

Figure 4-5 BOD5

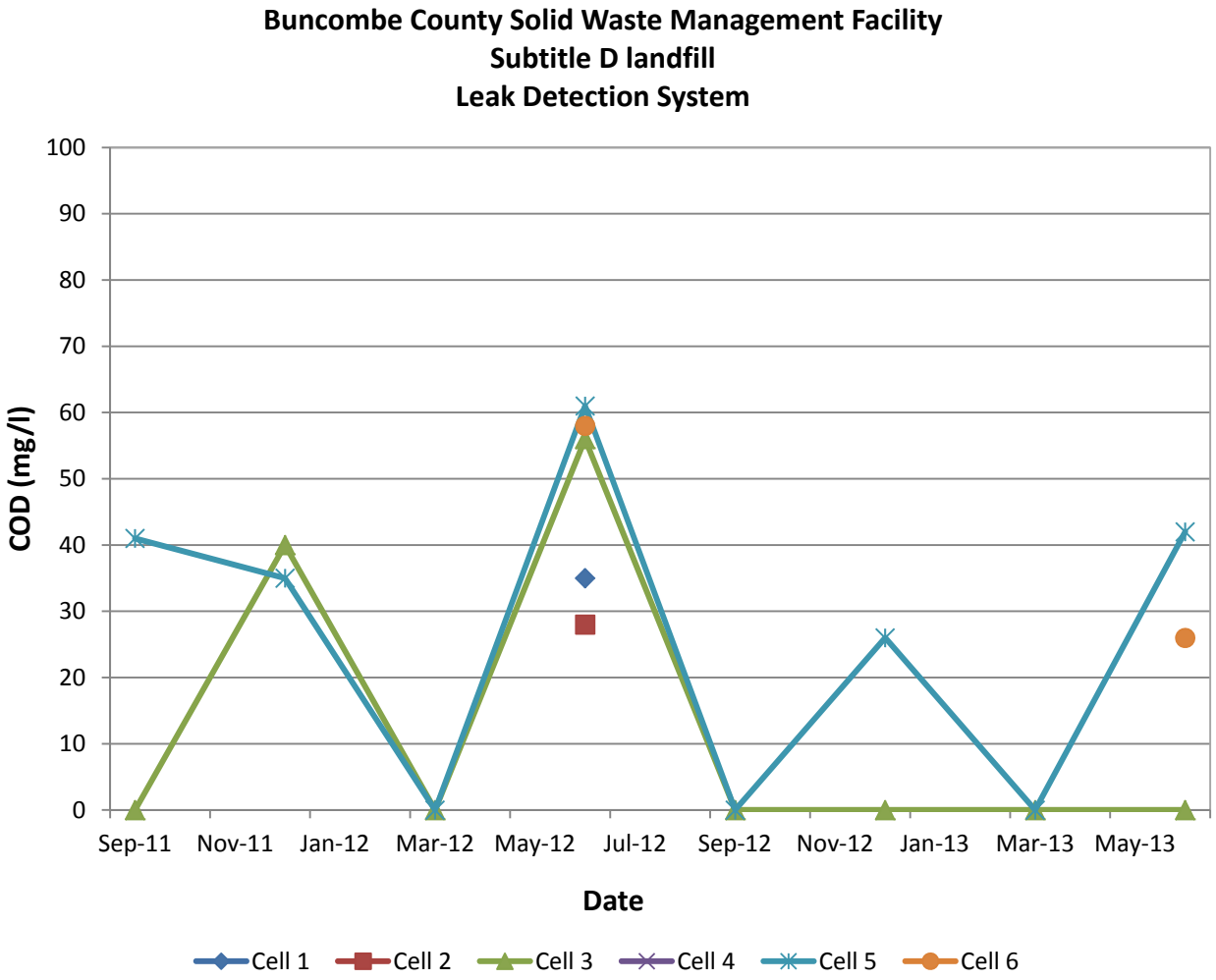

Figure 4-6 COD

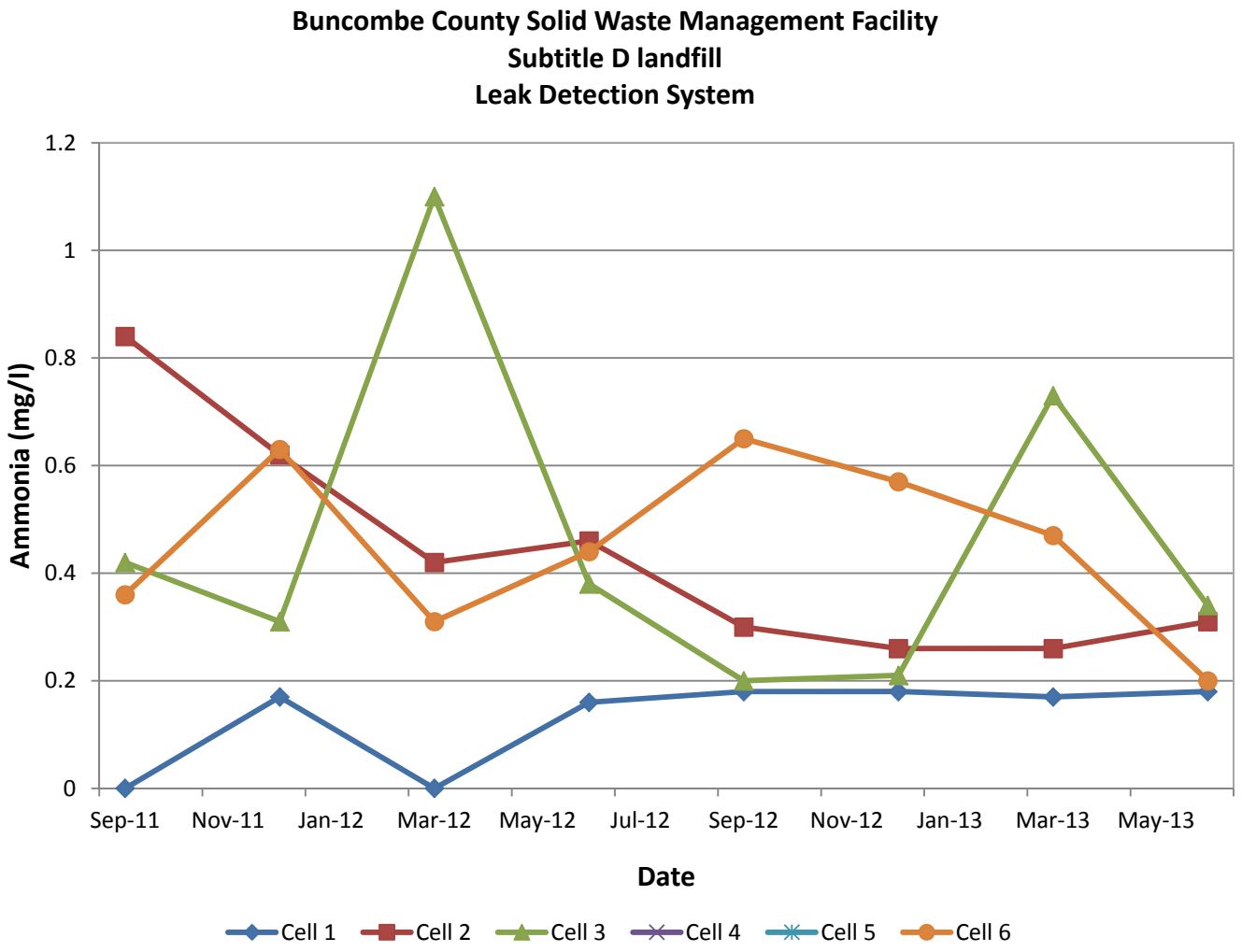

Figure 4-7 Ammonia

4.2 Leachate Collection System

Table 4-2 shows the quantity of leachate collected from the leachate collection system (LCS) of each cell. Leachate samples from Cells 1-6 and the leachate pond were analyzed for BOD5, conductance, COD, ammonia, pH, temperature, ORP, and TDS as shown in **Figures 4-8** through **4-14**.

Table 4-2 Leachate Collected from Cells 1-6

	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Total	Rainfall
	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(inches)
	Subtitle D Liner		Alternative Liner					
Nov.-Dec. 2007	9,723	487	20,898	11,382	11,675	981,305	1,035,470	
2008	288,526	8,860	94,705	173,647	164,467	8,904,461	9,634,666	33
2009	101,777	35,102	103,371	333,067	356,580	14,610,720	15,540,617	43
2010	173,878	34,813	283,867	419,454	124,089	7,097,590	8,133,691	33
2011	156,900	36,027	44,096	124,478	402,831	6,589,437	7,353,769	37
2012	191,608	71,821	92,225	355,101	332,049	5,441,508	6,484,312	40
Jan.-Jun. 2013	185,953	111,305	359,934	604,706	567,879	3,593,207	5,422,984	28
TOTAL	922,412	187,110	639,162	1,417,129	1,391,691	43,625,021	48,182,525	186

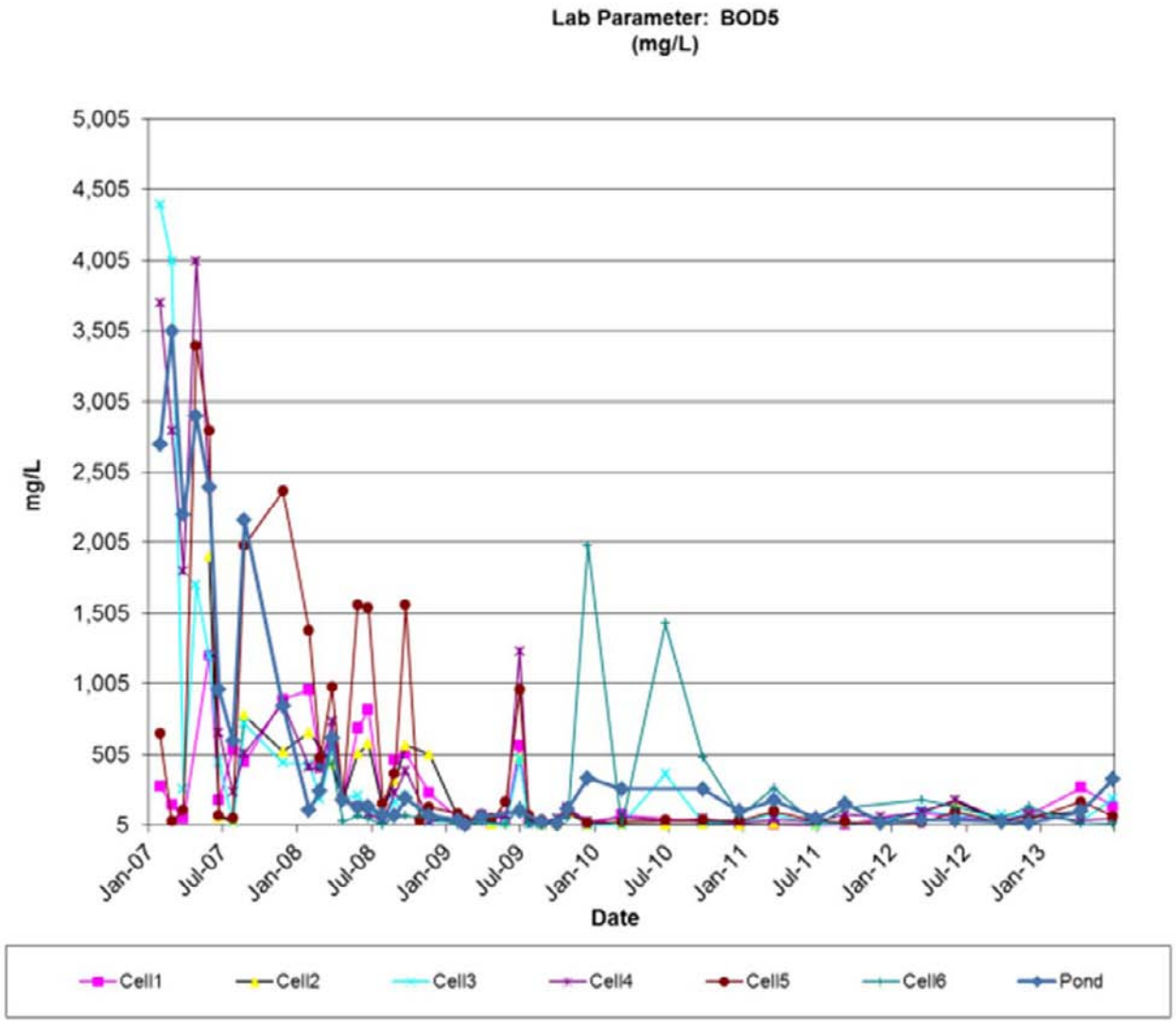

Figure 4-8 BOD5 of Leachate

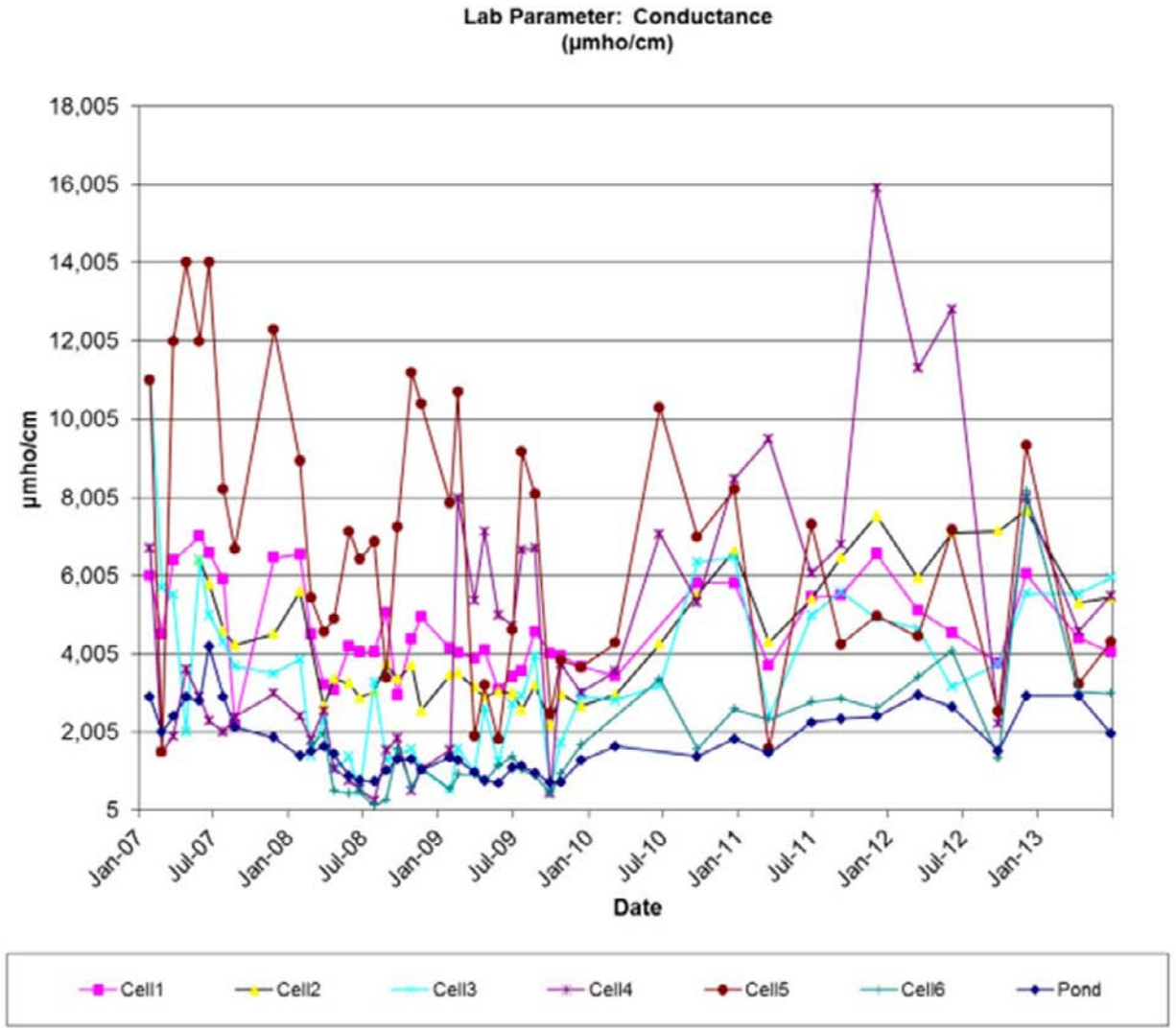

Figure 4-9 Specific Conductance of Leachate

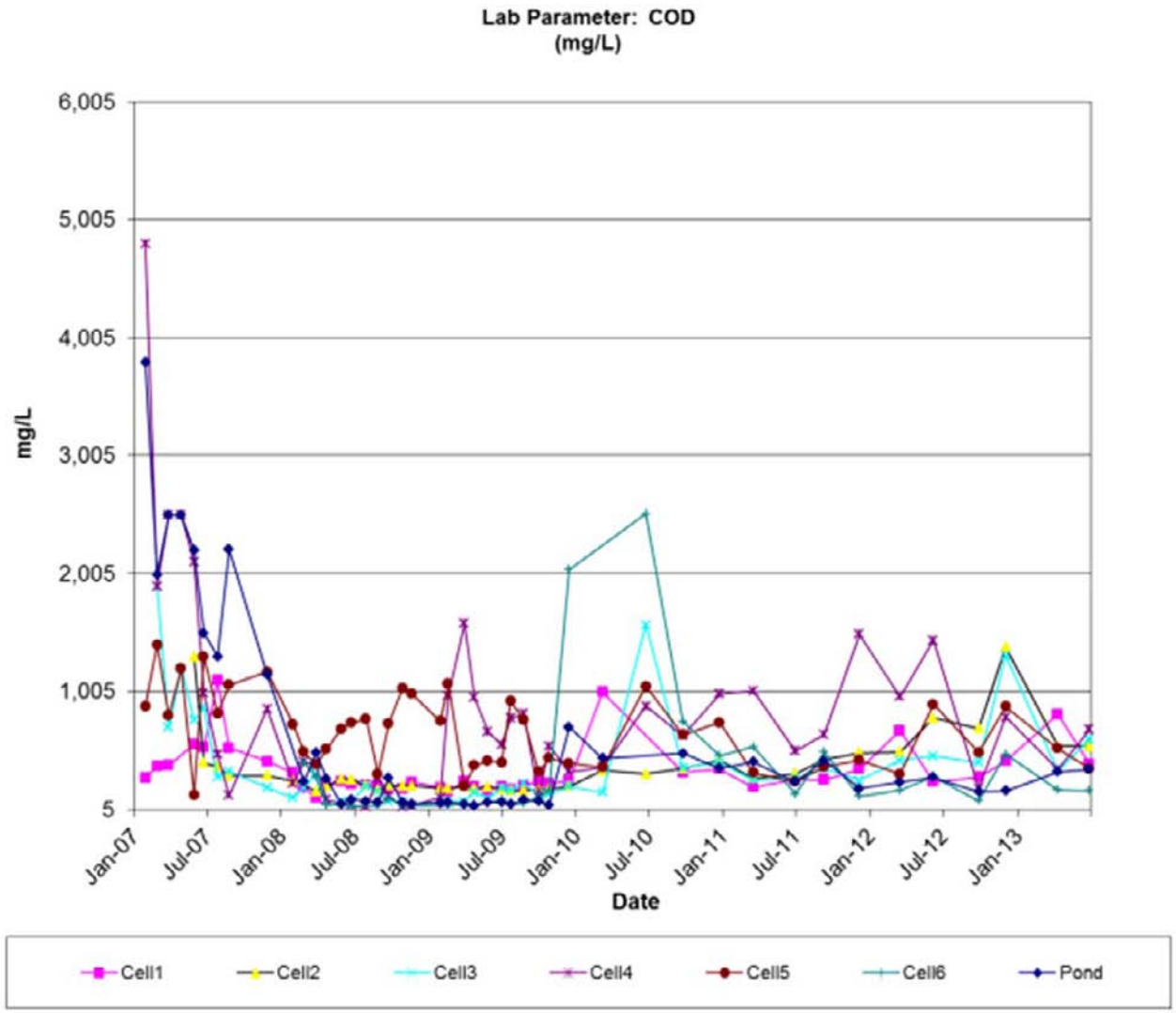

Figure 4-10 COD of Leachate

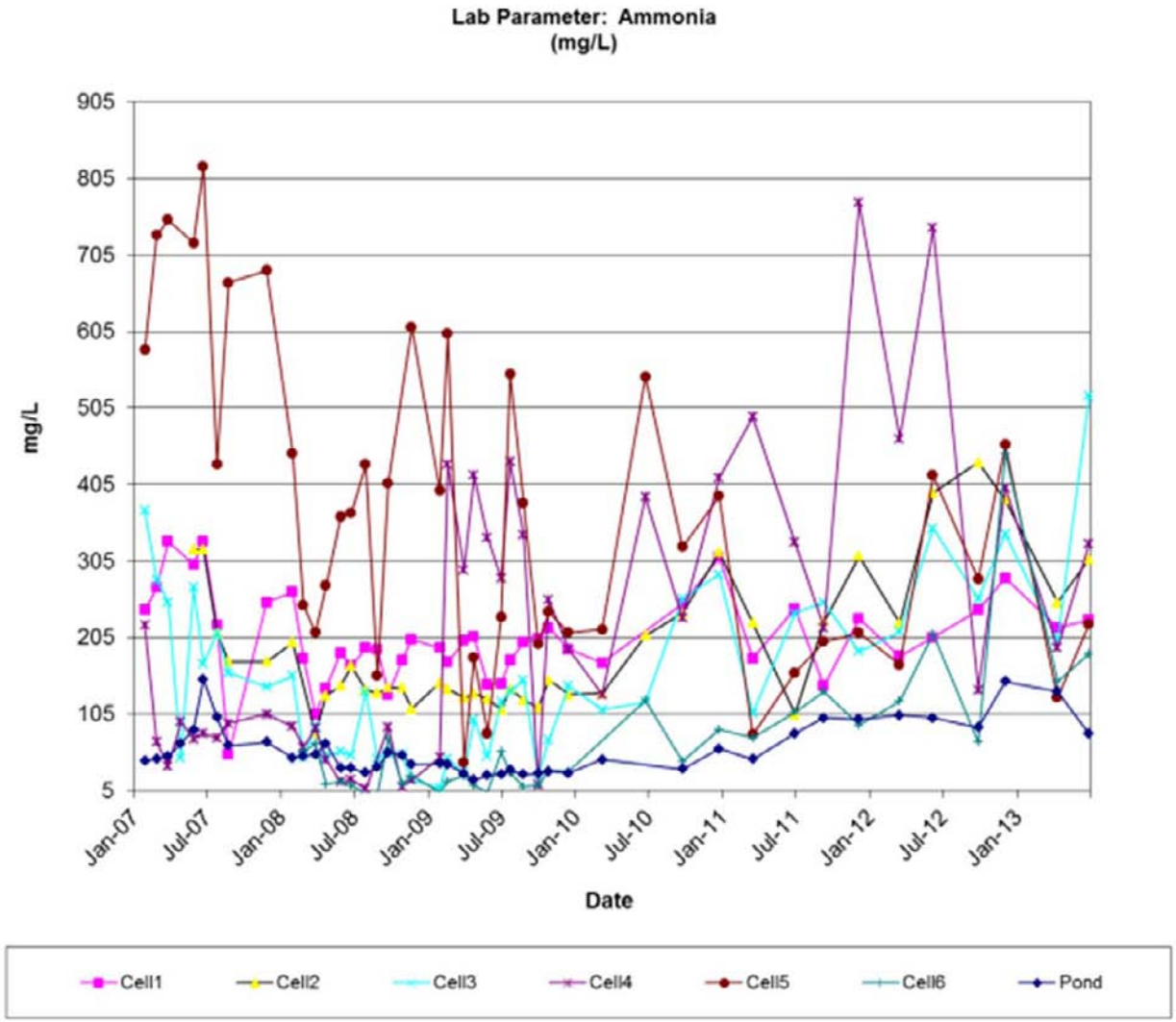

Figure 4-11 Ammonia of Leachate

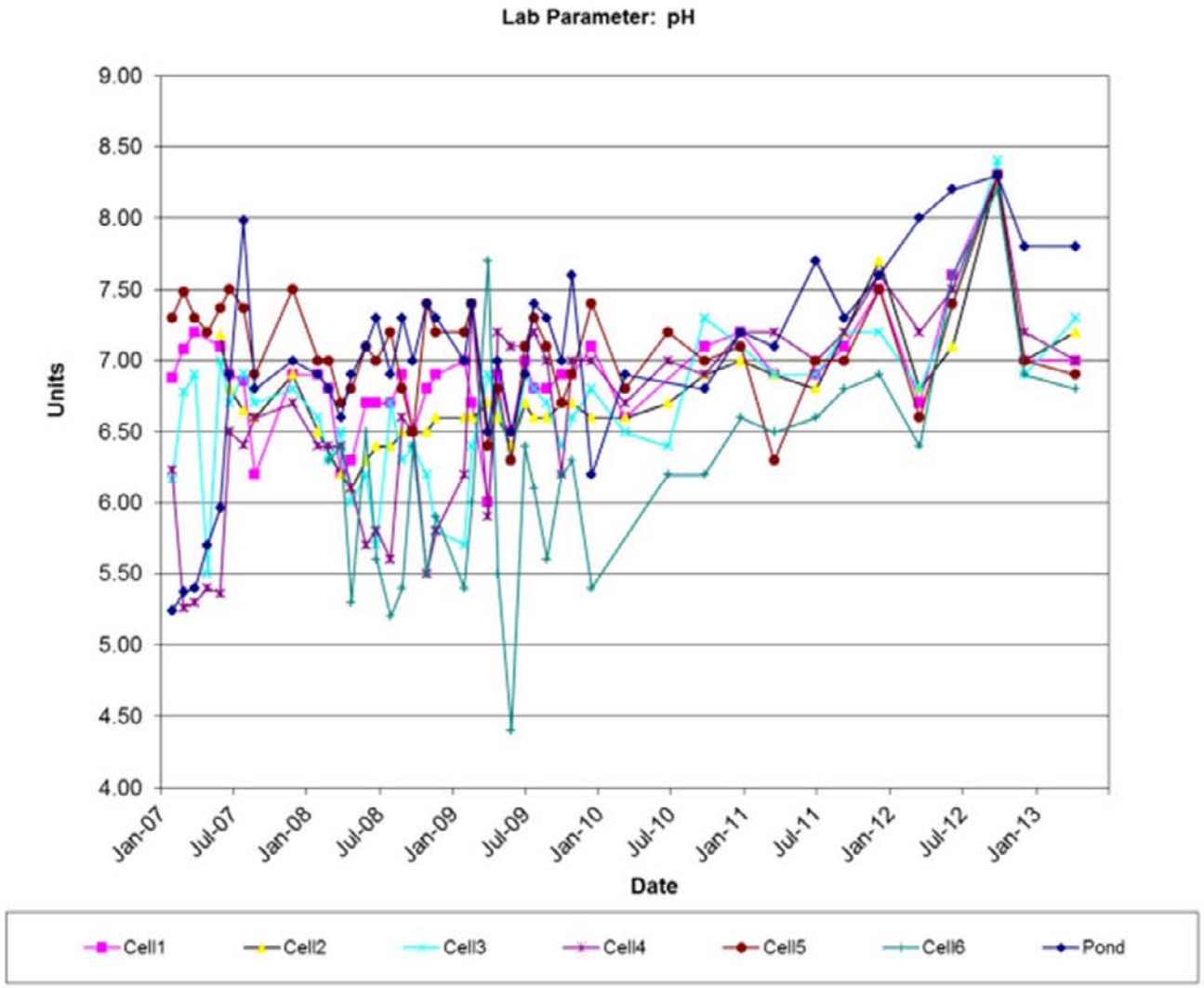

Figure 4-12 pH of Leachate

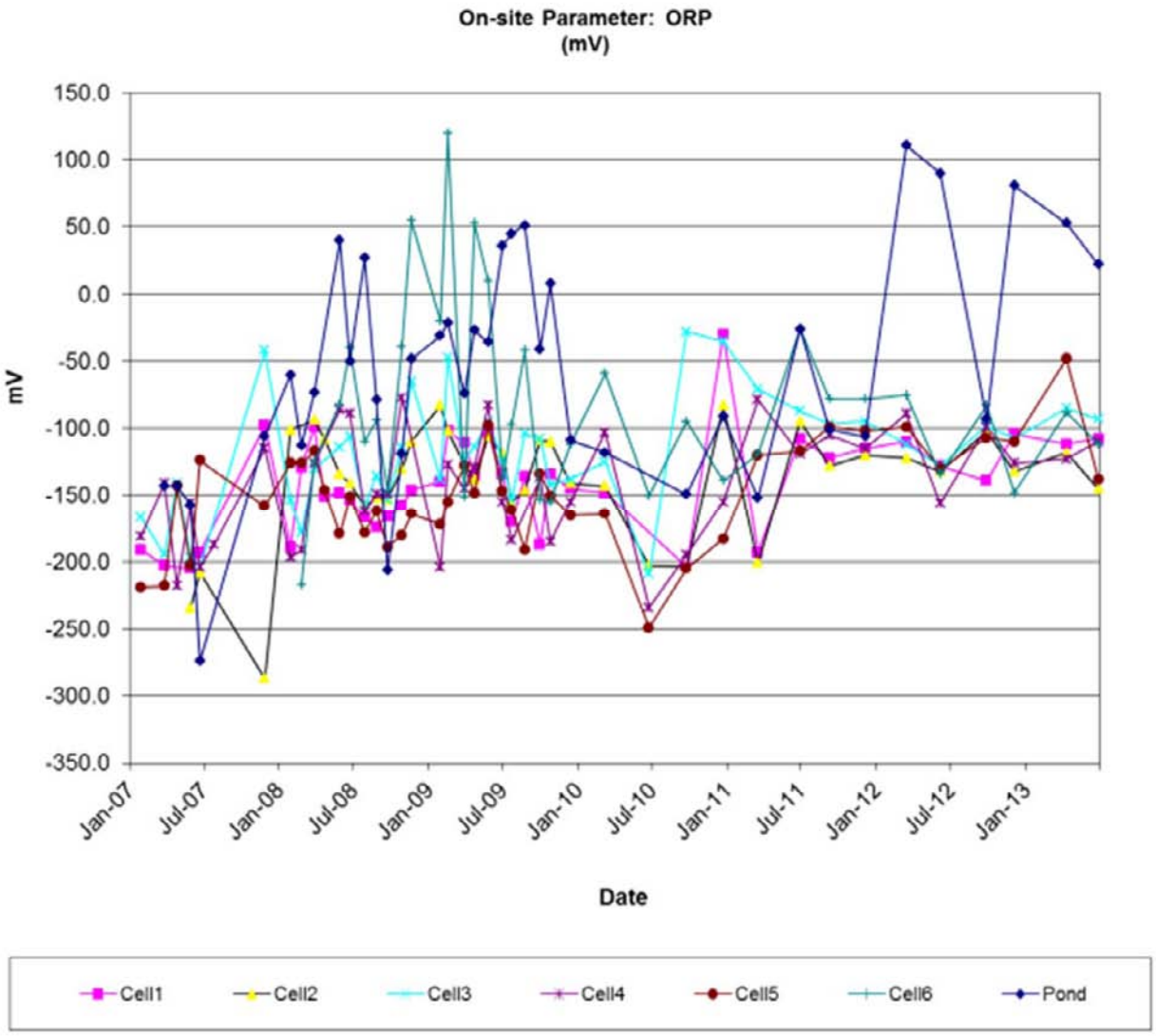

Figure 4-13 ORP of Leachate

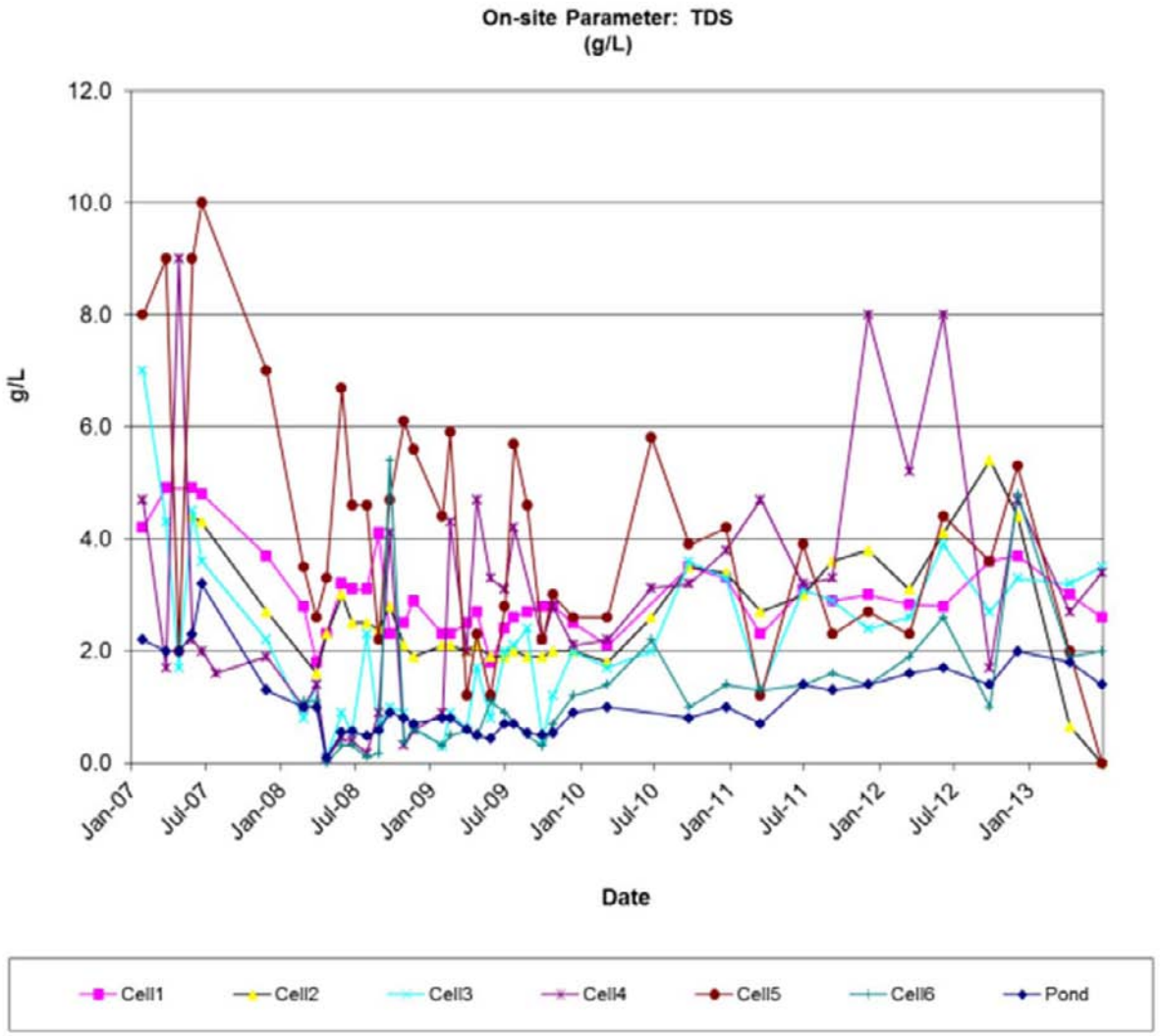

Figure 4-14 TDS of Leachate

4.3 Leachate Recirculation

Figure 4-15 shows the cumulative quantity of leachate recirculated from 2006 through June 2013. Approximately 2.97 million gallons of leachate has been recirculated. The annual leachate recirculated is presented in **Table 4-3**.

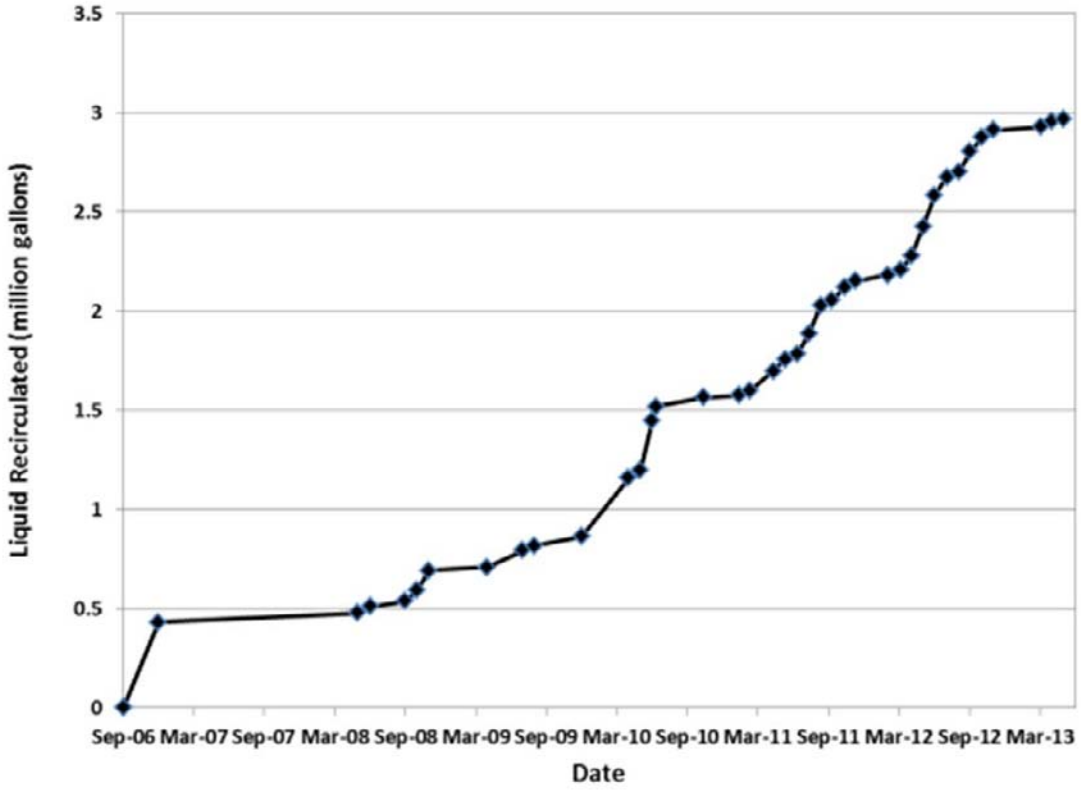

Figure 4-15 Cumulative Volume of Leachate Recirculated

Table 4-3 Leachate Recirculation Volumes

Date	HITs D, E, and F (gal)	SGTs 1A, B, and C (gal)	SGTs 2A, B, and C (gal)	SGTs 3A, B, and C (gal)	HITs A, B, and C (gal)	SGTs 4A and 4B (gal)	SGTs 5A and 5B (gal)	Annual Total (Gallons)
2006	32,093	48,140	48,140	48,140	32,093	10,698	10,698	230,000
2007	27,907	41,860	41,860	41,860	27,907	9,302	9,302	200,000
2008	116,108	51,914	42,883	35,985	14,720	-	-	261,610
2009	48,210	3,670	1,720	3,590	105,330	8,510	-	171,030
2010	296,600	20,000	24,100	21,300	307,733	21,667	10,000	701,400
2011	298,490	14,129	27,654	21,867	161,068	32,922	29,690	585,820
2012	425,620	24,867	33,968	25,765	213,010	19,955	18,235	761,420
Jan.-Jun. 2013	31,270	4,470	7,130	6,430	5,290			54,590
Total	1,276,298	209,050	227,455	204,937	867,151	103,054	77,925	2,965,870

4.4 Landfill Gas

Collected gas flow rate and methane percentage is monitored continuously at the LFGTE facility as presented in **Figure 4-16**. The significant increase in the total gas flow during the end of April of 2012 was due to adjusting the gas wells to optimize the gas collection system.

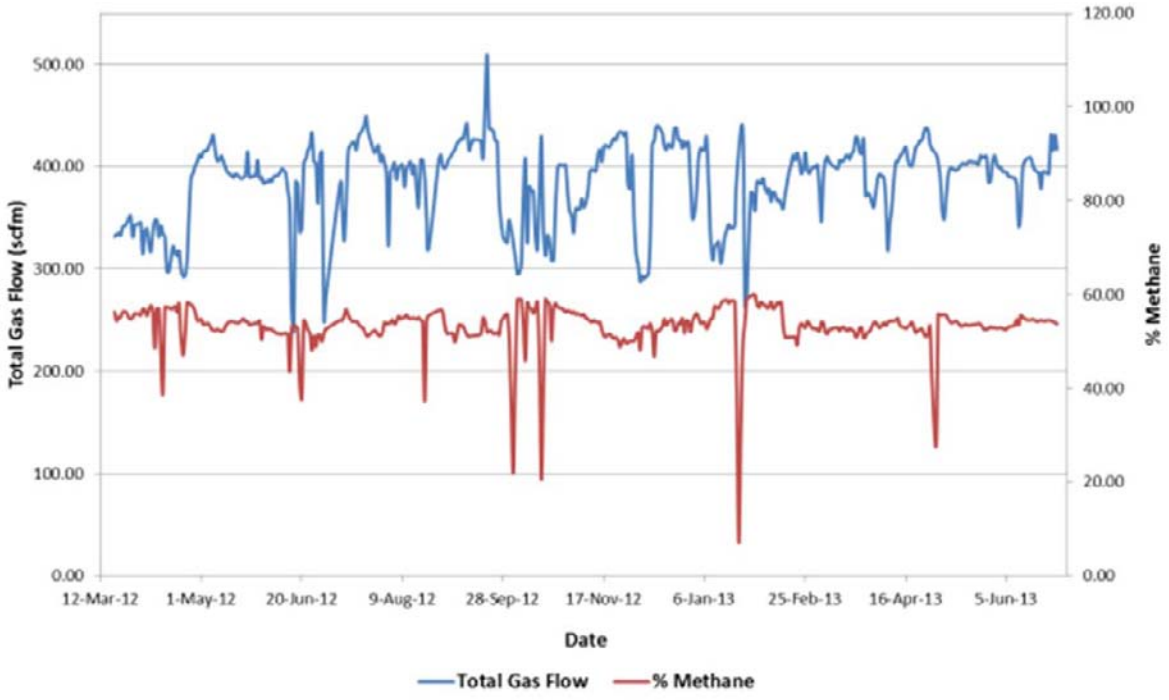

Figure 4-16 Total Gas Flow and % Methane at the LFGTE Facility

4.5 Settlement

The location of the ten (10) settlement plates installed within the retrofit area is shown in **Figure 4-17**.

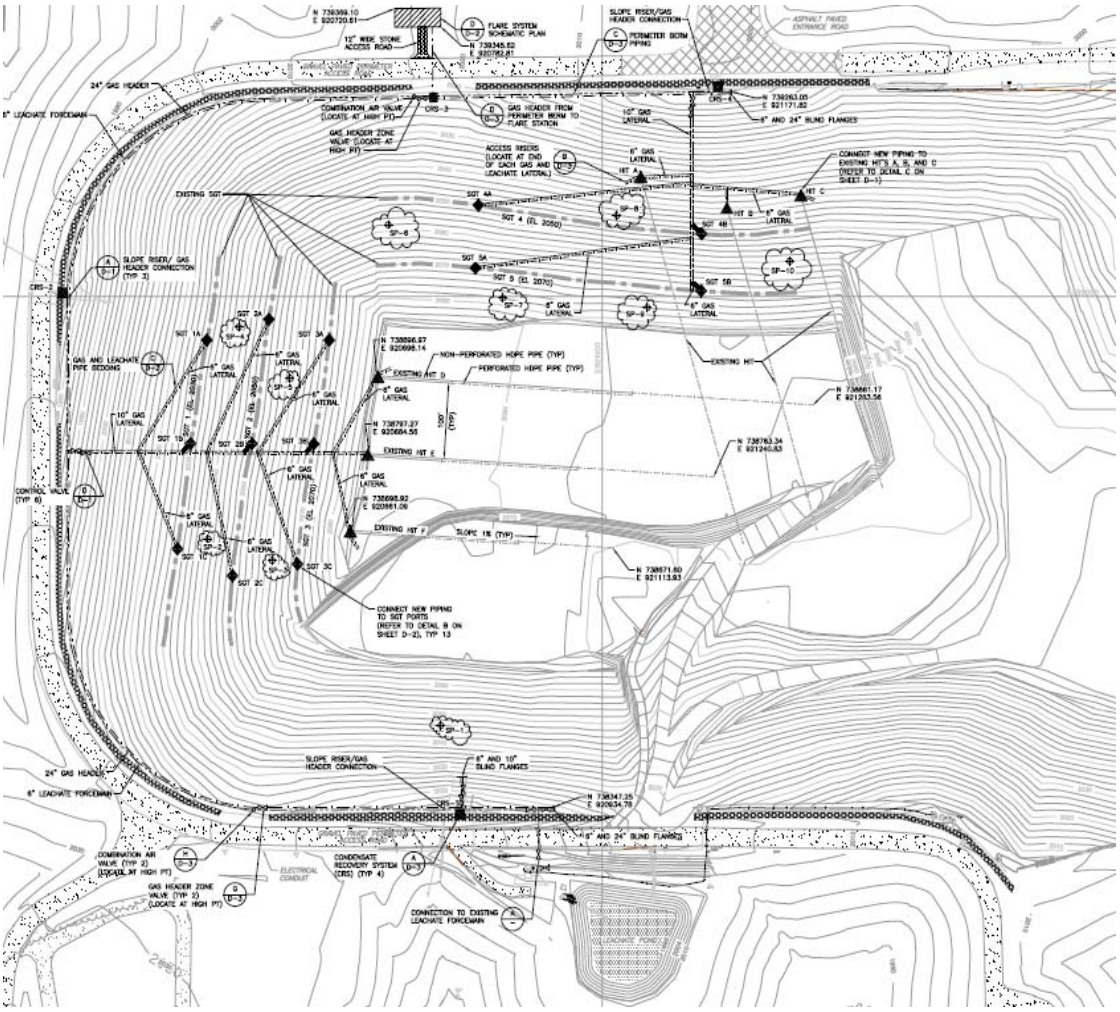

Figure 4-17 Settlement Plates in Cells 1-5, (Plate locations are shown circled with cloud outline.)

Figure 4-18 compares the measured settlement from July 2006 through July 2013 to the quantity of leachate recirculated in Cells 1-5.

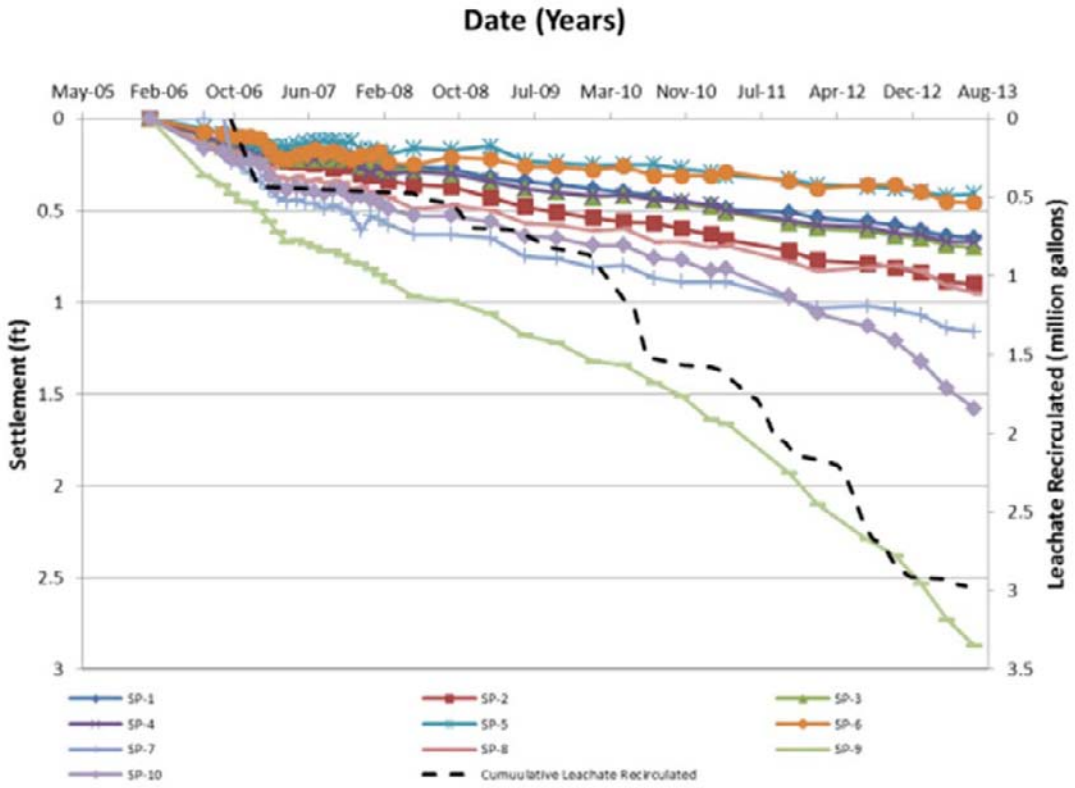

Figure 4-18 Cumulative Settlement

4.6 Effective Waste Density

The County tracks the effective waste density of the active cell as part of the landfilling operation. This data will be included in reports going forward to assess impacts of liquids addition on compaction. Pre-wetting density values for Cell 6 include:

- 2013: 0.77 tons/cy
- 2012: 0.86 tons/cy
- 2011: 0.63 tons/cy

Section 5
Project Assessment

5.1 Determination of Liquid Sources in the LDZ

It cannot be assumed that liquid in the LDZ is necessarily leachate leaking through the base liner system of a cell. As shown in **Figure 5-1**, the LDZ are open on the sides and therefore are subject to potential groundwater infiltration. This is particularly evident in Cell 1 where it appears that the LDZ is being impacted by an underground spring based on the amount of flow witnessed during sampling events and the high quality of the water. Comparison of testing data between the LDZ, leachate and groundwater was performed in an effort to determine the source of the liquid in the LDZ.

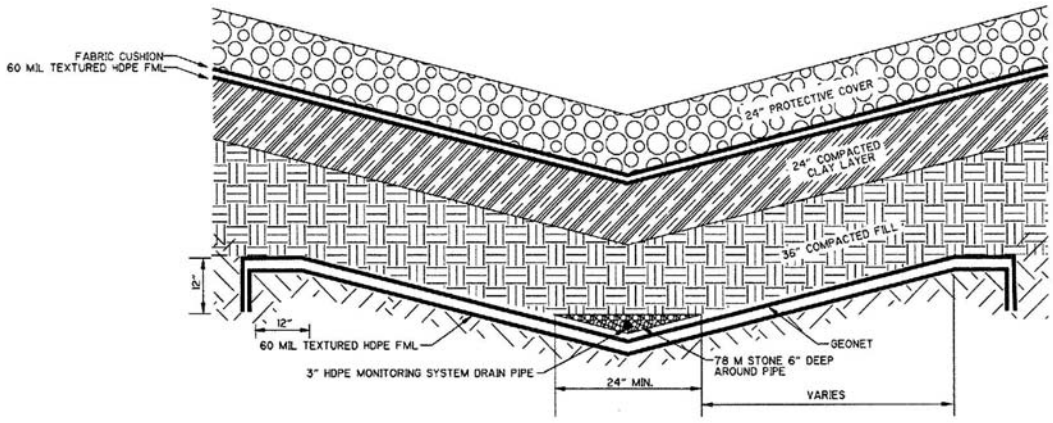

Figure 5-1 Leak Detection Zone in Cells 1-6 and Leachate Pond

The conductance levels of leachate are much higher than the samples tested for the LDZ. The conductance of leachate is in the range of 800-5,000 µmho/cm compared to 200-800 µmho/cm for the LDZ. The LDZ conductance is similar to the levels tested from groundwater well samples in the area as shown in **Figure 5-2**.

Toluene, which is often present in leachate, was found to be sustainably lower in the LDZ samples. Comparison to groundwater samples is provided in **Figure 5-3**.

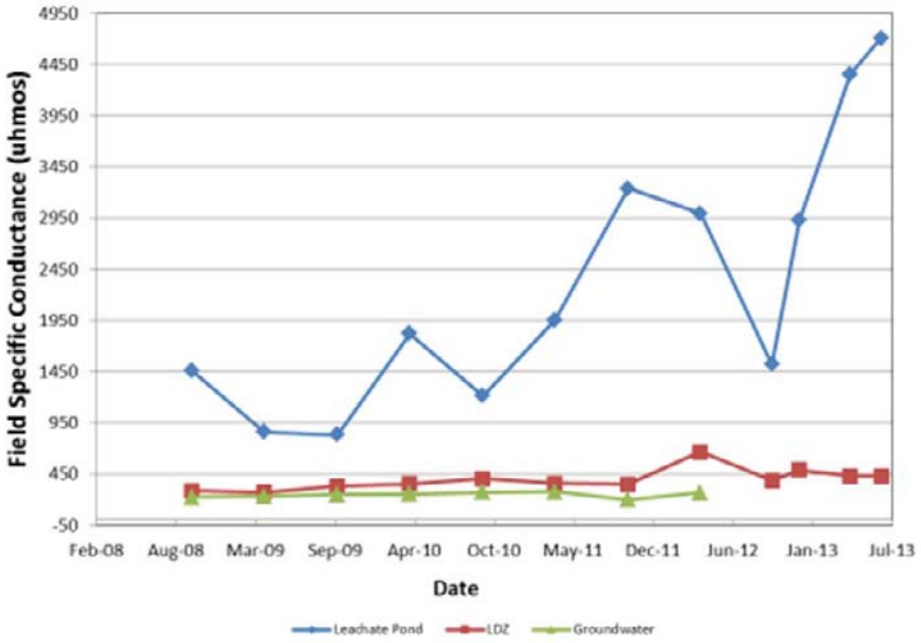

Figure 5-2 Conductance of Leachate Pond, LDZ, and GW Samples
(Values are averages of testing results for the six cells and all GW monitoring wells.)

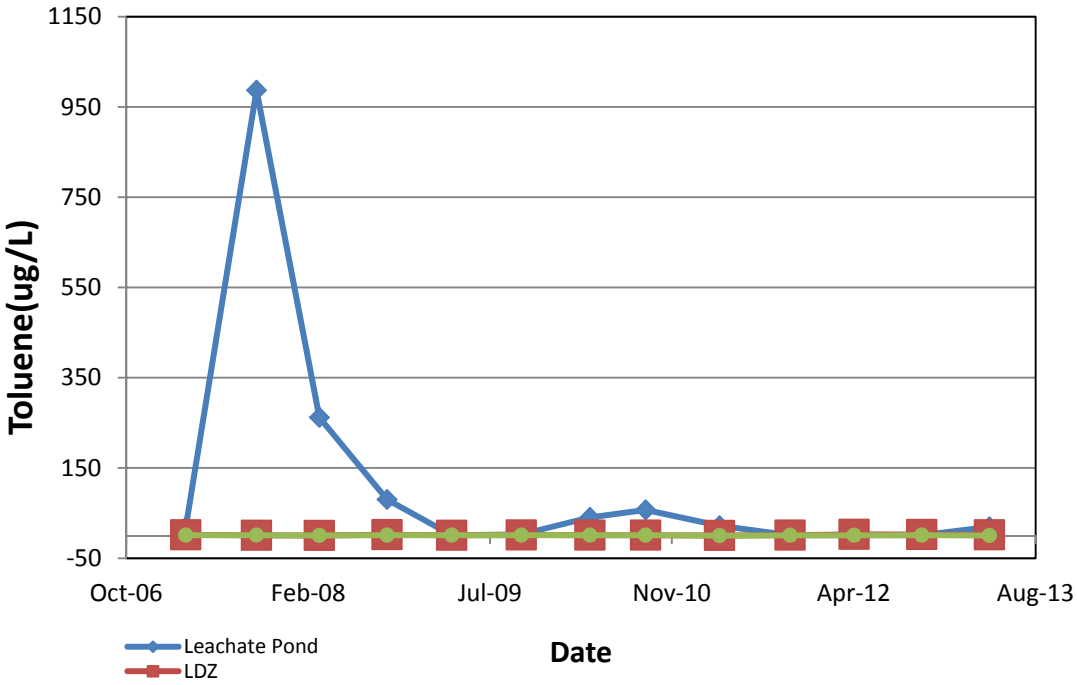

Figure 5-3 Toluene of Leachate Pond, LDZ and GW/SW Samples
(Values are averages of testing results for the six cells and all GW/SW monitoring wells.)

Figure 5-4 shows the ORP values for the leachate and LDZ samples for all cells. Comparison of ORP values also shows a strong distinction between leachate and the liquid sampled from the LDZ. The ORP values for leachate are all negative while all but two of the LDZ samples produced positive values. A negative value is indicative of anaerobic conditions as would be expected for landfill leachate. Thus, the positive readings for the LDZ samples indicate that it is not leachate.

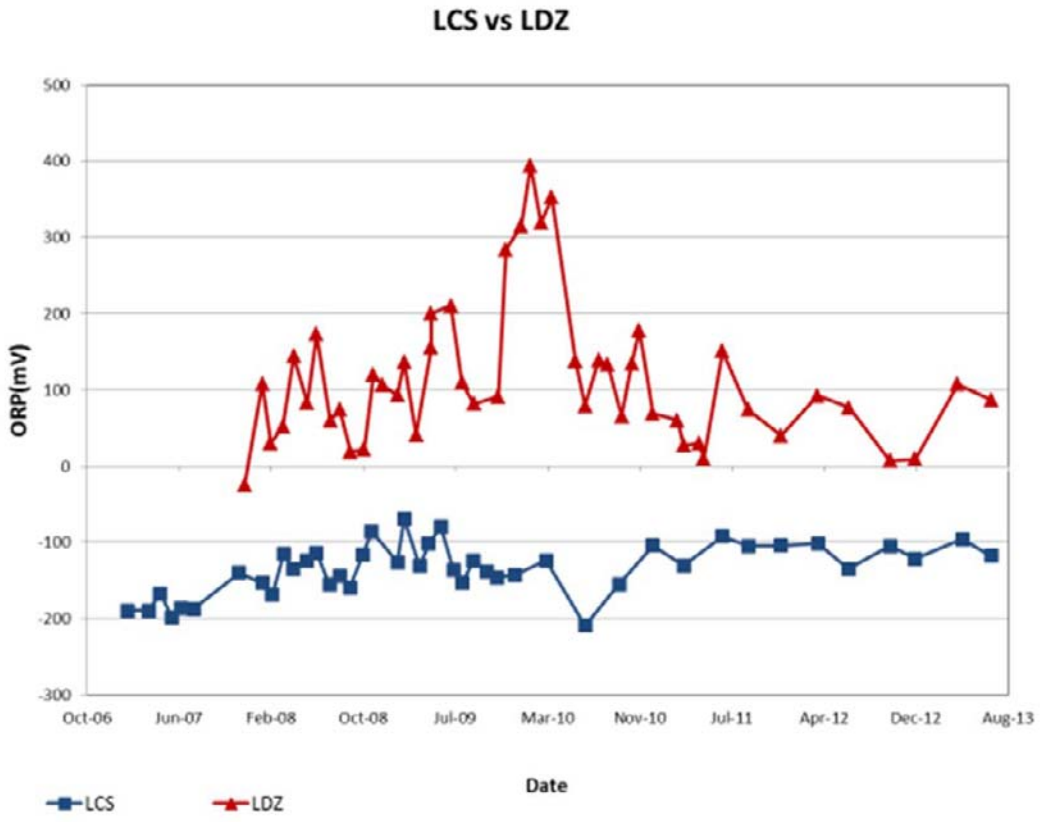

Figure 5-4 ORP of LCS and LDZ
(Values are averages of testing results for the six cells.)

Based on these comparisons it was determined that the liquid in the LDZ is coming from groundwater sources. As no appreciable amount of leachate has been detected in any of the LDZ it can be concluded that both types of liner systems are performing as designed and are not experiencing adverse impacts from the liquids addition program.

5.2 Reduction of Leachate Hauling and Treatment at the Wastewater Treatment Facility

As June 30th, 2013, a total of 2.97 million gallons of leachate has been recirculated, resulting in 593 avoided truck trips to the wastewater treatment plant and a savings of $227,185 hauling and treatment costs. The savings attributed to 2012 is $61,347. With the expansion of the wetting system into Cell 6, the largest cell of the landfill, the amount of leachate that can be recirculated will be significantly increased once it begins operation in 2013.

5.3 Leachate Recirculation

The ability to recirculate leachate has been hampered by the saturated state of the landfill Buncombe County has received a record amount of rainfall during the first half of this year. About 50 inches of rain has been measured at the Asheville Regional Airport so far this year, more than double the amount through this point in 2012 as quoted in an article by Citizen-Times (http://www.citizen-times.com/article/20130723/NEWS/307230022/Record-rainfall-Asheville-July) local news in July 2013. Table 4-2 indicates that the landfill has already seen 28 inches of rainfall during the first half of this year resulting in double the amount of leachate generated compared to first half of 2012.

5.4 Relocation of Condensate Discharge Line in Cell 4

The condensate discharge line from the gas wells around cell 4 was constructed incorrectly and connected to the Leak Detection Zone Riser. All condensate discharge lines connect directly to the leachate sump riser; the condensate line for cell 4 was disconnected from the leak detection zone and reinstalled correctly into the leachate sump riser at cell 4.

5.5 Waste Stabilization

Twenty five vertical wells were installed in Cells 1-5 in November 2010 for the landfill gas-to-energy project. Photographs were taken of the exhumed waste to observe the degree of stabilization as shown in **Figure 5-5** and **5-6**. Waste temperatures were taken immediately after waste was extracted from the boreholes with an infrared thermometer. Most locations showed waste temperatures in the mid-90s with the exception of the following five wells which showed elevated temperatures:

- VW-6: 100 deg F
- VW-24: 110 -130 deg F
- VW-10: 104 -108 deg F
- VW-18: 110 deg F
- VW-11: 105 -108 deg F

The waste from these five boreholes was observed to be noticeably wetter than the waste for the other boreholes. Steam emanating from the waste of VW-24 was indicative of the elevated temperatures. The waste from this borehole appeared to be well decomposed.

Figure 5-5 Exhumed Waste from Drilling of Vertical Well 24

Figure 5-6 Exhumed Waste from Drilling of Vertical Well 13

The BOD5/COD ratio of the landfill leachate has dropped steadily since 2007 indicating that stabilization of the organic waste fraction is occurring as shown in **Figure 5-7**.

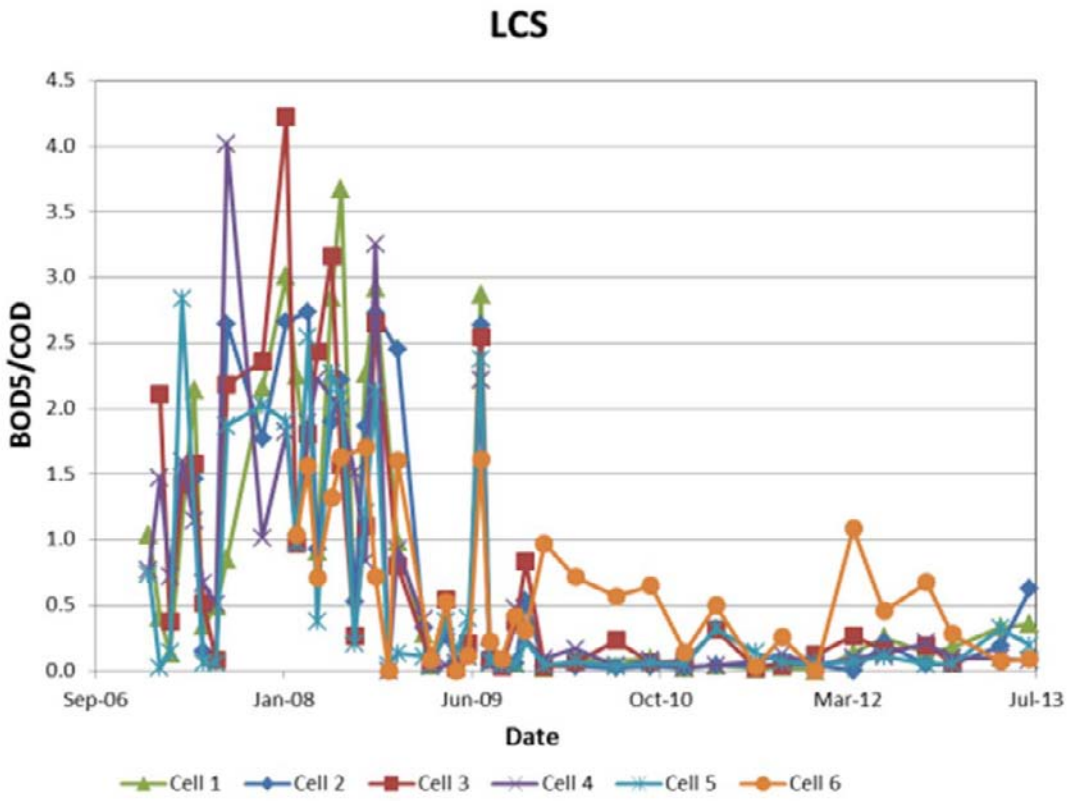

Figure 5-7 BOD5/COD Ratio of LCS in Cells 1-6

5.6 Greenhouse Gas Reductions

The HIT installed in the active disposal cell will provide early capture of LFG that would normally be released to the atmosphere until final grades are obtained and wells are installed. Collected gas from the active area will be measured to determine the amount of greenhouse gas reduction directly attributable to the project. Combustion of LFG also produces carbon credits for the County as the site is registered with the Climate Action Reserve. The County has registered 28,784 carbon credits in 2012, which is equivalent to offsetting gas emissions from 5,997 passenger vehicles.

5.7 Alternative Cover Material

Posi-shell has been approved by the North Carolina Department of Environment and Natural Resources for use at the Buncombe County landfill and is being used as an alternative daily cover since the last progress report. The use of alternative daily cover improves distribution of wetting from the HIT; uses less airspace than soil, and allows the onsite borrow soils to be saved for new cell and capping construction. It may also be contributing to improved compaction of waste. We recommend that alternative cover material be used to the largest extent possible in the ongoing landfill operation.

Section 6
Stakeholders Meeting

A project stakeholders meeting was held on September 20, 2012 at the Buncombe County solid waste management facility to provide an update and discuss project issues. The meeting was attended by the following persons:

NCDENR:	Ed Mussler, Allen Gaither, Andrea Keller
USEPA:	Craig Dufficy, on conference call
WNCRAQA:	David Brigman, Ashley Featherstone
Buncombe County:	Jerry Mears, Jon Creighton, Kristy Smith, Aaron McKinzie, Donna Cottrell
CDMSmith:	Chris Gabel, Ravi Kadambala
University of Florida:	Dr. Timothy Townsend

The following are the various topics discussed during the meeting along with follow-up activities performed.

6.1 Monitoring of the Alternative Liner System

Ed Mussler inquired if the project has sufficient data to reach a conclusion regarding the performance of the alt liner system and, if so, should we consider revising the project goals of Project XL and writing a final report addressing the performance of the alternative liner system.

Chris Gabel stated that further data is required to reach a conclusion and that Cell 6 will provide a means of tracking an accurate water balance. This will allow us to determine if the liner system is being subjected to higher leachate flows as a result of the newly installed build-as-you-go leachate recirculation system. The retro-fit system applies leachate at elevations that are 100+ feet above the leachate sump. The Phase 1 trenches installed in Cell 6 are 20 to 40-feet from the drainage layer.

Ed Mussler inquired if the leachate level at the sump is being monitored as it could be used to determine if leachate recirculation is over-capacitating the collection system. Kristy Smith responded that leachate levels are monitored daily but are not recorded. This prompted the idea of using the existing temperature sensor data logger to record leachate level data in Cell 6.

6.2 Discharge Liquids from Cell 1 LDZ

The Cell 1 LDZ has a large quantity of liquid in it that has been tested numerous times. The test results indicate that it is groundwater. The meeting attendees discussed options for draining the LDZ to determine if groundwater is still recharging this area. The proposed plane is to test the liquid to ensure it is not leachate and then drain into the adjacent stormwater channel. Onsite staff would monitor the process to see how long it takes to drain the accumulated volume. NCDENR representatives suggested submitting a letter describing how the process will be performed and the safeguards to be used to ensure protection of the environment.

Follow-up Activities: The County is planning to execute this plan in the latter half of this year.

6.3 Landfill Settlement

Settlement plates are used to track settlement resulting from wetting. We could consider using topographic surveys to supplement the plate information. The surveys could be performed on a 25-ft grid over the final slope areas for comparison from year to year to see where settlement is occurring. The cost is estimated at $3,500 per survey. Graphic representation could include color coded areas based on the amount of the settlement.

Settlement measurements can be taken internally by installing a level sensor into the HIT. The device, known as a settlement profiler consists of a pressure transducer which is connected to a liquid reservoir. The transducer is inserted into the HIT pipe using a push rod allowing measurements to be taken at various points of the trench. The transducer gives a measure of the elevation profile of the pipe relative to the reservoir located on stable ground. The liquid tube is stored on a reel.

Follow-up Activities: CDM Smith had contacted Ed Holmes & Associates to perform survey on a 50-ft grid over the final slope areas to reduce the annual cost. The cost is estimated at $2,500 per survey. The County is moving forward to start surveying in the latter half of this year.

6.4 Liquid Addition in Cell 6

Kristy Smith suggested dedicating HIT 6E to gas collection to reduce the likelihood of side seeps of leachate. Dr. Townsend suggested using only HITs 6B and 6D for leachate recirculation to determine the lateral extent of wetting using the temperature probes (refer to **Figure 6-1**). HITs 6A, 6C and 6E will be used for collecting gas. Temperature data and gas flow rates will be measured prior to leachate recirculation to get a background reading. The change in gas flow and temperature data will indicate the impact of leachate recirculation on gas generation.

Potential design changes for the next phase of lines in Cell 6:

1. Consider adding a vertical gas well intersecting the HITs
2. Consider installing temperature probes inside the HITs.
3. Consider utilizing waste heat from the LFGTE system to heat leachate for year-long leachate recirculation.

Follow-up Activities: Temperature data is currently being measured to get background readings. A water balance will be prepared later this year prior to recirculating leachate in Cell 6.

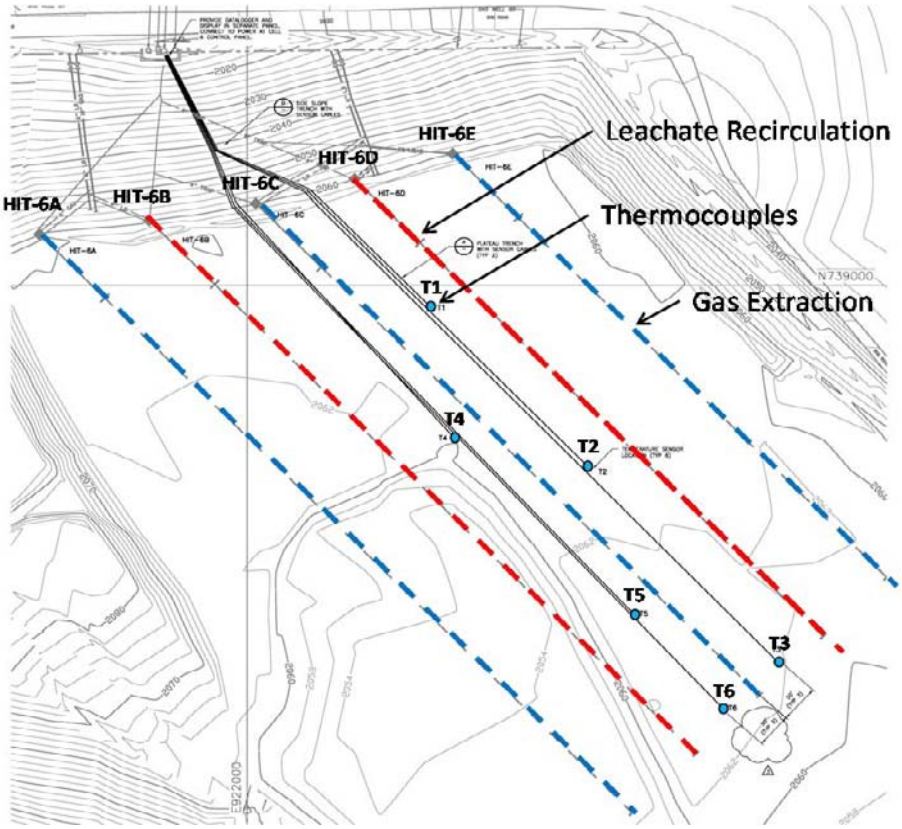

Figure 6-1 An Option Discussed at the Stakeholders Meeting for Cell 6 HIT Operation

6.5 Gas Collection System

Aaron stated that operation of the small flare was problematic as it keeps going out. Further investigation of the flare revealed that the orifice plate needs to be re-welded.

CDM Smith to perform wellfield adjustments with Buncombe County periodically to optimize gas extraction. Well 6A in the Cell 6 drainage layer is functioning now that leachate sump levels were re-set to provide a lower elevation for Pump ON.

Follow-up Activities: Small flare has been fixed and is currently operational.

Section 7
Recommendations

7.1 Modifications to the Monitoring Program

7.1.1 Investigation of Cell 1 LDZ

Refer to Section 6.2.

7.1.2 Measuring Settlement

Refer to Section 6.3.

7.1.3 Water Balance Monitoring

Water balance monitoring could be added to more accurately track the effects of moisture addition. Leachate, precipitation, and leachate recirculation data are being collected that could be used in a water balance calculation.

7.1.4 Performance of Alternate Liner System

The leachate levels in the Cell 6 sump could be recorded on the temperature sensor datalogger to track variations in leachate flows. This data would provide insight as to the impacts of leachate recirculation on the capacity of the leachate collection/pumping system.

7.2 Recommended Modifications to Design and Operation

7.2.1 Leak Detection Zones

For Cells 7-10, it is recommended that the design of the LDZ be revised to eliminate the 3-foot separation between the LDZ and the bottom of the base liner system as this will greatly reduce the potential for groundwater infiltration.

7.2.2 Strategy for Operation of Cell 6 HIT

Based on the discussions held at the next stakeholders meeting, a combination of dedicated recirculation and gas collection HIT is desirable for determining the effectiveness of the wetting operation and maximizing early gas capture.

Appendix A

Final Project Agreement

USEPA PROJECT XL
FINAL PROJECT AGREEMENT

Leachate Recirculation/Gas Recovery ("Bioreactor") Project

Buncombe County Solid Waste Management Facility
Alexander, North Carolina

September 18, 2000

TABLE OF CONTENTS

Tables

I. Introduction to the Agreement

A. Description of the Project and Its Purpose

Under this proposed XL Project, Buncombe County, North Carolina proposes to construct the necessary infrastructure and operate a combined leachate recirculation and gas recovery system (commonly referred to as a "bioreactor" system) at its Subtitle D landfill. Research has shown that there are numerous environmental benefits that can result from operating a sanitary landfill in such a manner. The primary goal of this project will be to demonstrate that leachate can be safely recirculated over an alternate liner system at a full-scale level (something that is not currently allowed under the Subtitle D landfill regulations, 40 CFR Part 258), and provide more data to substantiate the expected superior environmental and cost savings benefits. It is further hoped that data from this project can be used to support regulatory changes that will allow this type of project to be implemented at similar facilities across the country. It should be noted that, because the County will be making tremendous capital investments in facilities, it is requesting that it be allowed to expand the system to future cells assuming the project is successful and if enabling regulations are not promulgated in the meantime. This could potentially extend the term of the agreement to more than 25 years. Prior to implementation beyond cells 3, 4 and 5, the parties to the agreement will evaluate the progress to that point to determine whether or not to proceed with the remaining cells.

Buncombe County proposes an accelerated stabilization full-scale landfill pilot. The pilot would potentially encompass all 10 cells of the Buncombe County Municipal Solid Waste Management Facility. While other bioreactor studies have been conducted within this country and in Europe, many of those other bioreactor studies have been developed only at the bench scale or as pilot-scale studies which focused on a smaller, more controlled area. Buncombe County is seeking regulatory flexibility through Project XL. Project XL allows regulated entities to conduct pilot projects, within a specified scope, time, and on a site-specific basis to identify better ways to accomplish environmental benefits. The value in proposing the accelerated stabilization landfill at Buncombe is that it would provide superior environmental benefits (e.g., monitoring, gas collection, available data), in addition to cost savings to the County and the local residents.

First, one of the obvious differences between this pilot and other bioreactor landfills would be the scope of the experiment to be conducted. Buncombe proposes to conduct a large-scale (10 cell), fully controlled bioreactor landfill site. Buncombe County is the only known site to propose a full-scale pilot, in the true sense of the word. There is value in that alone. Second, the value in conducting a bioreactor pilot project at Buncombe County landfill in spite of other existing bioreactor experiments is because there are differences in the geographical context, and in State requirements for most projects. Third, another difference between the Buncombe site and others includes the proposed comparison between several existing and proposed cells on their own site. This comparison

would involve recirculating leachate and comparing Cell 1 and Cell 2 (composite liner), with Cells 3-10 (alternate, State-approved liner).

Buncombe County has developed their proposal for the bioreactor landfill based on the inclusion of all ten cells of the landfill. The infrastructure for the accelerated stabilization would require a substantial investment in the landfill of one million dollars. Buncombe County has conducted their research, has the necessary technical expertise to run such a bioreactor landfill, and is confident of the projected results. If the project were to be scaled-back to be less inclusive than the ten cells (e.g., cells 3-5), much of the cost effectiveness of the project would be lost.

Characteristics of waste streams change over time. As market preferences shift, and consumer interests change, the overall characteristics of waste going in to the landfill over time may change. By allowing a project that contemplates the life of the landfill (as opposed to a few cells) information concerning the behavior and effectiveness of bioreactors, EPA hopes to gain information about impact these types of changes have on the bioreactor.

EPA is also taking into account the long-term fiscal and physical planning necessary to optimally design and run a landfill. Viewing the whole landfill as a system, EPA has determined that this project provides an good opportunity to pilot the use of bioreactor technology over an alternative liner system. All other current safeguards and regulatory requirements that apply to bioreactors will remain in place.

Description of the Project Site:

The Buncombe County Solid Waste Management Facility was opened in September 1997. In addition to a Subtitle D landfill disposal area, the facility has a C&D landfill, a wood waste mulching facility, a convenience center for residential waste disposal and recycling, and drop-off areas for white goods and tires. The Subtitle D landfill disposal area comprises approximately 100 acres of the more than 600-acre site. The landfill has been designed with 10 separate disposal cells that will be constructed sequentially over the estimated 30-year life of the facility. Cells 1 and 2, which comprised Phase I of the landfill, were constructed with the standard Subtitle D composite liner system (i.e., two feet of clay with a permeability less than or equal to 1×10^{-7} cm/sec in combination with a 60-mil HDPE synthetic liner) as described in 40 CFR 258.40(b) and Section .1600 of the North Carolina Solid Waste Management Rules. In 1999, Cell 3 was constructed with an alternate composite liner system (18-inches of 10^{-5} cm/sec clay, a geosynthetic clay liner [GCL], and a 60-mil HDPE synthetic liner). The State of North Carolina did not allow alternate liners until 1998. The County recently bid and expects to begin construction by August, 2000 on Cells 4 and 5 which will also be constructed with the alternate liner system. This agreement is intended to potentially cover all ten cells of the landfill, with a decision point for the parties and stakeholders contingent upon a review and evaluation of data

from cells 1-5 as well as an assessment of project success every five years which will coincide with the decisions to renew the landfill's operating permits.

As noted previously, both the Federal and State regulations allow leachate recirculation over the standard composite liner system prescribed in Subtitle D, however, neither allow it over cells constructed with alternate liners. On Cell 3, the alternate liner system saved Buncombe County nearly $400,000 as compared with the standard composite system. It is estimated that the County will save a total of $5 million through build-out of the facility if the alternate liner system is used. Other potential cost savings from the project include:

- $5 - $10 million in reduced construction costs for additional landfill capacity if an increase of 20%-30% in additional waste volume can be achieved due to rapid waste decomposition during operations; and,

- $9 million if leachate hauling and off-site treatment can be eliminated.

Maintaining the region's pristine surface water and groundwater, and clean air, are high priorities for the County's elected officials and staff. The proposed leachate recirculation and gas recovery system will serve to support these goals.

Combining leachate recirculation with gas recovery at a Subtitle D landfill has been shown at the pilot scale to provide numerous environmental benefits. Currently however, the Subtitle D regulations restrict leachate recirculation to only those landfills that have been constructed with the standard composite liner system prescribed in the regulations (i.e., two feet of clay with a permeability of not more than 10^{-7} cm/sec and a 60-mil HDPE synthetic liner). The goal of this XL Project will be to demonstrate that leachate can be safely recirculated over equivalent, alternate liner systems (which in many cases are less expensive than the conventional Subtitle D composite liner system) and thus provide the basis for future regulatory changes that will allow this superior environmental performance to be achieved at similar facilities across the country. The superior environmental benefits that Buncombe County expects to achieve with this project are:

- Rapid organic waste conversion/stabilization leading to rapid settlement, increased gas yield and capture, improved leachate quality, reduced post-closure costs, and reduction in the potential for uncontrolled releases of leachate and/or gas to contaminate the ground water or air during the post-closure phase should a containment system failure occur

- Maximizing landfill gas capture for better and more efficient energy recovery and reduction of fugitive air emissions. Studies to determine the market and feasibility for use of the enriched gas produced during recirculation of leachate will be conducted as part of

this XL project. Reduction in air quality impacts from the facility is of primary importance since air inversions and the resulting degradation in air quality are common in the mountains.

- Increased landfill disposal capacity due to rapid settlement during the operational period that leads to more economical operations, deferred capital costs for additional landfill capacity, and delay in the siting and construction of a new facility.

- Improved leachate quality and a reduction in leachate quantity. Research has shown that leachate recirculation allows for: more time for decomposition of organic contaminants; adsorption of certain inorganic contaminants into the soil/waste matrix; and, enhanced chemical reactions such as metals precipitation. All of these processes will improve the quality of the leachate that is discharged to the local publicly owned treatment works (POTW) which should reduce any strain on the facility caused by the leachate. The quantity of leachate is reduced through adsorption by the waste and soil as well as by consumption during biological activity. Because leachate from the Buncombe County facility is hauled by tanker truck to the POTW, a reduction in the amount of leachate requiring treatment will result in fewer tanker trucks on the roads creating a safer situation for nearby residents

- Reduction in post-closure care, maintenance, and risk through rapid waste stabilization.

Therefore, to realize these superior environmental benefits as well as the cost savings discussed previously, Buncombe County is requesting that U.S. EPA and the State of North Carolina, Department of Environment and Natural Resources (NCDENR) grant site-specific regulatory flexibility from the prohibition in 40 CFR 258.28, Liquid Restrictions, which prohibits the recirculation of leachate over cells constructed with an alternative liner.

Some studies indicate that the amount of leachate generated at most landfills, even those in wet climates, will not be enough to totally saturate the waste mass thereby not achieving maximum waste decomposition. Buncombe County is requesting additional flexibility in 40 CFR 258.28 to allow the addition of supplemental liquid to the waste mass should the amount of leachate available become limiting at any time during operations. Water diverted from the neighboring French Broad River will be the only source of supplemental liquids circulated. Buncombe County requests similar flexibility from NCDENR for supplemental liquid addition if needed.

It is recognized that the addition of supplemental liquids may decrease the strength of the waste mass and, if not designed properly, decrease the stability of the landfill. Prior to adding any supplemental liquids to the facility, Buncombe County will prepare a comprehensive landfill stability analysis under recirculation conditions with supplemental liquids. Buncombe County will

submit this analysis to two of the three following university professors who are recognized as experienced in the field of geotechnical engineering in general and landfill slope stability specifically: Dr. Timothy Stark, University of Illinois; Dr. Craig Benson, University of Wisconsin; and, Dr. Robert Koerner, Drexel University. The County will incorporate comments from these professors into a final stability analysis for their final review. The County will forward the analysis along with letters from the reviewing professors stating that the landfill should remain stable under the operating plan developed by the County, to the USEPA and the State of North Carolina for concurrence prior to adding any supplemental liquids. Should two of the professors mentioned above be unable to conduct the review, the County will suggest an alternate that is acceptable to USEPA and the State.

Finally, Buncombe County intends to continue to recirculate leachate consistent with this agreement and in compliance with all applicable regulations throughout the landfill as long as gas generation data shows that biological activity continues and leachate flow and quality data show that improvements in leachate quality and reductions in quantity are occurring. It is expected that this will occur long after each cell has reached its permitted final grade. As long as these processes are ongoing, it is expected that waste decomposition and the resulting settlement will continue to occur. As mentioned above, one of the superior environmental benefits expected from this project is the additional airspace for waste disposal made available by more rapid waste settlement.

B. Description of the Facility and Facility Operations/Community/Geographic Area

The Buncombe County Solid Waste Management Facility (BCSWMF) is an existing Subtitle D landfill permitted by NCDENR, Solid Waste Section. The 600+ acre facility is located in northern Buncombe County about two miles from the Madison County line. NC 251 borders the facility to the south and west. Access to the site is from the northwest off of Panther Branch Road (SR 1745). A prominent physical feature of the facility is the French Broad River that borders the site to the south and west. The BCSWMF accepts non-hazardous municipal solid waste generated within the County for disposal in the Subtitle D landfill portion of the site. Construction and demolition waste is accepted and disposed of in an approved construction and demolition debris landfill also located on the site. Tires and white goods are accepted as well and they are processed prior to being shipped off-site for recycling and/or disposal. Wood and yard wastes are processed into mulch and sold to the public. Common household recyclables are also collected at the facility.

Since opening in September 1997, the Buncombe County Solid Waste Management Facility has received several prestigious awards including:

- 1998 Honors Award for Engineering Excellence from the North Carolina Consulting Engineers Council.

- 1999 Gold Award for Outstanding Integrated Solid Waste Management Program from the North Carolina Chapter of the Solid Waste Association of North America (NC SWANA)

- 1999 Bronze Award for Excellence in Solid Waste Management in North America, Landfill Category, from the Solid Waste Association of North America (SWANA).

- 2000 Award for Outstanding County Program from the North Carolina Association of County Commissioners for its Hazardous Waste Handling, Reduction, and Education Program.

The Subtitle D landfill portion of the BCSWMF comprises 100 acres. The site has been segregated into 10 distinct cells of varying size depending on topography. Cells 1 and 2, which combined are approximately 14 acres in size, were constructed as part of the initial facility construction. Both of these cells were constructed with the standard Subtitle D composite liner system. Two feet of crushed stone was used to construct the protective cover/leachate collection and drainage system. The synthetic liner is protected against abrasion and puncture from the stone and waste by a 28-oz. fabric cushion. Leachate is drained to a sump area located in each of the ten cells and then pumped to an on-site lined, leachate storage lagoon with 1.5 million gallons of capacity. Leachate is currently hauled approximately seven miles by tanker truck to a wastewater treatment plant owned and operated by the Metropolitan Sewerage District of Buncombe County (MSD).

The majority of ground water underlying the BCSWMF lies within a fractured bedrock aquifer system. Depth to ground water varies considerably across the site ranging from about five feet in the low lying areas to as much as 200 feet along the ridge lines. Because of the complexity of the ground water flow regime, it was decided during permitting that a standard perimeter network of ground water monitoring wells would need to be supplemented by an additional monitoring system. The alternative monitoring system agreed upon consists of a synthetically lined collection area located three feet below the bottom of the composite liner system. The lined area mirrors the bottom grades of each cell. The extent of the liner was determined by the wetted perimeter in the cell under precipitation from the 100-year storm. Any water collected in the alternative monitoring system drains to a sump and then out of the landfill through a sealed pipe. Samples are taken from the pipe during each semi-annual ground water monitoring event. There are currently nine ground water monitoring wells located around the perimeter of the site. Additional wells will be added as the Subtitle D portion of the site is expanded

The BCSWMF is located in a rural part of Buncombe County. Surrounding land uses within one mile of the site are predominantly rural residential with some small agricultural activities. In 1992,

during initial permitting of the site, there were 34 residences located within one-quarter mile of the site. There has not been any widespread development in this area in the intervening years. thus the number of residences is relatively the same. The majority of homes are located to the east and northeast of the site. There are neither water nor sewer utilities near the site nor any industrial buildings. There are four primary roads within one-quarter mile of the site. Each road is a state-designated, two-lane road.

C. Purpose of the Agreement

This Final Project Agreement ("the Agreement") is a joint statement of the plans, intentions, and commitments of the U.S. Environmental Protection Agency ("EPA"), the State of North Carolina, and Buncombe County, North Carolina to carry out this project approved for implementation at the county's solid waste management facility site near Alexander, North Carolina. This Project will be part of EPA's Project XL program to develop innovative approaches to environmental protection.

The Agreement does not create legal rights or obligations and is not an enforceable contract or a regulatory action such as a permit or a rule. This applies to both the substantive and the procedural provisions of this Agreement. While the parties to the Agreement fully intend to follow these procedures, they are not legally obligated to do so. For more detail, please refer to Section VI (Legal Basis for the Agreement).

Federal and State flexibility and enforceable commitments described in this Agreement will be implemented and become effective through a legal implementing mechanism such as a rule or permit modification.

All parties to this Agreement will strive for a high level of cooperation, communication, and coordination to assure successful, effective, and efficient implementation of the Agreement and the Project.

D. List of the Parties that Will Sign the Agreement

The Parties to this Final Project XL Agreement are the United States Environmental Protection Agency (EPA), County of Buncombe General Services Department, and the State of North Carolina.

E. List of the Project Contacts

County of Buncombe
General Services Department
30 Valley Street
Asheville, North Carolina 28801
Contact: Bob Hunter, Director

State of North Carolina
Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605
Contact: Dexter Matthews, Section Chief

U. S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-3104
Contact: Michelle Cook, Region 4 Project XL Coordinator

II. Detailed Description of the Project

A. Summary of the Project

Sanitary landfilling is the dominant method of solid waste disposal in the United States, accounting for about 217 million tons of waste annually (U.S. EPA, 1997). The annual production of municipal solid waste in the United States has more than doubled since 1960. In spite of increasing rates of reuse and recycling, population and economic growth will continue to render landfilling as an important and necessary component of solid waste management.

In a landfill which incorporates combined leachate recirculation and gas recovery, controlled quantities of liquid are added, and circulated through waste as appropriate, to accelerate the natural biodegradation and composting of solid and liquid waste components. This process significantly increases the biodegradation rate of waste and thus decreases the waste stabilization and composting time (5 to 10 years) relative to what would occur within a conventional landfill (30 years, to 50 years or more). If the waste decomposes (i. e., is composted) in the absence of oxygen (anaerobically), it produces landfill gas. Landfill gas is primarily a mixture of methane, a potent greenhouse gas, carbon dioxide, and VOC's, that are local air pollutants. Methane is also a

fuel. This by-product of landfill waste decomposition (composting) can be a substantial renewable energy resource that can be recovered for electricity or other uses. Other benefits of this type of landfill operation include: increased landfill waste settlement (and therefore an increase in landfill capacity and life); improved leachate quality, possible reduction of landfill post-closure efforts required; landfill mining; and, abatement of greenhouse gases through highly efficient methane capture over a much shorter period of time than is typical of waste management through conventional landfilling.

B. Specific project elements

Buncombe County intends to construct and operate a combined leachate recirculation and gas recovery system throughout its 100-acre Subtitle D landfill area. Currently, Cells 1-3 of the 10-cell design are in operation. These cells cover approximately 23 acres. Cells 4 and 5, which will cover approximately 20 acres, are expected to be under construction by mid-summer 2000 and in operation one year later. Cells 1 and 2 were constructed with the standard Subtitle D composite liner while Cells 3-5 were/will be constructed with an alternative liner approved by the NCDENR. Because of the presence of the separate alternative ground water monitoring system beneath each cell, the performance of the two types of liner systems can be evaluated as increased amounts of liquid are introduced to the cells.

DESIGN AND OPERATIONS OF PROPOSED LEACHATE RECIRCULATION/GAS RECOVERY PROJECT

As mentioned previously, two types of liner systems have been installed at the BCSWMF. Cells 1 and 2 (approximately 14 acres in size) were constructed with the standard Subtitle D composite liner system (i.e., two feet of 1×10^{-7} cm/sec clay overlain with a 60-mil HDPE synthetic liner). Cell 3 (approximately 8 acres in size and currently in operation) and the remaining cells yet to be constructed will have an alternate liner designed and constructed in accordance with North Carolina regulations. The alternate liner used in Cell 3 and proposed for all future cells, consists of 18 inches of 1×10^{-5} cm/sec clay overlain by both a geosynthetic clay liner (GCL) and a 60-mil HDPE synthetic liner. The GCL, consisting of a bentonite core and encapsulating polypropylene geotextile, will have a maximum permeability of 5 x 10-9 cm/sec. The HDPE synthetic liner shall conform to all applicable ASTM standards for textured and smooth HDPE liner. Based on groundwater modeling required by the State of North Carolina to demonstrate equivalency it appears that the alternative liner is actually more protective than the standard composite system (reference supporting documentation).

The leachate collection systems in all ten cells are distinct (i.e., not interconnected) and each drain to a separate sump. The internal slopes of Cells 1-5 are significant and range from 8.5% to 21%. Considering the internal slopes along with the highly permeable crushed stone drainage layer,

almost no head is built up on the liner system except in the sump area. A submersible pump installed in each cell pumps/will pump leachate through a common force main located around the perimeter of the landfill to the lined storage lagoon. The submersible pumps are set to switch on when the head builds up to 12 inches. Given the slopes, the area that actually experiences 12 inches of head before pumping is initiated is quite small. A new pump system will be constructed at the leachate storage lagoon to pump leachate back through a new, dedicated force main to the cells for recirculation.

Liner and Leachate Collection and Removal System (LCRS) Components

As mentioned, Cells 1 and 2 at the Buncombe County SWMF were constructed with the standard Subtitle D composite liner system. Cell 3 was constructed with a GCL/synthetic alternative liner system. Buncombe County, through this XL Project, intends to construct the remaining cells at the landfill with the alternative liner. The leachate collection system in each cell consists of two feet of locally generated crushed stone. In Cells 1 and 2, the internal cell slopes and permeability of the stone were sufficient to convey leachate to the sump areas without the use of collection pipes. The slopes in Cell 3 were somewhat less and thus one central collection line was installed. Collection pipes will be used in Cells 4 and 5. The synthetic liner is protected from the crushed stone drainage layer by a 28-oz. cushion fabric. The literature tends to recommend a 12-oz. fabric in this application, however, Buncombe County has decided to be conservative since the amount of data backing the available research is not significant.

Liner and LCRS Performance

40 CFR Part 258.28 already allows for leachate to be re-circulated in cells constructed with the standard Subtitle D composite liner. Performance of this alternate liner system will be monitored by the leak detection system underlying each cell. The alternative liner system constructed in Cell 3 and proposed for Cells 4-10 was thoroughly researched by the State of North Carolina before being proposed as a prescriptive alternative in the rules. The State's alternate liner design document calculated that the leakage rate through the standard Subtitle D liner system under a set of standard conditions was 1.12 gal/acre/day while through the alternative used in Cell 3 was only 0.53 gal/acre/day. Thus, the alternative liner being used at the Buncombe County MSWLF appears to perform in a manner at least as protective as the standard composite and, most likely, significantly more protective (modeling of both liners indicated the alternative liner would afford almost 50 percent more protection to the underlying aquifer than the composite liner.

Camp, Dresser, and McKee (CDM), under contract to Buncombe County, performed preliminary calculations on the performance of the crushed stone leachate drainage layer under anticipated leachate re-circulation conditions. Due to the high permeability of the crushed stone layer, the expected maximum depth of leachate under non-recirculation conditions is 0.03 feet. Therefore,

there is a significant design cushion to handle additional leachate flows expected under recirculation conditions. The crushed stone drainage layer has tremendous liquid carrying capacity which is why the expected maximum leachate depth is so small, and the slopes on the mountainous site allow rapid conveyance of the leachate to the sump area.

Buncombe County will demonstrate adequate performance of both the liner and leachate collection systems to the State of North Carolina during the permitting of the leachate re-circulation/gas recovery system

Specialized Design Considerations During Operation

Leachate will be applied during operations to provide enhanced conditions for rapid waste decomposition. It is possible that additional water will be needed to achieve and/or maintain optimal moisture levels in the landfill and thus, if needed, Buncombe County intends to supplement leachate recirculation with water withdrawn from the adjacent French Broad River. Cells 1 and 2 are near final grade and thus it is anticipated that leachate recirculation will be accomplished with both horizontal injection trenches and vertical injection wells. Most likely, both types of injection systems will be used to collect landfill gas as well. All leachate will be injected below the landfill surface to prevent contact with employees or users of the landfill. If supplemental river water is used it will either be discharged into the leachate pond and then pumped into the landfill, or applied to the working face of the landfill by a tanker truck. Moisture levels will be monitored and the recirculation system will be designed so that leachate can be applied or discontinued in small, distinct areas as needed. Table 1 identifies the Instrumentation Type and Location for the Bioreactor Project.

Moisture content will be monitored throughout the life of the Project through the use of a network of moisture sensors to be installed during waste placement. Buncombe County officials traveled to Yolo County, CA (the location of a similar, proposed XL Project) on June 29, 2000, to evaluate the moisture detection system that was used successfully on their pilot projects. The County will review what has worked and what has not, and then incorporate the final design of the moisture detection system during the preparation of permitting documents.

The quantity of leachate and supplemental water added back to the landfill will be measured throughout the life of the project. Buncombe County expects to quantify recirculation quantities using flow sensors installed on the leachate discharge line at the leachate storage pond, as well as the individual lines that feed each cell in the landfill. The goal of the system design will be to quantify the amount of leachate recirculated to each cell individually.

Table 1- Instrumentation Type and Location for the Bioreactor Project

Type of Instrumentation	Location	Description
Pressure transducers	Above primary liner and leachate collection system in the landfill cells	A series of pressure transducers will be installed on top of the primary liner in the LCRS trench in the anaerobic landfill cells to measure the head or depth of leachate above the liner. Total of eight pressure transducers will be installed, four in each cell at 200 feet spacing. A gas pressure transducer in each cell will be used to correct the liquid head for gas pressure.
Moisture and Temperature Sensors	Sensors will be placed on top of the primary liner and within the waste mass at three different depths at 20 feet intervals.	A series of moisture and temperature sensors will be installed within the waste mass to monitor the biological activity of each cell. Instrumentation will be installed directly on top of the bottom primary liner and at three different depths within the waste mass at an interval of 20 feet.
Gas Composition, Gas Pressure, and Gas Flowmeter	Gas extraction and collection pipelines using NSPS approved methods.	Chipped tire as part of the gas collection system will be installed at every lift to either collect landfill gas or inject air in the landfill. Pipes will be installed in each lift after placement of waste and chipped tires. Gas will be sampled from either the main collection pipe or each individual lift of waste to determine gas composition or

		measure gas pressure. The gas pressure and composition will be measured manually. Gas flow measurement will be continuous and automated.
Leachate Flow Measurement	Outflow and inflow from each cell is measured at each sump and at the injection manifold.	The quality of leachate added or collected from the LCRS is measured by flowmeters from each cell. The volumes of liquids are monitored from each cell continuously through a data collection system.

As discussed previously, the leachate collection/drainage layer constructed in each cell has been and will continue to be two feet of crushed stone. HELP model analyses show that, due to the internal cell slopes and high permeability of the crushed stone layer, there will be very little head buildup on the liner even when simulating high recirculation levels. The performance of the alternative liner system, especially under recirculation conditions that could produce higher head conditions, is of concern to U.S. EPA. While it can be shown with the HELP model that head buildup within the crushed stone leachate drainage layer will not be a problem, Buncombe County will install devices that can monitor head levels. This will be considered during the preparation of permitting documents. Leachate recirculation will be suspended in any cells where there appears to be head build up.

Improvement in leachate quality during recirculation operations is a claim made by proponents in the literature. This is an important environmental benefit of the project since improving leachate quality should be indicative of a stabilizing waste mass. Since leachate is pumped from each cell individually, Buncombe County intends to sample the leachate from each cell semi-annually for parameters that will be able to establish whether or not leachate quality is indeed improving.

The degradation and gas production of the waste mass is also related to the temperature within the decomposing waste. The effectiveness of the system is dependent on keeping the system within optimum temperature ranges, therefore, Buncombe County will install temperature gauges to aid in operation of the system. As with the moisture sensors, temperature gauges will also be installed as waste operations progress.

The Buncombe County MSWLF lies within a seismic impact zone as defined in 40 CFR Part 258. Adding liquids back into the landfill will increase the moisture content of the waste mass and raises the issue of whether or not this will make the waste mass less stable. Camp Dresser & McKee has re-run stability calculations that were completed during initial permitting of the facility

to assess the stability of the landfill and waste mass under these higher moisture conditions as well as during seismic events. The calculations show that significant increases in moisture content (i.e., within the range expected in a recirculation project) will have essentially no impact on waste mass or landfill stability, even during design seismic events. These calculations will be finalized and submitted as part of the County's permit amendment package that will be necessary to construct the proposed system.

As areas of the landfill reach design grade, Buncombe County will install monuments to monitor settlement caused by the degradation of the waste. These monuments will be checked semi-annually to track settlement. Annual aerial topographic surveys will also be performed to aid in the evaluation of settlement and the effectiveness of the leachate recirculation/gas recovery system.

Landfill gas will be collected from the landfill utilizing the horizontal and vertical trenches to be used for leachate recirculation. The total number of trenches to be installed for the initial phase of construction is 31. The trenches range in length from 150 to 500 feet. Separate header piping will be installed parallel to the leachate recirculation piping and interface at the head of each trench. The components of the system include:

* Gas Main - the HDPE pipe that conveys the gas from the landfill to the flare station.
* Header Piping - the HDPE piping that conveys gas from the horizontal collection trenches to the gas main. Plastic valves will be installed at various locations to control the collection process.
* Horizontal Injection/Collection Trench (HICT) - a perforated HDPE pipe placed in a 2-ft by 3-ft stone trench which is located within the waste; the HICT provide the conduit by which leachate is recirculated and landfill gas is collected.
* Wellhead Connection - this assembly will connect the header piping to the HICT; the connection includes valving, a flexible connection to accommodate settlement, a sampling port to monitor gas composition and pressure, a temperature gauge, and an orifice plate for measuring flow rate.

Gas will also be collected from the leachate collection system by connecting the gas main to the leachate sump. The components of this system that will be utilized for gas collection include the following:

* Gas Main - the same as described above, the main will be connected to the leachate riser pipe.
* Leachate Riser Pipe - the HDPE pipe that provides access to the leachate sump for the pumping system.
* Leachate Sump - a 24-inch diameter, perforated, HDPE pipe that is installed in the low point of each cell.
* Wellhead Connection - this assembly will connect the gas main to the leachate sump; the wellhead includes valving, a flexible connection to accommodate settlement, a sampling port to monitor gas composition and pressure, a temperature gauge, and an orifice plate for measuring flow rate.

It is anticipated that gas collection will begin sometime during the active filling stage of the landfill as a result of the accelerated generation of landfill gas. Once the gas system begins operation it will run continuously. The HICT will be installed at various elevations in the landfill as filling progresses to provide adequate coverage of the waste mound. It is anticipated that the uppermost tier of HICT, at any given time, will be used only for gas collection to control odors and gas emissions.

The lower tiers of HICT will be used for both leachate recirculation and gas collection. Gas collection from the leachate collection system and uppermost tier of HICT will envelop the gas being generated within the landfill and control release to the atmosphere.

Pressure, temperature, methane and oxygen concentrations at the active extraction points will be monitored at each wellhead on a monthly basis. The gas collection system will require periodic adjustments to maintain optimum performance during operation. During routine inspections, the operator will monitor and adjust the vacuum at the active gas collection trenches as needed to maximize system performance. The vacuum applied at individual extraction points can be adjusted using the valve provided at the wellhead connection. The vacuum can also be adjusted at the blower. However, if the vacuum is adjusted at the blower, the collection points throughout the system must be evaluated for performance. The following steps provide an outline of the system operation.

1. Each trench is equipped to recirculate leachate and collect gas. Since leachate recirculation will cause accelerated quantities of gas to be generated it is important that the gas collection system be ready to operate during the active filling stage. However, these processes should never be operated simultaneously in a HICT. Concurrent operation of leachate recirculation and gas collection at an HICT will result in flooding of the gas collection system.

2. Monitoring of the wellheads at the HICT will be necessary to provide indication of when gas generation begins.

3. In addition to confirming the generation of gas, the following criteria must be met before activating an HICT for gas collection:

* A minimum of 20-feet of waste must be present over an HICT. This is required to prevent excessive air intrusion into the system.
* A minimum of 1 week of draining time must be maintained before collecting gas from an HICT that has been used for leachate recirculation. This is to prevent the potential for flooding of the gas header.

4. If the presence of gas is confirmed and there is no sign of positive leachate pressure, then gas collection from an HICT can be operated until the next scheduled recirculation event at that HICT. Important: The wellheads should be installed with clear flexible tubing to allow the operator to visibly check for leachate flow.

5. The leachate collection system will also be utilized to collect gas from the landfill. Well heads will be installed at the riser pipe of each cell. A minimum of 20-feet of waste must be present in a cell before gas collection from the respective riser pipe may begin. It is anticipated that 20-feet of compacted waste will be sufficient to prevent air intrusion. However, the system should be monitored to verify that air intrusion is not occurring during the initial use of a leachate collection system for gas collection.

6. By utilizing the leachate collection system and the uppermost tier of HICT at any given time during the operation of the landfill, the system is designed to promote gas collection at the bottom and top of the waste mass by creating negative pressure in these two zones. The injection of leachate into HICTs in the center of the waste mass will enhance collection in these two zones by filling the void spaces in the waste with leachate (i.e., the gas will be forced to migrate to less saturated zones). However, gas collection will also be performed in the middle zone. Any HICT that has not received a leachate injection for more than 1 week may also be used for gas collection. The rotation of HICT employed for gas collection will be coordinated with the recirculation schedule to be established.

Cover material selection and application requires special consideration when operating a leachate recirculation system. Daily cover material will be sandy soils or some form of permeable alternative cover since clay soils and plastic tarps will block flow paths and inhibit lateral migration of the leachate. In areas in which additional waste will be placed, intermediate cover will be removed before placing the next lift to prevent blocking vertical flow paths and forming perched leachate zones. Removal of intermediate cover will also decrease the chance of leachate

seeps through the side slopes. Intermediate cover placed at final elevations will use clayey soils to block gas migration and leachate seeps. The placement of final cover will occur when filling is complete in a substantial area. However, placing waste to the design elevations will not necessarily constitute a completed filling area. As a result of recirculation, settlement will occur over a shortened time frame causing much of the settlement to occur while the landfill is still active. A significant amount of additional capacity will be obtained by returning to previously filled areas and placing more waste in the settled areas. Final cover will be installed after additional waste is placed and the capacity of the landfill is maximized.

III. How the Project Will Meet the XL Criteria

A. Superior Environmental Performance

1. Tier I: Is the Project Equivalent?

The literature on landfills conducting combined leachate recirculation and gas recovery identifies no significant adverse environmental impacts relative to those created by conventional landfill practice. Although leachate may be generated/recovered in quantities at times greater than that in conventional landfilling, the leachate collection, pumping, and storage systems are currently designed to handle the additional projected flows. The leachate storage pond is currently sized to handle leachate from the ultimate build-out of the landfill. During design of the leachate recirculation system, calculations will be made to determine if additional storage capacity will be needed when Cells 6-10 are put into operation. It is hoped that, once the system is in full operation, that the need for off-site hauling and treatment of the leachate will be eliminated. The County intends to keep its pre-treatment permit in effect and haul leachate off-site should emergency conditions dictate. It should be noted that leachate will be injected at least several feet below the active working level of the landfill thus there should be no exposure to those using or working at the landfill.

The design capacity of the Buncombe County Subtitle D landfill subjects it to regulation under 40 CFR Part 60 Subpart WWW of the Clean Air Act. Based on a recent Tier I analysis for the landfill, given its current design capacity and waste acceptance rate, it is anticipated that the landfill's emissions of nonmethane organic compounds (NMOC) will exceed 50 Mg/yr in 2001. At that point, the County could either initiate the design of a gas collection and control system, with 30 months allowed for startup of the system, or it could conduct a Tier II analysis to determine the possibility of postponing the installation of a gas collection and control system by at least five years. Because Tier II testing has not been performed, it is unknown how the landfill's NMOC concentration may differ from the default Tier I value. The proposed gas collection system will be designed to comply with Subpart WWW and will be in-place and operational when

recirculation starts and before it would be required under the rule. Therefore, overall and total lifetime fugitive emissions from the site will be reduced. The U.S. EPA is a strong proponent of landfill gas recovery and control through its Landfill Methane Outreach Program, among other initiatives.

This particular XL project will provide environmental performance at least equivalent to Tier 1 in all areas.

2. Tier 2: Superior Environmental Performance

a. Maximizing landfill gas control and minimizing fugitive methane and VOC emissions. Landfill gas contains roughly 50% methane, a potent greenhouse gas. In terms of climate effects methane is second in importance only to carbon dioxide. Landfill gas also contains volatile organic compounds (VOC's) that are local hazardous air pollutants. At closure, landfill gas capture is maximized by a surface permeable gas collection layer overlain by a cover of soil with embedded membrane. Gas is withdrawn to maintain this permeable layer beneath surface containment at slight vacuum. It is anticipated that the capture of methane is further facilitated and eased by a shortened generation interval, from 30 to 50 years to between 5 to10 years through enhanced decomposition afforded by leachate recirculation. Buncombe County is proposing to install vertical gas wells in areas that have already reached final grade and horizontal collection trenches in operational areas to collect gas throughout the active life of the site. With this gas capture approach, it is expected that fugitive landfill gas emissions will be reduced for reasons that include:

- Reduction in emissions through installation and operation of gas collection system before the final fill height is reached, and before it would be required by the current Clean Air Act NSPS regulations.

- Collection efficiency improvements with the proposed horizontal gas extraction method over vertical gas well efficiency.

- Reduction in long term emissions, from landfill gas generation occurring slowly beyond 30 years of post-closure, which are not easily controlled.

Other bioreactor demonstration projects have already shown close to a tenfold increase in methane recovery rates, which suggest a tenfold reduction in interval of methane generation. Available indications as well as basic physical principles suggest that capture effectiveness

approaches 100%, so long as vacuum is maintained under the permeable layer, cover integrity is maintained and the collection system is designed and maintained to collect the maximum amount of LFG generated at the site.

b. **Expedited methane gas generation/recovery.** Methane recovery is maximized by use of permeable gas collection layers as discussed above and also facilitated by methane generation over much shorter terms. This is expected to minimize long-term low-rate methane generation often lost to energy use in conventional landfill practice. The reliability of methane recovery of fuel for energy generation should reduce the uncertainty and improves economics of landfill gas projects. Greater use of methane to full potential can add still more greenhouse benefit by replacing fossil CO_2 otherwise emitted with fossil energy use elsewhere.

A recently completed study for the Federal Energy Technology Center (FETC, presently becoming the National Energy Technology Laboratory, NETL) of the U. S. Department of Energy indicates that wide application of controlled landfilling could reduce US greenhouse gas emissions by 50-100 million tons of CO_2 equivalent when both emission prevention and fossil CO_2 offsets are taken into account. This major reduction in CO2 emissions is also cost-effective. In the analysis for FETC (IEM, 1999), over a range of representative landfill conditions, greenhouse gas abatement was estimated as attainable at a cost of $1-5/ton CO_2 equivalent which represents extremely low (by more than tenfold) cost compared to most other options presented in the recent EIA Report (USDOE Energy Information Agency, 1998).

Buncombe County currently intends to flare the recovered gas in an approved control device while it seeks feasible reuse opportunities. It should be noted that the County currently extracts and sells landfill gas from its closed landfill to an adjacent wastewater treatment plant. The County is committed to trying to find a feasible re-use project for the landfill gas generated at its current facility.

c. **Landfill life extension and/or reduced landfill use.** The more rapid conversion of greater quantities of solid waste to gas reduces the volume of the waste. Settlement in a test cell in Yolo County, California is already over 18% in three years. Volume reduction translates into either landfill life extension and/or less landfill use. Thus, landfills that recirculate leachate and recover gas are able to accept more waste over their working lifetime. Alternatively, fewer landfills are needed to accommodate the same inflows of waste from a given population.

d. **Leachate-associated benefits:** Leachate recirculation promises more rapid leachate stabilization in terms of pollutant load, reduced leachate environmental impact, and elimination of

need for most discharges to treatment facilities. The biological processes, both anaerobic and aerobic, which are enhanced by the recirculation of leachate, have been shown in studies at many scales to reduce the content of many leachate pollutants. These include organic acids and other soluble organic pollutants. Since a biologically active landfill operation brings pH to near-neutral conditions, metals of concern are largely precipitated and sequestered/ immobilized in waste. Thus free liquid concentrations and mobility of metals are reduced compared to "conventional" landfill practices, where more contaminated lower-pH leachate is often observed to be generated slowly for years. For example, in the aforementioned Yolo County test cell demonstration, leachate reached near-neutral (pH 7) conditions within four months after liquid additions and recirculation commenced.

The need for off-site leachate treatment should be reduced as long as waste landfilling continues concurrently with leachate recirculation/gas recovery operations. Additional leachate that would have to be treated at a wastewater treatment facility could be avoided. Because this type of operation sometimes requires extra liquid for optimum performance, and leachate and condensate re-introduction are permissible are under specified circumstances (40 CFR 258.28), continuing liquids recirculation allows generated leachate and condensate to be reintroduced so long as new dry waste continues to flow into the landfill.

Improvements in leachate quality are expected to consist of organic compound reduction through increased biological activity and inorganic reductions by adsorption to the waste mass and soil, and by chemical reactions, such as metals precipitation.

e. **Lessened long-term risk and need for monitoring.** The leachate recirculation/gas recovery mode of landfill operation offers potential for substantial reductions in post-closure care needs and costs. With present conventional practice, it is highly likely that gas management will be required for at least a mandated 30-year post-closure period. This entails all of the associated expense of continuing monitoring and gas well adjustment. A number of other management needs occur as waste continues to decompose, including dealing with subsidence, gas collection line breakage caused by subsidence, and the like. Rapid decomposition of the waste during and shortly after disposal operations cease will likely reduce the potential for the facility to generate significant quantities of high strength leachate or landfill gas. This will reduce the long-term risk of ground water contamination and gas migration should there be a breach in either the top or bottom containment systems.

f. **Landfill gas energy project potential.** The recirculation of leachate and other liquids has been demonstrated to increase the rate and quantity of gas generation. Increased quantities of gas can make a gas-to-energy project more feasible. Since the current plan is to flare the gas at the

Buncombe County SWMF, identifying and constructing a beneficial reuse project could eliminate the use of another fuel on another project and its emissions. Buncombe County is currently in the initial stages of evaluating possible greenhouse projects as well as converting the gas to a fuel usable by county vehicles.

g. **Landfill Mining Potential.** The removal and re-use of waste for beneficial purposes, such as compost or landfill daily cover is a distinct possibility in the future. If landfill mining is carried out, it would occur when stabilization has sufficiently been achieved. Because the cells will be operated anaerobically, this could be beyond the expected term of the XL agreement.

3. How We Will Measure Superior Environmental Performance

Superior Environmental Performance will be measured using the baseline (Tier 1, without Project XL) against the actual results of the project (Tier 2, proposed Project XL). To determine specific project performance, the County plans to conduct monitoring as outlined in Table 2. Performance measurement against project goals is discussed further below:

a. **Maximizing landfill gas control and minimizing fugitive methane /VOC emissions.** The design capacity of the Buncombe County Subtitle D landfill exceeds the NSPS thresholds and thus the facility will have to comply with 40 CFR Subpart WWW. However, based on a recent Tier I analysis, installation and startup of a gas collection and control system might not be required until the year 2004. Although a Tier II test has not been performed to determine a specific NMOC concentration for this landfill, it is conceivable that a NMOC concentration significantly lower than the Tier I default value could allow the County to postpone the installation and operation of a gas collection and control system for at least five years and possibly indefinitely (see Section III. A. 1. above). Therefore, any gas collection before that time will be a significant environmental benefit. The gas collection and control system will be designed and operated to meet all Subpart WWW criteria. Monitoring of system performance will include surface methane emissions testing to track and confirm the collection effectiveness of the system. Because bioreactors generate more landfill gas earlier in the lifespan of the facility compared to standard MSW landfills, it will be necessary for gas collection and monitoring to be required prior to the time frame set out in subpart WWW, which does not contemplate bioreactor scenarios. Monitoring will continue for the duration of the project.

b. **Expedited methane generation/recovery**. It is well documented in the literature and from operating leachate recirculation/gas recovery landfills that expedited gas generation will occur in these types of landfills. The gas recovery system for the Buncombe County SWMF will be

designed to account for this enhanced generation. Gas flow rates will be monitored at the control device and will be compared with gas generation rates from non-recirculating landfills.

c. Additional waste disposal airspace through settlement. This will be based on annual topographical surveys. Total volume loss occurring within this time interval will be calculated as well as in-place waste density to see if actual densities can exceed those calculated at non-recirculating landfills.

d. Leachate contamination risk. Buncombe County will measure leachate quality over time to examine trends in leachate quality and whether or not quality is improving. The County will compare its results with similar, non-recirculating landfills.

e. Landfill gas energy project potential. Buncombe County is a strong proponent of beneficial reuse of landfill gas. The County currently recovers landfill gas from its old, closed landfill and sells it to the MSD wastewater treatment plant which is located immediately adjacent to the site. The County is a partner and active participant in U.S. EPA's Landfill Methane Outreach Program.

B. Other Benefits

As noted, results from other projects and the literature show that leachate recirculation combined with gas recovery have demonstrated a significant increase in landfill gas generation, increased landfill settlement, improved leachate quality, and highly cost-effective abatement of greenhouse gases. Preliminary economic analyses of the project show that implementing leachate recirculation/gas recovery operations can have significant cost savings and environmental benefits for the Buncombe County Solid Waste Management Facility.

C. Stakeholder Involvement and Support

Stakeholder involvement is considered essential by Buncombe County and has been an important part of the County's solid waste program since the initial siting of the Buncombe County Solid Waste Management Facility in the early 1990's. Stakeholder involvement and support are critical for the success of this project. Buncombe County has already begun providing the public with information about the project via a televised (and re-aired) presentation at the Buncombe County Commissioners' Annual Planning Retreat. The State of North Carolina has been included and consulted on the project to date, and was a participant via phone during the County's proposal presentation to EPA Region 4 in February, 2000, and subsequent open meetings (May 2, June 12). The County has identified the following list of stakeholders.

Buncombe County General Services Department

Buncombe County Board of Commissioners

U.S. Environmental Protection Agency

Buncombe County Environmental Affairs Board

The North Carolina Chapter of the Solid Waste Association of North America (NC SWANA)

The Western North Carolina Regional Air Pollution Control Agency (Title V Permit Issuer)

The State of North Carolina, Department of Environment and Natural Resources, Waste Management Division

Blue Ridge Environmental Defense League

local residents

The County conducted a 30-minute briefing at the County Commissioners 2000 annual retreat which was televised and re-broadcast on numerous occasions on the County's local access government cable channel. In addition, on June 12, 2000, the County held a three-hour educational workshop on the bioreactor technology that was highlighted by a presentation by one of the foremost experts in the field, Dr. Debra Reinhart of the University of Central Florida.

Stakeholders include any individuals, government organizations, neighborhood organizations, academic centers, and companies with an interest in the progress of the Buncombe County Solid Waste Management Facility Bioreactor Project. The identification of Stakeholders was based on inviting those who are already involved in other environmental issues in the Asheville/Buncombe County area, contacting others with related interests, and by general invitation to the local population. Stakeholders provide information on the preferences of the community and may also identify un-addressed issues.

Stakeholders in the XL program typically fall into three categories; direct participants (EPA, Buncombe County, and North Carolina DENR), Commentors (citizens living adjacent to the facility, Western North Carolina Air Pollution Control Agency, the Buncombe County Environmental Affairs Board, the Blue Ridge Environmental Defense League, Sierra Club, SWANA, Quality Forward, etc.), and the general public. Additional information on proposed stakeholder involvement is available in the draft stakeholder involvement plan, dated June 2000. This document is available from any of the contacts listed in this FPA or from the EPA Project XL website at "www.epa.gov/projectxl".

Buncombe County will convene periodic meetings of stakeholders to obtain comments on the Project as well as to report on the progress during the duration of the XL Agreement. These periodic meetings will be open to the public.

D. Innovative Approaches and Multi-media Pollution Prevention

Buncombe County intends to invest a portion of the projected savings from this project into its successful solid and hazardous waste education efforts. Buncombe County's solid waste program is the only one in the state of North Carolina that has a full-time hazardous waste officer. This person is responsible for educating local businesses and citizens about the proper handling and disposal of hazardous wastes. The hazardous waste officer conducts business inspections and in-plant consulting, as well as in home visits to residents. The hazardous waste officer also conducts an annual household hazardous waste collection day and is responsible for conducting educational programs in the schools. The goal of the hazardous waste program is to keep as much hazardous waste out of the Subtitle D and construction/demolition landfills at the new BCSWMF. The North Carolina Association of County Commissioners recently recognized the County's hazardous waste program as one of three outstanding county programs for the year 2000.

E. Transferability of the Approach to Other Entities or Sectors

Buncombe County believes that following the evaluation and approval of this proposed leachate recirculation/gas recovery landfilling concept by U.S. EPA and the State of North Carolina, many other public and private landfill owners and operators should be able to implement this type of technology. The technology is expected to yield substantial economic and environmental benefits for nearly all regions of the U. S., and, as noted, worldwide.

Following an evaluation of this XL Project by EPA, and assuming the overall success of the Project, the leachate recirculation/gas recovery landfill technology used in this project could be transferable to a subset of landfills where conditions are favorable for actively managing the decomposition process and where groundwater protection and gas control are ensured.

F. Feasibility of the Project

The project sponsor and regulatory agencies as designated in the Final Project Agreement, agree to support the project, subject to any review procedures necessary to implement the legal mechanism for this project. Further, the XL sponsor ,Buncombe County, has the financial

capability, personnel and senior management commitment necessary to implement the elements of this XL Project.

G. Monitoring, Reporting, Accountability, and Evaluation of Methods to be Used

The parties intend to implement as enforceable commitments, federal and state regulatory flexibility, monitoring, record-keeping, and reporting provisions of this FPA through site-specific rulemaking to implement this project. Table 2 identifies the Monitoring Parameters and Frequency for Monitoring for this project.

The enforceable requirement to initiate NSPS compliant gas collection and monitoring concurrently with recirculation activities will be implemented via a Federally Enforceable State Operating Permit (FESOP) provision. This FPA describes both enforceable and aspirational requirements, and it establishes certain limits and goals for Buncombe County's performance. The County will ensure compliance with legal requirements and ensure implementation of processes seeking to meet aspirational goals. The project sponsor will establish a record-keeping system to ensure compliance, as well as accurate reporting of environmental performance Buncombe County will make any such reports available publicly and will specifically discuss project performance with interested stakeholder groups.

The legal mechanisms that would apply to this project include a Federally Enforceable State Operating Permit for gas collection, and site-specific rule for liquid additions. The Western North Carolina Regional Air Pollution Control Agency is the regulatory agency that has permitting authority for the Buncombe County landfill. The FESOP would contain enforceable parameters and requirements with respect to gas collection and monitoring. It would require a public notice and comment period. In addition, EPA will be issuing a proposed rule for liquid additions at Buncombe County landfill. It would also require a public comment period. Either the FESOP or the site-specific rule (as appropriate) would contain the following enforceable project monitoring requirements listed in Table 2.

Table 2- Monitoring Parameters and Frequency for the Bioreactor Project

Monitoring Parameter	Frequency	Description
Leachate:		Leachate samples will be collected from each cell sump and tested. For the first six
pH	Weekly	
Conductivity	Weekly	

Dissolved Oxygen Dissolved Solids Biochemical Oxygen Demand Chemical Oxygen Demand Organic Carbon Nutrients(Ammonia Nitrogen, Total Nitrogen, and Total Phosphorus) Common Ions Heavy Metals Organic Priority Pollutants	Monthly, Quarterly Monthly, Quarterly Monthly, Quarterly Monthly, Quarterly Monthly, Quarterly Monthly, Quarterly Monthly, Quarterly Monthly, Quarterly Monthly, Quarterly	months starting from the initiation of recirculation Tests will be done monthly and the next six months will be done quarterly. After the first year test will be done on semi-annually.
Landfill Gas: CH_4, CO_2, O_2, and N_2 NMOCs N_2O Surface Emissions Well Head Gas Temperatures	 Weekly Semi-annually Semi-annually Semi-annually Monthly	Landfill gas will be tested routinely from the anaerobic cell. Semi-annually other gas emissions will be measured by using NSPS approved methods. Surface emissions will be monitored for compliance with the 500 ppm CH_4 limit in Subpart WWW.
Solid Waste Stabilization and decomposition: Volume of Gas Generation Landfill surface topographic survey Moisture Content Biochemical Methane Potential Cellulose Lignin Hemi-cellulose Volume of gas	 Hourly Annually Annually Annually Annually Annually Annually	In the anaerobic cell the total volume of CH_4 and CO_2 will be measured continuously to determine the degree of solid waste stabilization. Another means to measure the degree of decomposition will be to conduct a topographic survey of the two cells to determine the total percent change in volume over time. Annual topographic survey will be done on the top surface of each cell If funding is available solid waste samples may be

		collected to determine the degree of stabilization. Samples of waste may also be tested for heavy metals and organic pollutants.

Additionally, Buncombe County voluntarily commits to providing the following information to project stakeholders and regulators in order to facilitate the project's evaluation.

- Quantities of leachate recirculated in each cell, and the amount of supplementary liquids added to each cell.
- Quarterly reporting on the data collected by the moisture sensors located within each cell.
- Semi-annual reports on changes in the quality of the leachate subsequent to recirculation in each cell.
- Quarterly reporting on the data collected by temperature gauges installed in each cell.
- Semi-annual reporting on settlement in each cell as measured against monuments installed for this purpose.
- Annual reporting and assessment of the settlement in the cells based upon topographic surveys.
- Annual reporting on studies and efforts made by Buncombe County to identify a means of utilizing, or the feasibility of selling, landfill gas as an energy source.
- Annual comparisons of gas flow rates from the bioreactor cells which have the standard double liners and the alternative liners.

Information submitted for both the mandatory and voluntary reporting elements for this project will be considered and assessed annually by EPA and the State .

H. Avoidance of Shifting of Risk Burden to Other Areas or Media

It is expected that there will be enforceable monitoring requirements in place which will ensure that no shifting of risk burden to other environmental media associated with this project. Should the alternate liner system not perform sufficiently under recirculation conditions, the underlying groundwater monitoring zone (i.e., the lined area beneath the sump areas and liner systems in each cell) will be able to detect a release early, collect the release, and form the basis for halting the project. The monitoring zone will serve to collect any release of contaminants before they reach the

underlying groundwater regime. The County agrees to conduct periodic surface emissions monitoring conducted analytically in compliance with Subpart WWW to demonstrate compliance with NSPS as well as that no additional burden of air emissions has occurred.

IV. Description of the Requested Flexibility and Implementing Mechanisms

A. Requested Flexibility

In general, Buncombe County proposes to be able to undertake a leachate recirculation/gas recovery project that falls within the limitations established in this XT. Agreement. Buncombe County is requesting specific flexibility under the current federal and state regulations for liquid addition to the landfill. Buncombe County is requesting that U.S. EPA grant site-specific regulatory flexibility from the prohibition in 40 CFR 258.28, Liquid Restrictions, which currently precludes the recirculation of leachate in Subtitle D landfill cells not constructed with the standard Subtitle D composite liner system. Buncombe County desires to construct the remainder of its landfill cells with an approved alternative liner while implementing this leachate recirculation/gas recovery project. Buncombe County is also requesting that U.S. EPA grant site-specific regulatory flexibility from the prohibition in 40 CFR 258.28, Liquid Restrictions, which currently precludes the addition of useful bulk or non-containerized liquid amendments. During periods of low leachate generation, Buncombe County desires to supplement the leachate flow with water from the adjoining French Broad River to maintain moisture levels in the landfill. Buncombe County requests that the State of North Carolina provide similar flexibility.

B. Legal Implementing Mechanisms

To implement this Project, the parties intend to take the following steps:

1. EPA expects to propose for public comment and promulgate a site-specific rule amending 40 CFR 258.28 for Buncombe County's Solid Waste Management Facility. This site-specific rule will describe the project requirements and any other aspects of the rulemaking. It is expected that the site-specific rule will provide for Withdrawal or Termination and a Post-Project Compliance Period consistent with Section VII, and will address the Transfer procedures included in Section X. The standards and reporting requirements set forth in Section II (and any attachments to this FPA) will be implemented in this site-specific rulemaking.

2. Requisite permits for each projected five year phase of the project constitute the State legal mechanisms for the XL project. Buncombe County will submit to the Division of Waste Management of the North Carolina Department of Environment and Natural Resources a permit application for the first five-year phase of the proposed leachate recirculation and gas collection system. As described in Section IV.B.2 of this Agreement, the Division will review the application in accordance with relevant law. Upon determination by the Division that the application meets all applicable requirements, the Division will issue a permit to construct, followed by a permit to operate, the leachate recirculation and gas collection system.
3. Except as provided in any rule(s), permit provisions or other implementing mechanisms that may be adopted to implement the Project, the parties do not intend that this FPA will modify or otherwise alter the applicability of existing or future laws or regulations to Buncombe County's Solid Waste Management Facility.
4. By signing this FPA, EPA, Buncombe County, the State of North Carolina Department of Environment and Natural Resources acknowledge and agree that they have the respective authorities and discretion to enter into this FPA and to implement the provisions of this project, to the extent appropriate.

V. Discussion of Intentions and Commitments for Implementing the Project

A. Buncombe County's Intentions and Commitments

Buncombe County proposes to operate, as specifically allowed by rulemaking and permitting procedures, its existing cells (Cells 1-3) and its future cells (Cells 4-10) near Asheville, North Carolina as a leachate recirculation/gas collection landfill to attain a number of superior environmental and cost savings benefits. The county is committed to working with federal, state, and local governments to demonstrate, with regulatory flexibility allowing recirculation over cells constructed with alternative liners and the addition of supplemental water (if needed), how a leachate recirculation/gas collection landfill can demonstrate more desirable environmental results than a conventional landfill. Further, the County is seeking possible delay in the closure rule requirements allowing it to continue to recirculate leachate even after a cell has reached its permitted final grade so that it may return and place additional waste when the expected settlement occurs.

B. EPA's and the State of North Carolina's Intentions and Commitments

EPA intends to propose and issue (subject to applicable procedures and review of public

comments) a site-specific rule, amending 40 CFR Part 258.28 for Buncombe County to allow recirculation of leachate over cells constructed with an alternative liner and to allow the addition of supplemental water from the French Broad River should leachate availability become limited, that applies specifically to the Buncombe County Solid Waste Management Facility. The site-specific rule will also provide for withdrawal or termination and a post-Project compliance period consistent with Section XII of this Agreement, and will address the transfer procedures included in Section IX. The standards and reporting requirements set forth in Section V.E. will be implemented in the site-specific rule.

EPA will propose a site-specific rule to facilitate the implementation of this pilot project by providing regulatory flexibility for liquid additions into existing Cell 3, and future Cells 4 and 5. Based on periodic review of the pilot project the parties, in consultation with the stakeholders, determine that the pilot program is successfully exhibiting the superior environmental performance anticipated at this time and that no detrimental results (such as the alternative liner failing to perform as anticipated, or unsatisfactory performance of the gas collection or monitoring strategy) have been exhibited during the pilot project, then EPA may extend the regulatory flexibility described under this FPA to future cells at the Buncombe County project site. EPA will also take into account any relevant amendments to the regulations in 40 CFR Part 258 that concern addition of liquids to MSWLFs or landfill gas collection/ monitoring requirements. EPA expects that such amendments would supercede the site-specific rule and would apply to future landfill cells at the Buncombe site.

The Department of Environment and Natural Resources, Division of Waste Management, is the statutorily designated agency for permitting and regulation of municipal solid waste landfills in North Carolina. The Buncombe County landfill is currently operating under a permit to construct and a permit to operate the first five year phase3 of its municipal solid waste landfill facility with a projected total operational period of 34 years. Upon receipt of a permit application from Buncombe County for the first five year phase of the proposed leachate recirculation and gas recovery system at the landfill, the Division of Waste Management will review the application in accordance with applicable State statutes and rules and consistency with the site-specific rule promulgated by EPA for this XL project. If the Division determines that the application meets all of the applicable requirements, the Division will issue a permit to construct the first five-year phase of the project. A permit to operate will be issued following receipt and review of appropriate construction quality assurance and quality control documentation. Application for subsequent five-year phases of the project may be made to the Division for review in accordance with statutes and rules in effect at the time and the periodic assessment of the project performance described above.

C. Project XL Performance Targets

The performance targets of this project will be to achieve the superior environmental performance described in Section III, G of this FPA in Table 2. It describes some of the measures that will be used. Others may be developed as part of the permitting processes and the associated stakeholder involvement.

D. Proposed Schedule and Milestones

This project will be developed and implemented over a time period necessary to complete its desired major objectives, beginning from the date that the final legal mechanism becomes effective, unless it is terminated earlier or extended by agreement of all Project Signatories. Assuming that a Final Project Agreement is executed by October, 2000, the County intends to begin final design of the system and have it complete by the end of 2000. At that time, the appropriate permitting documents will be submitted to the State of North Carolina for permitting and to the USEPA for verification of consistency with the Final Project Agreement. It is expected that final permitting can be accomplished within six months at which time construction of the leachate recirculation/gas recovery system will commence. It is expected that the system will be operational by the beginning of 2002.

The current estimated build-out schedule for the Buncombe County Landfill is provided below. The actual schedule will depend mainly on the amount of waste received each year.

	Opening Date	**Expected Life**
Cells 4-5	Summer 2001	4.7 years
Cell 6	Winter 2006	5.6 years
Cell 7	Fall 2011	4.3 years
Cell 8	Fall 2015	4.1 years
Cells 9-10	Fall 2019	5.5 years

Vertical Above Cells 4-10	Spring 2025	5.0 years

E. Project Tracking, Reporting and Evaluation

The project tracking, reporting and evaluation will be accomplished by the project sponsor in accordance with EPA requests. The County also agrees to provide periodic updates of project performance at nationally recognized solid waste symposiums, subject to acceptance by those symposia.

The County will prepare semi-annual reports which will include all monitoring data commencing with the execution of the Final Project Agreement and deliver them to USEPA and the stakeholders. An annual meeting will be held to review the project progress and results to date for as long as Buncombe County continues to recirculate leachate at its site under the provisions of the site specific rule(s) promulgated to implement this XL project.

F. Periodic Review by the Parties to the Agreement

The Parties will hold periodic performance review conferences to assess their progress in implementing this Project. Unless they agree otherwise, the date for those conferences will be concurrent with annual Stakeholder Meetings. No later than thirty (30) days following a periodic performance review conference, Buncombe County will provide a summary of the minutes of that conference to all Direct Stakeholders. Any additional comments of participating Stakeholders will be reported to EPA.

G. Duration of the Project

If the project, which is currently expected to cover Cells 1-5 at the facility, is deemed successful when evaluated against the expected superior results three years from the date of the Final Project Agreement, the County will request that they be able to expand the system to future cells under similar terms. This assumes that the current regulations for which the County is seeking flexibility are not changed in the meantime to allow the activities requested herein. In the event that EPA and North Carolina promulgate changes to the generally applicable requirements for leachate recirculation or landfill gas collection/ monitoring at municipal solid waste landfills like the Buncombe County landfill, and the stakeholders involved in this XL Project agree that no reason exists to have the project continue to be in effect, then this FPA may be terminated

according to the procedures set forth within this document. The site specific rule mechanism(s) will contain a "sunset" provision ending authorization for this Project 25 years after the effective date of the final implementing mechanism(s). It will also address withdrawal or termination conditions and procedures (as described in Section XI). This Project will not extend past the agreed upon date, and Buncombe County will comply with all applicable requirements following this date (as described in Section XII), unless all parties agree to an amendment to the Project term (as provided in Section VIII).

The average duration for a conventional landfill with a geosynthethic membrane can be 20-50 years. The design life of the Buncombe County landfill is 35 years. The County proposes to conduct the bioreactor pilot over a period of twenty-five years. During that period, the County will to conduct specified monitoring at designated intervals during the life of the project. The data from the project monitoring will benefit EPA, State and local regulatory agencies, and will also be available to all other stakeholders who are interested in the environment, and safety at the site and in the project vicinity. The implementation of the pilot will be permissible through the promulgation of a site-specific rule. The County recognizes that the State permit will be valid for a period of five years. Prior to the the permit expiration, the site will be required to undergo an evaluation to ensure that there have been no instances of non-compliance, and to determine whether or not revisions need to be made to the permit prior to issuance of a new one. EPA evaluation would occur either during the same period of evaluation for the State permit review, or during the annual assessment for the project under the XL program.

If, during the 25 year period, EPA develops a new rule or rule modification addressing recirculation of leachate, Buncombe County and/or EPA could make the determination to cancel or terminate the pilot project and continue the recirculation consistent with the new regulations. At any point during the pilot project, if either party chooses to terminate the project, they may do so. However, it is expected that the implementation and operation of the bioreactor landfill site at Buncombe County will provide useful data in the for the evaluation of EPA rules as initiated by the April 6, 2000 Federal Register Notice (65FR, 18014).

VI. Legal Basis for the Project

A. Authority to Enter into the Agreement

By signing this Agreement, all signatories acknowledge and agree that they have the respective authorities, discretion, and resources to enter into this Agreement and to implement all applicable provisions of this Project, as described in this Agreement.

B. Legal Effect of the Agreement

This Agreement states the intentions of the Parties with respect to Buncombe County's XL Project. The Parties have stated their intentions seriously and in good faith, and expect to carry out their stated intentions. This Agreement in itself does not create or modify legal rights or obligations, is not a contract or a regulatory action, such as a permit or a rule, and is not legally binding or enforceable against any Party. Rather, it expresses the plans and intentions of the Parties without making those plans and intentions binding requirements. This applies to the provisions of this Agreement that concern procedural as well as substantive matters. Thus, for example, the Agreement establishes procedures that the parties intend to follow with respect to dispute resolution and termination (see Sections X and XI). However, while the parties fully intend to adhere to these procedures, they are not legally obligated to do so.

EPA intends to propose for public comment a site-specific rule needed to implement this Project. Any rules, permit modifications or legal mechanisms that implement this Project will be effective and enforceable as provided under applicable law.

This Agreement is not a "final agency action" by EPA or the State, because it does not create or modify legal rights or obligations and is not legally enforceable. This Agreement itself is not subject to judicial review or enforcement. Nothing any Party does or does not do that deviates from a provision of this Agreement, or that is alleged to deviate from a provision of this Agreement, can serve as the basis for any claim for damages, compensation or other relief against any Party.

C. Other Laws or Regulations That May Apply

Except as provided in the site specific rule for this Project, the parties do not intend that this Final Project Agreement will modify the applicability of any other existing or future laws or regulations.

D. Retention of Rights to Other Legal Remedies

Nothing in this Agreement affects or limits Buncombe County's, EPA's, or the State of North Carolina's legal rights. These rights include legal, equitable, civil, criminal or administrative claims or other relief regarding the enforcement of present or future applicable federal and state laws, rules, regulations or permits with respect to the facility.

VII. Amendments or Modifications to the Agreement

This Project is an experiment designed to test new approaches to environmental protection and there is a degree of uncertainty regarding the environmental benefits and costs associated with activities to be undertaken in this Project. Therefore, it may be appropriate to amend this Agreement at some point during its duration.

This Final Project Agreement may be amended by mutual agreement of all parties at any time during the duration of the Project. The parties recognize that amendments to this Agreement may also necessitate modification of legal implementation mechanisms or may require development of new implementation mechanisms. If the Agreement is amended, EPA and Buncombe County expect to work together with other regulatory bodies and stakeholders to identify and pursue any necessary modifications or additions to the implementation mechanisms in accordance with applicable procedures (including public notice and comment). If the parties agree to make a substantial amendment to this Agreement, the general public will receive notice of the amendment and be given an opportunity to participate in the process, as appropriate.

In determining whether to amend the Agreement, the parties will evaluate whether the proposed amendment meets Project XL acceptance criteria and any other relevant considerations agreed on by the parties. All parties to the Agreement will meet within ninety (90) days following submission of any amendment proposal (or within a shorter or longer period if all parties agree) to discuss evaluation of the proposed amendment. If all parties support the proposed amendment, the parties will (after appropriate stakeholder involvement) amend the Agreement.

VIII. Transfer of Project Benefits and Responsibilities to a New Owner

The parties expect that the site specific rule will allow for a transfer of Buncombe County's benefits and responsibilities under the Project to any future owner or operator upon request of Buncombe County and the new owner or operator, provided that the following conditions are met:

A. Buncombe County will provide written notice of any such proposed transfer to the EPA, the State of North Carolina, and all applicable local agencies at least ninety (90) days before the effective date of the transfer. The notice is expected to include identification of the proposed new owner or operator, a description of its financial and technical capability to assume the obligations associated with the Project, and a statement of the new owner or operator's intention to take over the responsibilities in the XL Project of the existing owner or operator.

B. Within forty-five (45) days of receipt of the written notice, the parties expect that EPA, the State of North Carolina, and all applicable local agencies in consultation with all stakeholders, will determine whether: (1) the new owner or operator has demonstrated adequate capability to meet EPA's requirements for carrying out the XL Project; (2) is willing to take over the responsibilities in the XL Project of the existing owner or operator; and, (3) is otherwise an appropriate Project XL partner. Other relevant factors, including the new owner or operator's record of compliance with Federal, State and local environmental requirements, may be considered as well. It is expected that the site specific rule will provide that, so long as the demonstration has been made to the satisfaction and unreviewable discretion of EPA, the State of North Carolina, and all applicable local agencies and upon consideration of other relevant factors, the FPA will be modified to allow the proposed transferee to assume the rights and obligations of Buncombe County. In the event that the transfer is disapproved by any agency, withdrawal or termination may be initiated, as provided in Section XI.

It will be necessary to modify the Agreement to reflect the new owner and it may also be necessary for EPA to amend appropriate rules (subject to applicable public notice and comment) to transfer the legal rights and obligations of Buncombe County under this Project to the proposed new owner or operator. The rights and obligations of this Project remain with Buncombe County prior to their final, legal transfer to the proposed transferee.

Landfill permits are not transferable in North Carolina. A proposed new ownerof the landfill is required under State rules to obtain a new permit for the landfill.

IX. Process for Resolving Disputes

Any dispute that arises under or with respect to this Agreement will be subject to informal negotiations between the parties to the Agreement. The period of informal negotiations will not exceed twenty (20) calendar days from the time the dispute is first documented, unless that period is extended by a written agreement of the parties to the dispute. The dispute will be considered documented when one party sends a written Notice of Dispute to the other parties.

If the parties cannot resolve a dispute through informal negotiations, the parties may invoke non-binding mediation by describing the dispute with a proposal for resolution in a letter to the Regional Administrator for EPA Region 4, with a copy to all parties. The Regional Administrator will serve as the non-binding mediator and may request an informal mediation meeting to attempt

to resolve the dispute. He or she will then issue a written opinion that will be non-binding and does not constitute a final EPA action. If this effort is not successful, the parties still have the option to terminate or withdraw from the Agreement, as set forth in Section XI below.

This dispute resolution process is not applicable to State permitting and enforcement actions.

X. Withdrawal From or Termination of the Agreement

A. Expectations

Although this Agreement is not legally binding and any party may withdraw from the Agreement at any time, it is the desire of the parties that it should remain in effect through the expected duration of 25 years, or until changes in generally applicable regulations make the requested flexibility unnecessary, or until the Subtitle D landfill portion of the BCSWMF reaches capacity, which ever occurs sooner. The agreement will be implemented as fully as possible, unless one of the conditions below occurs:

1. Failure by any party to: (a) comply with the provisions of the enforceable implementing mechanisms for this Project, or (b) act in accordance with the provisions of this Agreement. The assessment of the failure will take its nature and duration into account.

2. Failure of any party to disclose material facts during development of the Agreement.

3. Failure of the Project to provide superior environmental performance consistent with the provisions of this Agreement.

4. Enactment or promulgation of any environmental, health or safety law or regulation after execution of the Agreement, which renders the Project legally, technically or economically impracticable.

5. Decision by an agency to reject the transfer of the Project to a new owner or operator of the facility.

Buncombe County will be given notice and a reasonable opportunity to remedy any substantial failure before EPA's withdrawal. If there is a disagreement between the parties over whether a substantial failure exists, the parties will use the dispute resolution mechanism identified in Section X of this Agreement. EPA, the State of North Carolina, and all applicable local agencies retain their discretion to use existing enforcement authorities, including withdrawal or termination of this Project, as appropriate. Buncombe County retains any existing rights or abilities to defend itself against any enforcement actions, in accordance with applicable procedures.

B. Procedures

The parties agree that the following procedures will be used to withdraw from or terminate the Project before expiration of the Project term. They also agree that the implementing mechanism(s) will provide for withdrawal or termination consistent with these procedures.

1. Any party that wants to terminate or withdraw from the Project is expected to provide written notice to the other parties at least sixty (60) days before the withdrawal or termination.

2. If requested by any party during the sixty-(60) day period noted above, the dispute resolution proceedings described in this Agreement may be initiated to resolve any dispute relating to the intended withdrawal or termination. If, following any dispute resolution or informal discussion, a party still desires to withdraw or terminate, that party will provide written notice of final withdrawal or termination to the other parties.

   If any agency withdraws or terminates its participation in the Agreement, the remaining agencies will consult with Buncombe County to determine whether the Agreement should be continued in a modified form, consistent with applicable federal or State law, or whether it should be terminated.

3. The procedures described in this Section apply only to the decision to withdraw or terminate participation in this Agreement. Procedures to be used in modifying or rescinding any legal implementing mechanisms will be governed by the terms of those legal mechanisms and applicable law. It may be necessary to invoke the implementing mechanism's provisions that end authorization for the Project (called "sunset provisions") in the event of withdrawal or termination.

XII. Compliance After the Project is Over

The parties intend that there be an orderly return to compliance upon completion, withdrawal from, or termination of the Project, as follows:

A. Orderly Return to Compliance with Otherwise Applicable Regulations, if the Project Term is Completed

Buncombe County is expected to anticipate and plan for all activities to return to compliance sufficiently in advance of the end of the Project term. Buncombe County may request a meeting with EPA, the State of North Carolina, and all applicable local agencies to discuss the timing and nature of any actions that they will be required to take. The parties should meet within thirty days of receipt of Buncombe County's written request for such a discussion. At and following such a meeting, the parties should discuss in reasonable, good faith, which of the requirements deferred under this Project will apply after termination of the Project.

B. Orderly Return to Compliance with Otherwise Applicable Regulations in the Event of Early Withdrawal or Termination

In the event of a withdrawal or termination not based on the end of the Project term and where Buncombe County has made efforts in good faith, the parties to the Agreement will determine an interim compliance period to provide sufficient time for Buncombe County to return to compliance with any regulations deferred under the Project. The interim compliance period will extend from the date on which EPA, the State of North Carolina, and all applicable local agencies provide written notice of final withdrawal or termination of the Project, in accordance with Section XI of this Project Agreement. By the end of the interim compliance period, Buncombe County will comply with the applicable deferred standards set forth in 40 CFR Part 258.28 and 40 CFR 258.60(f). During the interim compliance period, EPA, the State of North Carolina, and any applicable local agency may issue an order, permit, or other legally enforceable mechanism establishing a schedule for Buncombe County to return to compliance with otherwise applicable regulations as soon as practicable. This schedule cannot extend beyond 6 months from the date of withdrawal or termination. Buncombe County intends to be in compliance with all applicable Federal, State, and local requirements as soon as is practicable, as will be set forth in the new schedule.

XII. Signatories and Effective Date

A. Stanley Meiburg, Deputy Regional Administrator
EPA, Region 4

C. Thomas Sobol
Chairman
Buncombe County Board of Commissioners

Robin Smith
Assistant Secretary for Environment
North Carolina Department of the Environment and Natural Resources

Supporting Signatories

The Buncombe County XL Project enjoys the support of a broad range of public and private organizations and individuals. The project incorporates both public/private and federal/local partnerships and will serve as an example that will benefit the economy, the community, and the environment.

Our signatures below express our support for this project and the contribution it will make to the environment and the community.

Signed: _____

Affiliation: WNC Regional Air Quality Agency

Appendix B

Monitoring Data

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Generation and Rainfall (Leachate Collection System)

Date	Rain	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Weekly Total
	(inches)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)
11/13/2007	0.02	1,015	0	0	5,677	566	27,799	35,057
11/20/2007	0.89	2,795	0	11,385	0	2,028	351,253	367,461
11/28/2007	0.19	1,434	0	9	1	2,868	69,124	73,436
12/5/2007	0.11	1,184	0	0	5,704	1,092	35,391	43,371
12/12/2007	0.31	982	375	0	0	1,122	99,675	102,154
12/18/2007	0.52	554	16	0	0	1,042	166,337	167,949
12/27/2007	0.61	1,759	96	9,504	0	2,957	231,726	246,042
1/2/2008	1.24	1,747	93	0	3,391	3,377	368,811	377,419
1/7/2008	0.05	755	188	0	0	1,231	34,359	36,533
1/14/2008	0.86	2,577	344	0	0	5,579	287,507	296,007
1/24/2008	0.29	1,599	219	0	7,752	3,291	121,773	134,634
1/30/2008	0.2	704	164	9,241	0	1,958	42,290	54,357
2/1/2008	0.64	283	62	54	0	1,937	141,494	143,830
2/5/2008	0.58	2,185	575	0	0	7,974	0	10,734
2/13/2008	0.27	4,017	396	0	7,361	5,297	212,707	229,778
2/20/2008	0.82	1,906	276	9,512	0	7,329	297,974	316,997
2/29/2008	0.62	2,127	67	0	0	4,279	143,987	150,460
3/4/2008	2.11	1,099	14	0	52,129	14,615	131,403	199,260
3/14/2008	2.59	0	0	11,438	492,030	9,759	481,716	994,943
3/19/2008	0.76	0	0	0	5,078	7,575	248,035	260,688
3/26/2008	0.38	7,244	0	0	5,619	7,208	157,094	177,165
4/2/2008	0.39	4,440	0	0	2,757	2,406	94,525	104,128
4/9/2008	1.03	3,210	0	10	3,334	7,245	232,460	246,259
4/17/2008	0.16	35	152	578	156	0	66,345	67,266
4/23/2008	0.4	2,131	167	4	2,923	0	178,019	183,244
4/30/2008	0.7	2,093	256	0	2,825	2,427	111,200	118,801
5/7/2008	0.04	1,494	1,276	2	0	1,663	0	4,435
5/12/2008	0.6	923	0	9,374	2,378	1,767	190,822	205,264
5/22/2008	0.61	1,646	168	3,335	3,109	2,411	205,550	216,219
5/27/2008	0.09	760	119	211	99	866	22,003	24,058
5/29/2008	0.74	324	0	2	3,994	618	189,878	194,816
6/2/2008	0.16	546	102	3,371	5	766	31,552	36,342
6/10/2008	0	1,159	60	7	13	2,335	22,935	26,509
6/16/2008	0.8	880	0	3,465	2,924	2,017	455,984	465,270
6/25/2008	0.33	1,088	0	192	35	2,538	123,443	127,296
6/30/2008	1.58	1,065	0	2,650	3,111	1,602	386,737	395,165
7/9/2008	0.54	971	0	3	36	1,701	137,328	140,039
7/16/2008	1.75	1,239	52	2,950	3,946	4,080	664,111	676,378
7/23/2008	0.03	1,158	1	0	0	1,935	38,166	41,260
7/31/2008	0.47	1,316	2	150	3,372	1,911	148,956	155,707
8/7/2008	0.51	1,043	1	4	250	1,141	90,385	92,824
8/13/2008	0.13	890	2	3,486	3,117	826	19,254	27,575
8/20/2008	0.46	1,019	1	15	193	1,961	88,671	91,860
8/26/2008	1.05	853	1	5	2,643	0	124,645	128,147
8/27/2008	2.25	553	17	2,540	131,344	9,087	129,576	273,117
8/28/2008	0.89	571	7	195	223,248	3,820	92,276	320,117

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Generation and Rainfall (Leachate Collection System)

Date	Rain	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Weekly Total
	(inches)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)
9/3/2008	0.09	460	4	2,334	241,195	2,593	176,706	423,292
9/10/2008	0.53	3,281	3	2,762	12,868	1,521	287,350	307,785
9/16/2008	0.22	2,318	1	0	5,079	1,671	251,367	260,436
9/24/2008	0.09	2,921	2	3,597	1,795	1,675	53,685	63,675
10/1/2008	0.2	1,977	2	0	2,478	978	24,638	30,073
10/8/2008	0.05	1,622	2	0	1,427	2,006	43,888	48,945
10/16/2008	0.39	1,836	300	7,887	10,679	0	110,125	130,827
10/27/2008	0.48	1,997	395	1,138	3,828	0	142,176	149,534
11/6/2008	0.03	1,620	335	3,302	1,904	1,872	26,290	35,323
11/12/2008	0.01	885	168	1,294	1,291	1,140	10,378	15,156
11/13/2008	0.54	131	835	3	0	0	49,763	50,732
11/19/2008	0.6	789	0	1,121	1,862	1,291	301,770	306,833
11/25/2008	0.04	839	185	1,946	1,150	1,009	22,273	27,402
12/3/2008	0.3	941	494	649	1,551	1,274	105,664	110,573
12/9/2008	0.03	673	165	1,332	1,147	531	18,091	21,939
12/12/2008	1.94	436	776	1,660	1,326	7,741	457,970	469,909
12/18/2008	0	977	0	1,557	483	1,914	229,872	234,803
12/23/2008	0.54	1,155	412	1,329	2,229	2,390	329,851	337,366
1/7/2009	1.99	2,779	1,857	7,255	3,648	21,686	470,469	507,694
1/14/2009	0.13	2,799	783	5,434	6,883	6,577	449,630	472,106
1/22/2009	0.04	2,780	332	1,969	2,221	2,053	201,161	210,516
1/29/2009	0.21	1,979	338	1,380	1,608	2,339	58,963	66,607
2/10/2009	0.15	3,022	451	1,871	2,137	2,743	51,999	62,223
2/18/2009	0.9	1,800	590	1,946	1,951	1,742	169,527	177,556
2/25/2009	0.09	1,370	59	2,235	1,367	1,888	61,140	68,059
3/3/2009	0.82	1,135	460	1,443	1,645	2,474	215,255	222,412
3/11/2009	0	1,572	497	1	1,762	208	10,344	14,384
3/16/2009	1.09	714	441	0	1,039	2	193,805	196,001
3/26/2009	0.45	1,309	186	3,567	1,627	565	102,322	109,576
4/1/2009	0.65	1,190	649	3,260	2,153	2,020	154,307	163,579
4/8/2009	0.38	1,063	546	2,754	0	2,824	99,824	107,011
4/13/2009	1.08	830	602	2,038	1,708	2,833	313,483	321,494
4/20/2009	0.88	1,293	884	2,290	1,837	3,989	223,560	233,853
4/29/2009	0.1	1665	838	4042	3030	7288	140539	157,402
5/4/2009	0.6	952	447	2056	506	1595	140560	146,116
5/7/2009	1.76	620	318	13	1272	4400	465910	472,533
5/11/2009	1.09	1075	711	2379	1957	4182	385501	395,805
5/15/2009	1.03	1252	673	2080	1088	11045	417800	433,938
5/18/2009	1.05	1601	830	2832	22815	10309	262835	301,222
5/26/2009	0.28	2038	708	2093	1920	3626	320915	331,300
5/27/2009	0.72	717	354	383	612	3821	208743	214,630
6/4/2009	1.98	2450	1132	2925	19762	10204	559007	595,480
6/10/2009	0.27	2198	468	1653	1933	3045	223440	232,737
6/17/2009	0.68	2939	1580	2193	1852	3350	271160	283,074

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Generation and Rainfall (Leachate Collection System)

Date	Rain	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Weekly Total
	(inches)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)
6/23/2009	2.41	1900	454	1068	19120	5971	336230	364,743
7/1/2009	0.35	2738	633	3074	5750	3285	581276	596,756
7/8/2009	0.47	2336	484	2907	2147	2382	82675	92,931
7/13/2009	0.71	1601	478	1863	1232	1464	143379	150,017
7/23/2009	0.3	2925	583	2143	1894	2430	104053	114,028
7/29/2009	1.52	1798	450	1165	2067	1751	359897	367,128
8/5/2009	1.44	1910	492	1125	13414	3208	367280	387,429
8/14/2009	1.84	2367	550	1535	2249	6035	752930	765,666
8/20/2009	0.14	1861	488	1553	1357	1788	61661	68,708
8/27/2009	1	1832	261	1148	2074	1697	254588	261,600
9/2/2009	0.54	1521	253	1084	1121	1340	799	6,118
9/9/2009	0.05	1760	464	600	1917	1898	0	6,639
9/17/2009	0.78	1899	375	78	2730	2773	644005	651,860
9/21/2009	1.37	1031	395	920	559	4665	424377	431,947
9/30/2009	2.33	2999	1795	4426	274518	25651	555920	865,309
10/5/2009	0.57	1636	453	1206	3172	2825	337221	346,513
10/16/2009	1.12	2955	830	1712	2153	6612	562920	577,182
10/21/2009	0.19	1511	333	1132	2890	3196	68370	77,432
10/28/2009	1.08	2389	431	2479	1955	9719	299064	316,037
11/2/2009	0.72	1035	329	32	0	10681	252367	264,444
11/12/2009	2.38	3187	1482	2154	10378	33787	362393	413,381
11/18/2009	0.3	2071	640	1837	88179	5992	208045	306,764
11/25/2009	0.37	2629	772	629	62841	4860	273660	345,391
12/3/2009	0.91	2951	1075	528	5142	10144	472033	491,873
12/9/2009	1.68	2244	722	964	1510	16858	240863	263,161
12/17/2009	0.2	2842	368	2784	4129	8639	617029	635,791
12/22/2009	0.68	1812	1348	34	3748	9283	39335	55,560
12/28/2009	1.68	895	1430	3099	298748	50838	36151	391,161
1/6/2010	0.1	3498	0	226935	432852	11247	56855	731,387
1/15/2010	0	4869	0	2423	24111	5286	112132	148,821
1/20/2010	0.82	1603	13996	2507	76615	10806	240875	346,402
1/25/2010	1.16	3067	638	5885	35907	0	187010	232,507
2/3/2010	0.96	5960	652	9106	78861	0	646295	740,874
2/11/2010	1.1	5521	628	4676	56800	0	328875	396,500
2/18/2010	0.19	8135	522	6666	61765	0	301970	379,058
2/24/2010	0.19	7703	321	165	5087	0	254379	267,655
3/3/2010	0.38	8202	224	1987	3090	0	39201	52,704
3/10/2010	0.12	2174	339	1810	2767	0	77383	84,473
3/17/2010	1.14	0	374	2184	2855	0	292943	298,356
3/25/2010	0.53	566	655	3692	3234	937	132303	141,387
3/31/2010	0.52	3726	663	1834	2501	5023	88497	102,244
4/7/2010	0.01	5213	1005	2772	2655	4330	48079	64,054
4/14/2010	1.18	4723	700	978	3398	11048	416340	437,187
4/22/2010	0.13	5283	782	5	1813	3794	130155	141,832

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Generation and Rainfall (Leachate Collection System)

Date	Rain	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Weekly Total
	(inches)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)
4/26/2010	0.77	2836	348	92	1302	1653	106740	112,971
5/3/2010	1.3	4982	571	1176	2529	2718	82630	94,606
5/10/2010	0.15	5313	503	1544	2694	4119	340174	354,347
5/18/2010	0.51	5165	844	1548	1827	2317	18627	30,328
5/27/2010	0.57	5199	590	42	2682	2422	23236	34,171
6/1/2010	0.61	2706	353	22	1250	1090	9661	15,082
6/9/2010	1.01	4131	558	15	2773	2035	106683	116,195
6/16/2010	0.96	3613	568	1606	1730	1800	106393	115,710
6/22/2010	0.02	2989	275	57	1229	1269	18109	23,928
6/30/2010	0.47	3547	390	57	1984	1307	20153	27,438
7/6/2010	0	2553	405	0	1465	1155	13257	18,835
7/14/2010	1.28	3145	341	0	1260	1423	129071	135,240
7/21/2010	1.75	2520	574	0	1815	3852	394491	403,252
7/29/2010	0.04	3175	402	0	1830	1623	36681	43,711
8/4/2010	1.3	2186	263	0	1310	2435	254856	261,050
8/11/2010	0.2	2596	311	0	1873	1245	23426	29,451
8/18/2010	1	2663	311	0	1292	1388	187572	193,226
8/23/2010	1.35	1758	157	0	1281	1111	223068	227,375
9/1/2010	0.16	3345	408	252	1988	1728	54982	62,703
9/9/2010	0.32	2649	273	33	0	996	1928	5,879
9/15/2010	0.73	2446	317	198	0	780	0	3,741
9/22/2010	1.01	2041	215	0	0	0	138882	141,138
9/27/2010	1.5	1666	214	57	40	0	53799	55,776
10/6/2010	1.2	3097	1230	17	0	0	483721	488,065
10/13/2010	0.36	2416	144	14	0	1284	34642	38,500
10/26/2010	0.66	4427	319	1225	7075	2391	0	15,437
11/3/2010	0.66	2799	205	13	2311	161	34402	39,891
11/12/2010	0.57	3229	268	2205	2419	1593	47081	56,795
11/18/2010	0.35	1855	194	0	1515	1580	14123	19,267
12/1/2010	2.47	3699	636	0	4615	16615	189685	215,250
12/8/2010	0.37	2377	404	68	1307	3653	481396	489,205
12/15/2010	0.16	2277		1	1775	0	34152	38,205
12/23/2010	0.28	2446	446	0	2702	4044	51703	61,341
12/29/2010	0.16	1789	277	0	122	1831	28974	32,993
1/5/2011	0.51	2,131	1,491	3	3,245	13,551	208,399	228,820
1/13/2011	0.37	2,290	324	0	3,679	4,005	29,464	39,762
1/21/2011	0.2	2,047	1,504	0	1,350	11,760	90,029	106,690
1/31/2011	0.33	2,874	822	2	2,953	5,236	89,170	101,057
2/9/2011	0.89	2,881	1,118	1	3,321	14,065	291,029	312,415
2/16/2011	0.03	1,589	637	3	1,869	4,081	134	8,313
2/23/2011	0.1	874	383	2,841	1,929	2,914	32,128	41,069
3/1/2011	1.65	2,076	499	0	2,573	13,328	162,505	180,981
3/7/2011	1.32	2,241	756	5,505	2,930	26,912	34,264	72,608

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Generation and Rainfall (Leachate Collection System)

Date	Rain	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Weekly Total
	(inches)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)
3/16/2011	1.41	4,258	1,878	4,785	3,288	26,219	796,378	836,806
3/24/2011	0.32	3,965	1,197	0	3,053	7,325	53,952	69,492
3/30/2011	1.03	2,920	598	394	2,197	5,403	154,422	165,934
4/7/2011	0.97	3,886	842	70	2,925	12,004	261,437	281,164
4/13/2011	1.2	3,076	870	1	14	10,466	319,498	333,925
4/18/2011	0.99	2,803	804	0	0	16,645	321,706	341,958
4/27/2011	0.24	4,803	1,072	23	0	6,708	44,315	56,921
5/4/2011	1.12	3,829	741	491	10,352	3,845	57,397	76,655
5/11/2011	0.82	3,901	710	21	2,664	3,074	58,189	68,559
5/18/2011	1.16	3,846	610	0	1,200	2,987	171,104	179,747
5/25/2011	0.08	3,658	640	0	3,599	3,005	50,332	61,234
6/2/2011	0.78	4387	872	8	2,753	3,165	107,885	119,070
6/6/2011	0.24	2,047	273	0	1,281	1,130	10,747	15,478
6/14/2011	0.87	5,152	604	35	3,182	3,051	32,924	44,948
6/21/2011	2.23	2,546	518	0	2,941	6,790	316,296	329,091
6/29/2011	1.2	4,138	715	1	3,446	4,978	212,607	225,885
7/5/2011	1.77	2,994	484	1	2,830	1,090	185,109	192,508
7/13/2011	0.75	4,012	0	6,341	3,087	0	269,712	283,152
7/19/2011	0	2,952	0	1,082	1,859	0	40,923	46,816
7/27/2011	1.42	1,096	1	2,324	3,155	0	235,415	241,991
8/3/2011	0.02	3,404	0	1	2,059	0	28,764	34,228
8/10/2011	0.08	3,539	18	24	2,315	46	12,491	18,433
8/17/2011	0.21	3,324	0	30	2,892	2,071	11,653	19,970
8/24/2011	0.37	3,274	0	23	1,519	4,033	7,368	16,217
9/1/2011	0	3,585	165	1,390	2,749	1,976	13,468	23,333
9/6/2011	2.66	2,345	916	0	962	14,324	144,763	163,310
9/14/2011	0.07	3,762	1,083	77	3,497	5,668	237,466	251,553
9/21/2011	0.1	3,254	527	0	1,530	1,734	17,435	24,480
9/28/2011	0.91	3,058	556	71	3,359	3,446	51,483	61,973
10/5/2011	0.02	3,077	367	0	2,450	1,756	15,075	22,725
10/12/2011	0.51	3,032	657	273	791	3,830	9,609	18,192
10/19/2011	0.47	2,768	338	30	2,502	1,956	32,095	39,689
10/26/2011	0.41	2,803	574	1	2,189	1,809	16,960	24,336
11/4/2011	0.99	3,344	597	215	2,202	1,890	39,474	47,722
11/9/2011	0.11	1,818	283	6	1,439	1,744	33,110	38,400
11/16/2011	0.48	2,507	623	1	2,156	3,113	11,447	19,847
11/22/2011	0.64	2,057	209	47	1,564	1,479	63,866	69,222
11/29/2011	1.7	2,365	1,243	3,011	3,046	24,084	254,525	288,274
12/8/2011	1.85	3,473	3,363	7,196	4,377	67,988	530,990	617,387
12/14/2011	0.03	2,839	1,220	1,697	1,130	7,004	141,916	155,806
12/22/2011	0.57	3,923	737	1,867	2,075	7,989	44,170	60,761
12/30/2011	0.98	4,077	1,588	4,204	0	31,154	233,839	274,862
1/5/2012	0.02	3286	679	1316		6172	20499	31,952
1/11/2012	0.59	3111	1619	4955		19726	97977	127,388

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Generation and Rainfall (Leachate Collection System)

Date	Rain	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Weekly Total
	(inches)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)
1/20/2012	0.87	5088	2295	4756	6628	26578	187373	232,718
1/26/2012	0.63	3548	2636	3575	8474	18324	94384	130,941
2/3/2012	0.43	4639	1586	2979		11283	64523	85,010
2/9/2012	0.24	3716	1255	1129	3276	7300	36244	52,920
2/21/2012	0.32	6742	1772	5499	2120	8690	30889	55,712
3/1/2012	0.56	5251	1397	1382	2115	6920	18162	35,227
3/8/2012	0.68	4198	1088	2226	3182	7619	76482	94,795
3/15/2012	1.1	4351	1405	2019	2287	6882	56737	73,681
3/23/2012	1.35	4981	2349	3619	3389	9505	98690	122,533
3/28/2012	0.16	2923	1024	1545		4112	13961	23,565
4/2/2012	0.48	2951	790	957	3246	3250	12823	24,017
4/12/2012	0.78	5761	1756	2446	3182	6999	46362	66,506
4/18/2012	2.25	3586	1134	854		10175	181299	197,048
4/25/2012	0.77	4085	1267	1012	3131	6039	298618	314,152
5/2/2012	1.61	4378	1711		3243	10160	343442	362,934
5/10/2012	0.61	5142	1308			7587	36902	50,939
5/17/2012	0.75	4560	6835	41	3070	4641	45950	65,097
5/23/2012	0.16	3902	1187	2585		4593	17264	29,531
5/31/2012	1.06	4688	1432	2585	3138	4812	43236	59,891
6/7/2012	0.71	4112	888	2585	2840	3324	35042	48,791
6/13/2012	0.17	3539	1177	2585		4443	12551	24,295
6/19/2012	0.26	3222	746	89	2748	1579	11681	20,065
6/27/2012	0.01	3027	1038			2935	40878	47,878
7/9/2012	1.47	6839	1822		2565	6203	201221	218,650
7/19/2012	4.11	5,714	2,261	0	4,930	4,820	439,885	457,610
7/26/2012	0.56	4088	887	6671	0	0	15357	27,003
8/1/2012	2.14	3332	1003	0	2259	0	337053	343,647
8/9/2012	2.1	4370	1544	0	67684	15460	372567	461,625
8/16/2012	0.89	3760	1334	5937	21104	6343	328323	366,801
8/22/2012	0.28	3129	865	0	2414	2676	178274	187,358
8/30/2012	0.47	4296	1255	0	3120	2357	27190	38,218
9/5/2012	0.48	2849	528	0	0	2214	9890	15,481
9/13/2012	0.81	3928	1095	6443	2649	3592	38434	56,141
9/19/2012	2.84	2874	1269	0	77746	22813	276262	380,964
9/26/2012	0.06	3567	1447	87	92812	5026	185442	288,381
10/8/2012	1.65	5818	2281	6046	4952	5507	315618	340,222
10/17/2012	0.77	4048	1351	0	2888	5398	279578	293,263
10/24/2012	0.02	3270	953	0	0	1509	22877	28,609
11/1/2012	0.79	3487	887	2	2432	4689	45191	56,688
11/8/2012	0.22	2907	1089	5693	2256	1581	17856	31,382
11/16/2012	0.26	3336	1626	0	0	3033	22175	30,170
11/19/2012	0.01	1193	464	0	2494	0	5667	9,818
11/29/2012	0.09	3878	1455	0	0	3728	96069	105,130
12/5/2012	0.01	2167	916	5248	2199	1353	10323	22,206

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Generation and Rainfall (Leachate Collection System)

Date	Rain	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Weekly Total
	(inches)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)	(gallons)
12/12/2012	0.29	2542	902	0	2064	2854	12541	20,903
12/20/2012	0.93	2794	1516	5359	135	1504	52599	63,907
12/27/2012	2.17	2635	2697	0	2329	25741	229147	262,549
1/7/2013	0.48	4533	4658	7147	4765	9961	239509	270,573
1/16/2013	3.8	4270	4121	9431	86141	92287	501938	698,188
1/24/2013	1.67	6124	8763	278150	305046	65293	120775	784,151
2/1/2013	1.27	6124	3308	15666	136090	30102	363788	555,078
2/6/2013	0.08	4315	1917	0	7774	8155	274146	296,307
2/13/2013	0.92	6625	3857	4784	7566	14567	124353	161,752
2/21/2013	0.08	7316	3788	4795	4513	13151	47817	81,380
2/27/2013	1.08	5850	3145	0	4668	16133	44331	74,127
3/8/2013	1.06	8687	5328	4948	4365	32801	145100	201,229
3/13/2013	0.82	4641	3688	4627	2174	22441	103811	141,382
3/20/2013	0.58	6654	4120	0	2502	13759	79599	106,634
3/27/2013	1.1	6635	4614	4937	2418	26207	111623	156,434
4/3/2013	0.87	6889	5029	49	5317	19517	98956	135,757
4/10/2013	0.53	7272	5054	5002	2511	17528	77285	114,652
4/17/2013	2.06	9875	6305	0	2603	42253	261403	322,439
4/24/2013	1.07	6077	3106	5042	2345	9106	50055	75,731
5/1/2013	1.78	9306	4525	0	2581	26007	130466	172,885
5/9/2013	1.59	10007	4901	4970	4768	29717	293553	347,916
5/16/2013	0.06	8540	4141	0	2276	10918	65757	91,632
5/22/2013	0.76	7087	3542	0	2365	6658	23762	43,414
5/29/2013	0.52	8564	3894	5093	2304	7731	27078	54,664
6/5/2013	0.52	8674	3867	0	0	7073	17865	37,479
6/12/2013	2.91	8232	4314	0	2466	26712	231124	272,848
6/19/2013	0.34	8477	4393	5293	2422	7211	101882	129,678
6/26/2013	0.47	8187	3844	0	2361	6393	26516	47,301
7/2/2013	1.56	6992	3083	0	2365	6198	30715	49,353

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Buncombe Bioreactor
Leachate Recirculated

YEAR	MONTH	TOTAL GALLONS RECIRCULATED	Total into West Zone (HITs D,E,F & SGT's 1,2,3)	Total into North Zone (HITs A,B,C & SGT's 4,5)
2006	December	430,000	330,000	100,000
2008	May	47,460	47460	
	June	32,770	32770	
	September	25,820	25820	
	October	57,730	57,730	
	November	97,830	83,110	14720
	2008 Total	**261,610**	**246,890**	**14,720**
2009	April	16,890	10,220	6670
	July	84,850	24,450	60400
	August	23,530	23,530	
	December	45,760	22,520	23240
	2009 Total	**171,030**	**80,720**	**90,310**
2010	April	293,000	86,000	207,000
	May	42,800	22,800	20,000
	June	248,800	160,400	88,400
	July	69,600	45,600	24,000
	November	47,200	47,200	
	2010 Total	**701,400**	**362,000**	**339,400**
2011	February	11,520		11,520
	March	21,420	4,470	16,950
	May	101,000	52,000	49,000
	June	58,000	58,000	
	July	26,000	26,000	
	August	103,540	55,060	48,480
	September	144,070	73,360	70,710
	October	24,470	11,850	12,620
	November	68,440	54,040	14,400
	December	27,360	27,360	
	2011 Total	**585,820**	**362,140**	**223,680**
2012	March	32,250	20,830	11,420
	April	23,710	23,710	0
	May	69,750	47,290	22,460
	June	151,310	68,580	82,730
	July	157,620	131,400	26,220
	August	90,260	71,260	19,000
	September	25,120	0	25,120

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Buncombe Bioreactor
Leachate Recirculated

YEAR	MONTH	TOTAL GALLONS RECIRCULATED	Total into West Zone (HITs D,E,F & SGT's 1,2,3)	Total into North Zone (HITs A,B,C & SGT's 4,5)
	October	104,890	74,550	30,340
	November	72,870	52,760	20,110
	December	33,640	19,840	13,800
	2012 Total	**761,420**	**510,220**	**251,200**
2013	April	16,180	16,180	0
	May	29,070	23,780	5,290
	June	9,340	9,340	0
	2013 Total	**54,590**	**49,300**	**5,290**
Total Leachate Recirculated		**2,965,870**	**1,941,270**	**1,024,600**

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 1

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
1/29/2007	280	6,000	270	240	6.88	130	0.66	11.7	16.3	6.90	-191	4.2	1.0
2/27/2007	150	4,500	370	270	7.08								0.4
3/27/2007	51	6,400	380	330	7.20	120	0.77	7.3	18.8	7.10	-203	4.9	0.1
4/27/2007													
5/29/2007	1,200	7,000	560	300	7.10	240	0.78	12.2	26.4	6.80	-205	4.9	2.1
6/22/2007	180	6,600	530	330	6.90	430	0.76	14.7	19.9	7.00	-193	4.8	0.3
7/27/2007	540	5,900	1,100	220	6.86								0.5
8/24/2007	450	2,190	528	52	6.20								0.9
11/27/2007	892	6,470	414	250	6.90	12.5			16.2	6.88	-98	3.7	2.2
1/29/2008	960	6,550	319	264	6.90	29.60	5.42	3.49	14.81	7.11	-189		3.0
2/25/2008	427	4,490	190	177	6.80	6.95	4.33	5.41	17.81	6.95	-129	2.8	2.2
3/27/2008	558	3,210	104	104	6.20	77.4	2.87	9.04	16.84	6.74	-99	1.8	5.4
4/21/2008	184	3070	202	138	6.30	66.5	3.59	1.48	17.58	6.99	-151	2.3	0.9
5/28/2008	687	4,200	242	184	6.70	57	4.52	6.30	19.42	7.16	-148	3.20	2.8
6/23/2008	819	4,060	223	167	6.70	58.1	4.78	5.29	24.42	7.32	-154	3.10	3.7
7/29/2008	68	4060	214	191	6.70	76.9	4.81	9.45	22.73	7.31	-167	3.1	0.3
8/27/2008	462	5,060	204	189	6.90	62.2	4.66	4.41	24.75	7.35	-174	4.1	2.3
9/23/2008	510	2,940	175	130	6.50	111	5.67	4.57	20.4	7.24	-166	2.3	2.9
10/27/2008		4390	184	174	6.8	128	3.97	8.26	17.38	7.59	-158	2.5	0.0
11/20/2008	232	4940	235	202	6.9	252	4.61	9.49	15.94	7.38	-146	2.9	1.0
1/29/2009	54	4140	191	191	7.0	167	3.62	10.45	15.22	6.82	-140	2.3	0.3
2/17/2009	6.6	4030	159	172.00	6.7	213	3.58	10.94	14.41	7.35	-102	2.3	0.0
3/30/2009	73.7	3900	245	200.00	6	198	3.77	7.27	19.44	7.33	-111	2.5	0.3
4/23/2009	10.3	4090	195	205.00	6.9	363	4.22	5.5	20.87	7.55	-135	2.7	0.1
5/27/2009	26.4	3090	167	143.00	6.5	196	2.79	7.53	21.05	7.08	-104	1.8	0.2
6/30/2009	570	3420	199	144.00	7	250	3.69	5.26	21.03	7.04	-134	2.4	2.9
7/23/2009	20.5	3560	173	175.00	6.8	380	3.99	5.21	22.57	7.64	-170	2.6	0.1
8/24/2009	10.2	4570	207	198.00	6.8	319	4.09	8.11	21.56	6.93	-136	2.7	0.0
9/30/2009	13	4010	246	203	6.9	382	4.42	5.57	19.52	7.57	-187	2.8	0.1
10/26/2009	118	3950	224	217	6.9	339	4.41	6.7	18.18	7.59	-134	2.8	0.5
12/14/2009	4.8	3680	246	189	7.1	338	3.9	7.27	16.61	7.71	-145	2.5	0.0

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 1

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
3/8/2010	77.4	3440	1000	171	6.6	396	3.24	7.86	17.93	7.82	-148	2.1	0.1
6/23/2010													
9/23/2010	28.1	5820	320	248	7.1		5.45	9.52	22.67	8.55	-204	3.5	0.1
12/23/2010	8.6	5820	348	309	7.2		5.26	2.33	12.97	8.69	-30	3.3	0.0
3/17/2011	8.3	3690	195	177	6.9	955	3.51	3.76	18	8.97	-193	2.3	0.0
6/29/2011	4.2	5450	258	242	6.9	71.6	4.68	3.59	24.65	6.77	-108	3.1	0.0
9/8/2011	7.2	5500	257	141	7.1	616	4.41	2.61	29.66	6.86	-122	2.9	0.0
12/5/2011		6560	349	229	7.5		4.63		25.38	6.89	-115	3	0.0
3/15/2012	90.9	5120	675	180	6.7						-110	2.83	0.1
6/5/2012	61.8	4550	242	204	7.6						-128	2.8	0.3
9/26/2012	37.3	3760	277	240	8.3						-139	3.6	0.1
12/3/2012	75.7	6040	415	282	7						-104	3.7	0.2
4/10/2013	268	4410	810	217	7						-112	3	0.3
6/27/2013	138	4050	388	227	7.8						-108	2.6	0.4

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 2

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	**BOD5 Day (mg/L)**	**Conductance (µmho/cm)**	**COD (mg/L)**	**Ammonia (mg/L)**	**pH --**	**Turbidity (NTU)**	**Conductance (S/m)**	**DO (mg/L)**	**Temp (C)**	**pH --**	**ORP (mV)**	**TDS (g/L)**	**BOD5/COD**
1/29/2007													
2/27/2007													
3/27/2007													
4/27/2007													
5/29/2007	1,900	6,400	1,300	320	7.18	210	0.7	14.2	26.8	7.00	-234	4.4	1.5
6/22/2007	60	5,800	400	320	6.80	310	0.68	14.3	19.7	7.00	-208	4.3	0.2
7/27/2007	30	4,600	370	210	6.65								0.1
8/24/2007	780	4,240	295	173	6.60								2.6
11/27/2007	525	4,520	296	173	6.90	11.1			11.8	6.97	-287	2.7	1.8
1/29/2008	660	5,600	248	198	6.50	15	4.79	3.6	15.3	6.73	-101		2.7
2/25/2008													
3/27/2008	438	2,660	160	79.7	6.20	81.5	2.43	10.36	10.77	6.72	-94	1.6	2.7
4/21/2008	187	3370	202	129	6.10	67.8	3.80	5.45	14.95	6.77	-108	2.3	0.9
5/28/2008	507	3,250	267	141	6.30	63.9	4.35	5.4	21.22	7.17	-134	3	1.9
6/23/2008	579	2,890	261	167	6.40	79	3.96	4.49	23.52	8.36	-141	2.5	2.2
7/29/2008	110	3,040	209	136	6.40	77.5	3.68	6.42	25.3	7.14	-158	2.5	0.5
8/27/2008	321	3,760	172	132	6.50	76.50	3.7	6.48	22.73	6.96	-152	2.4	1.9
9/23/2008	570	3,370	209	139	6.50	82.8	3.76	5.20	22.98	7.15	-153	2.8	2.7
10/27/2008		3710	207	139	6.5	102	3.34	11.14	15.92	7.26	-130	2.1	0.0
11/20/2008	504	2550	206	111	6.6	132	2.95	10.37	11.24	7.45	-110	1.9	2.4
1/29/2009	60	3470	187	145	6.6	171	3.31	9.94	8.95	7.16	-83	2.1	0.3
2/17/2009	15.0	3510.0	178.0	137.0	6.6	192	3.26	10.66	16.4	7.12	-102	2.1	0.1
3/30/2009	57.3	3160.0	208.0	126.0	6.7	228	3.16	8.36	17.52	7.55	-127	2	0.3
4/23/2009	10.3	2900.0	183.0	131.0	6.6	314	3.3	6.57	21.23	7.47	-138	2.1	0.1
5/27/2009	23.4	3050.0	196.0	124.0	6.4	206	2.96	8.44	20.38	7.09	-106	1.9	0.1
6/30/2009	480.0	2990.0	182.0	110.0	6.7	177	2.88	5.63	26.52	6.72	-119	1.9	2.6
7/23/2009	32.6	2580.0	163.0	137.0	6.6	363	3.2	4.38	24.15	7.41	-155	2	0.2
8/24/2009	6.6	3200.0	164.0	123.0	6.6	255	2.92	6.24	26.48	7.22	-146	1.9	0.0
9/30/2009	10.6	2200.0	176.0	113.0	6.7	244	3.03	3.03	19.57	6.96	-109	1.9	0.1
10/26/2009	95.1	2980.0	178.0	149.0	6.7	288	3.1	7.33	17.79	7.33	-110	2	0.5
12/14/2009	7.2	2670.0	204.0	130.0	6.6	347	3.07	6.53	15.33	7.13	-141	2	0.0

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 2

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	**BOD5 Day (mg/L)**	**Conductance (µmho/cm)**	**COD (mg/L)**	**Ammonia (mg/L)**	**pH --**	**Turbidity (NTU)**	**Conductance (S/m)**	**DO (mg/L)**	**Temp (C)**	**pH --**	**ORP (mV)**	**TDS (g/L)**	**BOD5/COD**
3/8/2010	11.0	2960.0	338.0	131.0	6.6	445	2.88	6.5	18.18	7.98	-143	1.8	0.0
6/23/2010	7.0	4260.0	304.0	207.0	6.7	439	4.01	4.89	22.98	8.66	-203	2.6	0.0
9/23/2010	11.3	5510.0	350.0	236.0	6.9	543	5.21	5.82	22.18	8.76	-204	3.5	0.0
12/23/2010	8.6	6640.0	421.0	316.0	7.0	788	5.51	2.46	13.8	8.34	-83	3.4	0.0
3/17/2011	11.9	4300.0	273.0	224.0	6.9	741	4.17	3.53	19.9	8.63	-201	2.7	0.0
6/29/2011	10.4	5410.0	309.0	104.0	6.8	44	4.55	3.71	25.08	6.54	-95	3	0.0
9/8/2011	21.6	6470.0	430.0	225.0	7.2	691	5.38	2.57	28.61	6.88	-128	3.6	0.1
12/5/2011	21.8	7530.0	486.0	311.0	7.7		4.63		24.93	7.09	-120	3.8	0.0
3/15/2012		5950.0	493.0	223.0	6.8						-122	3.1	0.0
6/5/2012	168.0	7100.0	780.0	393.0	7.1						-132	4.1	0.2
9/26/2012	31.3	7,150	691	433	8.3						-102	5.4	0.0
12/3/2012	77.2	7,670	1380	384	7						-132	4.4	0.1
4/10/2013	103	5,300	545	250	7.2						-118	0.65	0.2
6/27/2013	341	5,440	545	307	7.3						-145		0.6

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 3

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
1/29/2007	4,400	11,000		370	6.16	330	1.2	8.5	19.4	6.15	-167	7	
2/27/2007	4,000	5,700	1,900	280	6.78								2.1
3/27/2007	260	5,500	700	250	6.90	120	0.69	7.5	20.5	6.80	-195	4.3	0.4
4/27/2007	1,700	2,000	1,200	47	5.50	100	0.25	9.9	16.1	5.40	-141	1.7	1.4
5/29/2007	1,200	6,400	760	270	7.00	240	0.71	11.7	26.6	6.50	-197	4.5	1.6
6/22/2007	450	5,000	870	170	6.70	230	0.57	11.8	22.3	6.60	-204	3.6	0.5
7/27/2007	24	4,300	280	210	6.91								0.1
8/24/2007	720	3,680	330	158	6.70								2.2
11/27/2007	445	3,490	189	140	6.80	25			18.8	6.80	-42	2.2	2.4
1/29/2008	435	3,870	103	154	6.60	15.40	3.40	3.53	19.77	6.92	-154		4.2
2/25/2008	184	1,390	190	48.4	6.30	39.80	1.25	4.91	20.80	6.58	-178	0.8	1.0
3/27/2008	558	2,350	309	88	6.50	126.00	2.2	7.50	13.86	6.96	-130	1.4	1.8
4/21/2008	190	1040	78	49.6	6.00	91.10	1.30	6.47	17.68	6.93	0	0.1	2.4
5/28/2008	215	1,370	68	55.4	6.20	75.10	1.36	4.85	27.95	7.10	-114	0.9	3.2
6/23/2008	116	476	74	51.1	5.70	45.70	0.849	5.34	28.77	7.07	-106	0.55	1.6
7/29/2008	56	3280	207	133.0	6.70	61.00	3.58	13.49	24.04	6.97	-158	2.3	0.3
8/27/2008	171	1,280	155	45.8	6.30	69.30	0.98	5.46	24.02	6.95	-135	0.6	1.1
9/23/2008	204	1,440	77	54.6	6.40	80.90	1.5	4.24	25.25	7.11	-153	1	2.6
10/27/2008		1570	74	51.4	6.2	98.00	1.44	8.38	17.97	7.42	-114	0.9	0.0
11/20/2008	29	1050	36	18	5.8	127.00	0.937	10.45	13.46	7.14	-65	0.6	0.8
1/29/2009	30	530		7.8	5.7	165	0.482	165.00	11.21	6.54	-138	0.31	
2/17/2009	4.0	1590.0	74.5	45.9	6.4	176	1.45	11.02	12.85	7.06	-47	0.9	0.1
3/30/2009	36.8	966.0	68.2	26.5	6.9	315	0.931	5.72	17.85	6.94	-124	0.6	0.5
4/23/2009	3.1	2630.0	154.0	97.2	6.7	343	2.68	3.68	20.11	7.34	-114	1.7	0.0
5/27/2009	20.0	1230.0	94.9	49.2	6.3	201	1.19	8.34	23.14	6.58	-95	0.8	0.2
6/30/2009	480.0	2720.0	189.0	120.0	6.9	241	3.19	5.38	26.11	6.9	-124	2	2.5
7/23/2009	13.3	2930.0	169.0	134.0	6.8	294	3.26	3.9	25.28	7.5	-153	2.1	0.1
8/24/2009	6.6	3950.0	224.0	148.0	6.7	256	3.55	6.66	20.77	7.07	-104	2.4	0.0
9/30/2009	47.9	590.0	127.0	23.7	6.4	318	0.631	5.44	22.03	6.95	-108	0.41	0.4
10/26/2009	111.0	1730.0	133.0	70.2	6.6	283	1.86	6.24	20.36	7.45	-142	1.2	0.8
12/14/2009	6.0	2920.0	203.0	141.0	6.8	298	3.07	7.29	17.31	7.5	-138	2	0.0

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 3

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	**BOD5 Day (mg/L)**	**Conductance (µmho/cm)**	**COD (mg/L)**	**Ammonia (mg/L)**	**pH --**	**Turbidity (NTU)**	**Conductance (S/m)**	**DO (mg/L)**	**Temp (C)**	**pH --**	**ORP (mV)**	**TDS (g/L)**	**BOD5/COD**
3/8/2010	9.0	2810.0	147.0	110.0	6.5	371	2.71	7.41	19.01	7.66	-125	1.7	0.1
6/23/2010	365.0	3190.0	1570.0	120.0	6.4	561	3.09	4.07	31.72	8.25	-209	2	0.2
9/23/2010	23.3	6350.0	360.0	255.0	7.3		5.72	8.75	24.06	8.7	-28	3.6	0.1
12/23/2010	31.4	6480.0	407.0	287.0	7.1	841	5.24	1.87	14.26	8.63	-35	3.3	0.1
3/17/2011	80.6	2390.0	257.0	105.0	6.9	661	2.04	2.01	16.96	8.04	-71	1.3	0.3
6/29/2011	7.0	4990.0	272.0	236.0	6.9	58.5	4.48	4.24	24.56	6.69	-87	3.1	0.0
9/8/2011	14.4	5580.0	352.0	250.0	7.2	310	4.45	1.55	27.49	6.88	-97	2.9	0.0
12/5/2011	31.0	4920.0	251.0	186.0	7.2		3.67		22.57	6.9	-95	2.4	0.1
3/15/2012	113.0	4650.0	421.0	212.0	6.8						-112	2.6	0.3
6/5/2012	69.2	3150.0	459.0	347.0	7.4						-128	3.9	0.2
9/26/2012	76.9	3750	402	255	8.4						-98	2.7	0.2
12/3/2012	78.4	5550	1310	340	6.9						-108	3.3	0.1
4/10/2013	38.2	5540	333	200	7.3						-85	3.2	0.1
6/27/2013	191	5950	600	520	7.7						-93	3.5	0.3

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 4

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
1/29/2007	3,700	6,700	4,800	220	6.23	580	0.75	11.9	11.6	6.13	-181	4.7	0.8
2/27/2007	2,800	1,500	1,900	68	5.26								1.5
3/27/2007	1,800	1,900	2,500	37	5.30	100	0.25	9.9	16.1	5.40	-141	1.7	0.7
4/27/2007	4,000	3,600	2,500	94	5.40	420	1.50	8.3	21.8	7.30	-218	9	1.6
5/29/2007	2,400	2,900	2,100	72	5.36	210	0.33	14.2	23	5.10	-156	2.2	1.1
6/22/2007	660	2,300	990	79	6.50	360	0.31	11.7	23.1	6.50	-204	2	0.7
7/27/2007	240	2,000	470	73	6.41		0.25	4.8	23.1	5.90	-187	1.6	0.5
8/24/2007	510	2,390	127	92	6.60								4.0
11/27/2007	870	2,990	859	104	6.70	93.2			14.4	6.80	-115	1.9	1.0
1/29/2008	415	2,420	228	88	6.40	50	2.35	0.0	10.2	6.88	-197		1.8
2/25/2008	397	1,800	408	61.5	6.40	29.5	1.61	5.38	17.7	6.50	-191	1	1.0
3/27/2008	738	2,560	391	86	6.40	116	2.23	9.48	13.42	6.90	-126	1.4	1.9
4/21/2008	193	1080	86.7	45	6.10	83.8	1.36	7.37	16.29	7.08	0	0.1	2.2
5/28/2008	137	774	ND	16.4	5.70	65.9	7.34	6.17	23.01	7.34	-86	0.45	
6/23/2008	86	552	43	19.2	5.80	47.6	0.616	4.33	32.16	6.78	-89	0.4	2.0
7/29/2008	38	252	25	6.7	5.60	54	0.287	15.07	29.88	7.13	-162	0.18	1.5
8/27/2008	231	1,540	276		6.60	74.6	1.41	7.65	20.67	6.85	-149	0.9	0.8
9/23/2008	390	1,840	120	87.6	6.50	96.3	3.06	5.84	25.49	7.30	-149	4.1	3.3
10/27/2008		503	26	9.5	5.50	109	0.481	8.01	18.39	7.6	-77	0.32	0.0
11/20/2008	35	1050	38	18.6	5.8	140	0.918	13.15	14.06	7.01	-1	0.58	0.9
1/29/2009	42	1550	108	48.2	6.2	170	1.32	2.25	11.84	6.81	-204	0.9	0.4
2/17/2009	31.8	7980.0	972.0	430.0	7.4	201	6.9	11.1	15.81	7.41	-127	4.3	0.0
3/30/2009	61.3	5360.0	1580.0	293.0	5.9	302	3.18	6.58	18.65	7.12	-145	2	0.0
4/23/2009	51.7	7130.0	951.0	416.0	7.2	303	7.43	6.26	24	7.95	-129	4.7	0.1
5/27/2009	74.1	5000.0	666.0	335.0	7.1	259	5.28	6.96	22.62	7.67	-83	3.3	0.1
6/30/2009	1230.0	4720.0	556.0	282.0	7.1	310	4.86	5.53	23.65	7.37	-155	3.1	2.2
7/23/2009	42.2	6670.0	778.0	434.0	7.2	363	6.63	5.27	25.27	7.64	-184	4.2	0.1
8/24/2009	28.2	6700.0	814.0	339.0	7.0		0.172			9.09			0.0
9/30/2009	53.9	430.0	113.0	12.2	6.2	295	0.464	4.88	21.79	6.75	-137	2.2	0.5
10/26/2009	128.0	3740.0	542.0	253.0	7.0	314	4.41	5.87	21.23	7.82	-185	2.8	0.2
12/14/2009	30.0	3020.0	324.0	189.0	7.0	385	3.32	5.41	19.79	7.83	-155	2.1	0.1

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 4

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
3/8/2010	61.5	3550.0	362.0	130.0	6.7	419	3.37	7.68	18.97	7.16	-103	2.2	0.2
6/23/2010	35.3	7070.0	879.0	388.0	7.0	590	6.32	6.74	23.8	8.06	-234	3.13	0.0
9/23/2010	50.6	5330.0	632.0	230.0	6.9	823	5.02	7.57	25.96	8.59	-195	3.2	0.1
12/23/2010	24.2	8470.0	983.0	413.0	7.2	936	6.09	1.53	13.98	8.89	-155	3.8	0.0
3/17/2011	44.8	9490.0	1010.0	493.0	7.2	893	7.4	2.86	21.39	9.11	-79	4.7	0.0
6/29/2011	34.4	6070.0	501.0	329.0	7.0	113	4.85	4.26	27.16	6.68	-119	3.2	0.1
9/8/2011	80.2	6790.0	644.0	217.0	7.2	868	5.2	1.31	31.85	6.87	-105	3.3	0.1
12/5/2011	63.9	15900.0	1490.0	773.0	7.6		12.6		27.91	7.41	-115	8	0.0
3/15/2012	94.0	11300.0	962.0	464.0	7.2						-89	5.2	0.1
6/5/2012	183.0	12800.0	1440.0	740.0	7.5				29.04		-156	8	0.1
9/26/2012	39.7	2210	185	136	8.3						-99	1.7	0.2
12/3/2012	76.0	7990	790	400	7.2						-126	4.7	0.1
4/10/2013	33	4580	345	191	7						-123	2.7	0.1
6/27/2013	55.5	5490	685	327	7.7						-110	3.4	0.1

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 5

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
1/29/2007	650	11,000	880	580	7.30	300	1.20	6.5	22.0	7.18	-219	8.0	0.7
2/27/2007	30	1,500	1,400	730	7.48								0.0
3/27/2007	110	12,000	800	750	7.30	420	1.50	8.3	21.8	7.30	-218	9.0	0.1
4/27/2007	3,400	14,000	1,200		7.20	88	0.32	7.1	16.6	5.50	-143	2.0	2.8
5/29/2007	2,800	12,000	130	720	7.37	180	1.50	13.3	27.6	7.30	-203	9.0	21.5
6/22/2007	70	14,000	1,300	820	7.50	330	1.50	11.6	25.8	7.60	-124	10.0	0.1
7/27/2007	50	8,200	820	430	7.37								0.1
8/24/2007	1,980	6,690	1,060	668	6.90								1.9
11/27/2007	2,370	12,300	1,170	684	7.50	10			20.9	7.20	-158	7.0	2.0
1/29/2008	1380	8,940	726	445	7.00	10.50	7.51	4.36	13.86	7.18	-126.00		1.9
2/25/2008	478	5,430	495	247	7.00	23.10	5.58	14.31	15.23	7.06	-126.00	3.50	1.0
3/27/2008	978	4,580	385	211	6.70	90.50	4.09	8.95	17.09	7.18	-117.00	2.60	2.5
4/21/2008	193	4890	517	272	6.80	105.00	5.25	6.19	20.99	6.91	-146.00	3.30	0.4
5/28/2008	1,560	7,130	689	362	7.10	69.70	9.99	4.22	26.84	7.47	-179.00	6.70	2.3
6/23/2008	1,540	6,420	740	367	7.00	163.00	7.28	6.50	33.98	7.74	-151.00	4.60	2.1
7/29/2008	158	6,870	771	430	7.20	129.00	7.32	6.03	35.24	7.52	-178.00	4.60	0.2
8/27/2008	366	3,400	304	154	6.80	73.60	3.42	4.94	28.57	7.37	-162.00	2.20	1.2
9/23/2008	1,560	7,240	733	406	6.50	143.00	7.05	5.12	29.42	7.82	-189.00	4.70	2.1
10/27/2008	42	11,200	1,030	6660	7.40	217.00	9.38	9.41	22.43	8.03	-180.00	6.10	0.0
11/20/2008	131	10400	984	610	7.2	352.00	9.01	13.43	17.86	8.04	-164.00	5.60	0.1
1/29/2009	84	7850	755	396	7.2	327.00	6.91	10.19	16.80	7.66	-172.00	4.40	0.1
2/17/2009	40.2	10700.0	1070.0	601.0	7.4	242.00	9.26	8.59	21.62	7.84	-155.00	5.90	0.0
3/30/2009	75.9	1890.0	201.0	41.3	6.4	237	1.85	8.05	21.39	7.15	-128	1.2	0.4
4/23/2009	51.1	3200.0	377.0	178.0	6.8	316	3.57	5.89	24.71	7.45	-148	2.3	0.1
5/27/2009	166.0	1820.0	416.0	79.3	6.3	223	1.86	8.64	21.55	7.31	-98	1.2	0.4
6/30/2009	960.0	4610.0	404.0	231.0	7.1	253	4.42	5.31	24.2	7.22	-147	2.8	2.4
7/23/2009	67.9	9180.0	924.0	549.0	7.3	304	8.82	7.61	26.68	7.62	-161	5.7	0.1
8/24/2009	37.8	8080.0	760.0	380.0	7.1	363	6.99	6.36	26.16	7.54	-191	4.6	0.0
9/30/2009	16.8	2470.0	324.0	196.0	6.7	252	3.44	2.46	21.69	7.13	-134	2.2	0.1
10/26/2009	98.5	3840.0	441.0	238.0	6.9	286	4.7	4.72	20.75	7.05	-150	3	0.2
12/14/2009	16.8	3660.0	399.0	211.0	7.4	397	4.05	6.43	18.72	7.45	-165	2.6	0.0

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Cell 5

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	**BOD5 Day (mg/L)**	**Conductance (µmho/cm)**	**COD (mg/L)**	**Ammonia (mg/L)**	**pH --**	**Turbidity (NTU)**	**Conductance (S/m)**	**DO (mg/L)**	**Temp (C)**	**pH --**	**ORP (mV)**	**TDS (g/L)**	**BOD5/COD**
3/8/2010	26.6	4280.0	365.0	215.0	6.8	422	4.02	5.95	20.8	8	-164	2.6	0.1
6/23/2010	37.7	10300.0	1050.0	545.0	7.2	405	9.15	1.82	25.56	8.95	-249	5.8	0.0
9/23/2010	38.6	6990.0	640.0	323.0	7.0	557	6.19	3.23	25.6	7.5	-205	3.9	0.1
12/23/2010	37.4	8200.0	744.0	389.0	7.1	966	6.79	3.82	18.33	8.74	-183	4.2	0.1
3/17/2011	103.0	1580.0	318.0	77.5	6.3	731	1.87	2.36	16.2	7.92	-120	1.2	0.3
6/29/2011	33.2	7310.0	242.0	158.0	7.0	9.6	6.2	2.03	27.48	6.88	-117	3.9	0.1
9/8/2011	25.2	4250.0	368.0	199.0	7.0	318	3.52	1.67	29.72	6.64	-99	2.3	0.1
12/5/2011	24.2	4980.0	425.0	211.0	7.5		4.12		27.71	6.83	-102	2.7	0.1
3/15/2012	22.3	4450.0	307.0	169.0	6.6						-99	2.3	0.1
6/5/2012	97.8	7170.0	897.0	416.0	7.4						-130	4.4	0.1
9/26/2012	24.7	2520.0	490.0	281.0	8.3						-107	3.6	0.1
12/3/2012	44.8	9340	876	456	7						-110	5.3	0.1
4/10/2013	169	3240	524	126	6.9						-48	1.99	0.3
6/27/2013	67.3	4300	351	222	7.2						-138		0.2

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results-2008
Cell 6

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
1/29/2008													
2/25/2008	417.00	1680.00	404.00	55.60	6.30	24.80	1.64	7.90	17.20	6.50	-217.00	1.10	1.0
3/27/2008	438.00	1980.00	281.00	65.70	6.40	261.00	1.74	10.68	13.64	7.05	-125.00	1.10	1.6
4/21/2008	30.60	505.00	43.00	12.90	5.30	148.00	0.61	5.25	18.81	6.73	0.00	0.00	0.7
5/28/2008	68.70	443.00	52.00	16.00	6.50	61.70	0.47	4.36	21.06	6.95	-82.00	0.32	1.3
6/23/2008	48.90	479.00	30.00	11.60	5.60	51.90	0.46	7.27	25.62	7.13	-40.00	0.32	1.6
7/29/2008	7.40	127.00		1.30	5.20	55.40	0.18	2.54	26.24	6.09	-110.00	0.11	
8/27/2008	63.00	281.00	37.00	2.00	5.40	78.90	0.278	4.35	24.14	6.21	-94.00	0.18	1.7
9/23/2008	70.50	1580.00	98.00	72.30	6.40	90.50	1.61	5.99	24.66	7.11	-146.00	5.40	0.7
10/27/2008		580.00	37.00	13.00	5.50	122	0.58	4.51	19.75	7.21	-39.00	0.37	0.0
11/20/2008	61	1080	38	23.8	5.9	160	0.979	17.32	16.31	6.66	55	0.62	1.6
1/29/2009	8.4	543		3.3	5.4	192	0.478	10.01	13.46	6.6	-20	0.31	
2/17/2009	3.0	920.0	36.2	16.5	6.0	202	0.789	10.72	16.03	7.13	120	0.5	0.1
3/30/2009	27.0	922.0	51.4	23.9	7.7	380	0.918	3.69	19.14	6.48	-151	0.58	0.5
4/23/2009		730.0	48.2	11.3	5.5	304	0.721	2.29	21.69	6.56	53	0.46	0.0
5/27/2009	8.0	1150.0	66.9	3.3	4.4	234	1.75	8.1	22.49	6.96	10	1.1	0.1
6/30/2009	140.0	1380.0	86.7	54.9	6.4	232	1.34	5.53	20.7	7.76	-137	0.9	1.6
7/23/2009	10.9	1040.0	48.1	27.3	6.1	246	1.04	5.73	24.14	6.8	-97	0.7	0.2
8/24/2009	5.1	885.0	55.3	9.6	5.6	259	0.773	1.87	24.58	6.14	-42	0.5	0.1
9/30/2009	46.6	430.0	111.0	11.5	6.2	291	0.463	6.07	21.96	6.89	-153	0.3	0.4
10/26/2009	51.7	953.0	169.0	30.8	6.3	286	1.09	5.91	20.4	7.45	-155	0.7	0.3
12/14/2009	1980.0	1680.0	2040.0	29.6	5.4	684	1.85	1.38	17.34	6.26	-112	1.2	1.0
3/8/2010						535	2.23	6.91	17.04	7.07	-59	1.4	
6/23/2010	1430.0	3350.0	2510.0	122.0	6.2	653	3.4	6.24	24.5	7.81	-150	2.2	0.6
9/23/2010	486.0	1570.0	750.0	42.5	6.2	981	1.61	8.44	25.25	8.45	-95	1	0.6
12/23/2010	66.0	2590.0	463.0	83.7	6.6	999	2.15	1.95	15.6	8.75	-139	1.4	0.1
3/17/2011	267.0	2330.0	534.0	73.6	6.5	727	1.98	2.47	18.54	8.16	-119	1.3	0.5
6/29/2011	4.2	2780.0	137.0	107.0	6.6	49.2	2.14	2.69	29.6	7.6	-26	1.4	0.0
9/8/2011	126.0	2860.0	492.0	134.0	6.8	354	2.47		27.34	6.53	-78	1.6	0.3
12/5/2011		2610.0	119.0	90.0	6.9		2.16		24.03	6.64	-78	1.4	0.0
3/15/2012	182.0	3410.0	168.0	121.0	6.4						-75	1.9	1.1
6/5/2012	130.0	4080.0	284.0	209.0	7.6				29.08		-134	2.6	0.5

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results-2008
Cell 6

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
9/26/2012	54.6	1330	81	68.3	8.2						-83	1	0.7
12/3/2012	133.0	8160	474	445.0	6.9						-148	4.8	0.3
4/10/2013	12.6	3030	172	147	6.8						-88	1.9	0.1
6/27/2013	15.3	2990	164	183	7.9						-112	2	0.1

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Leachate Pond

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
1/29/2007	2,700	2,900	3,800	43	5.24	140	0.34	12.3	7.5	5.50	--	2.2	0.7
2/27/2007	3,500	2,000	2,000	46	5.37								1.8
3/27/2007	2,200	2,400	2,500	49	5.40	88	0.32	7.1	16.6	5.50	-143	2.0	0.9
4/27/2007	2,900	2,900	2,500	66	5.70	88	0.32	7.1	16.6	5.50	-143	2.0	1.2
5/29/2007	2,400	2,800	2,200	84	5.96	260	0.37	10.6	32.0	6.05	-157	2.3	1.1
6/22/2007	960	4,200	1,500	150	6.90	360	0.51	11.8	23.8	7.10	-274	3.2	0.6
7/27/2007	600	2,900	1,300	100	7.98								0.5
8/24/2007	2,160	2,130	2,210	64	6.80								1.0
11/27/2007	848	1,860	1,150	68	7.00	130	208	5	9.9	7.30	-106	1.3	0.7
1/29/2008	110	1390		47.1	6.9	152	1.26	3.34	8.14	7.09	-60		
2/25/2008	247	1510	242	50	6.80	72.90	1.47	7.26	14.74	6.91	-113.00	1.00	1.0
3/27/2008	618	1630	488	51	6.60	171.00	1.57	12.70	12.04	7.03	-73.00	1.00	1.3
4/21/2008	178.00	1440.00	269.00	66.20	6.90	131.00	1.78	2.94	15.59	7.52	0.00	0.10	0.7
5/28/2008	131.00	874.00	54.00	33.80	7.10	103.00	0.84	12.42	21.91	7.46	40.00	0.55	2.4
6/23/2008	134.00	771.00	90.00	34.00	7.30	112.00	0.87	10.89	29.54	7.33	-50.00	0.56	1.5
7/29/2008	79.80	735.00	77.00	27.80	6.90	105.00	0.75	17.37	31.34	7.25	27.00	0.49	1.0
8/27/2008	69.00	1020.00	70.00	34.80	7.30	134.00	0.873	9.17	27.04	7.23	-79.00	0.58	1.0
9/23/2008	192.00	1300.00	272.00	54.70	7.00	199.00	1.34	1.32	21.20	7.02	-206.00	0.90	0.7
10/27/2008		1310	67	51	7.4	153	1.19	13.39	12.57	7.79	-119	0.8	0.0
11/20/2008	74	1040	52	38.7	7.3	281	1.02	17.32	8.13	7.9	-48	0.7	1.4
1/29/2009	42	1,360	62	40	7.0	464	1.3	15.2	7.83	7.39	-31	0.8	0.7
2/17/2009	9.0	1290.0	63.2	38.4	7.4	389	1.2	19.95	11.66	7.68	-21	0.8	0.1
3/30/2009	63.0	978.0	51.6	27.3	6.5	324	1	10.03	17.81	7.45	-74	0.6	1.2
4/23/2009		771.0	32.2	18.2	7.0	424	0.784	8.81	22.34	7.97	-27	0.5	0.0
5/27/2009		695.0	68.9	24.6	6.5	277	0.682	6.95	24.92	7.31	-36	0.44	0.0
6/30/2009	102.0	1100.0	64.0	26.0	6.9	256	1.05	6.69	25.97	6.81	36	0.7	1.6
7/23/2009		1140.0	50.8	31.3	7.4	318	1.16	7.04	28.77	8.03	45	0.7	0.0
8/24/2009	27.0	962.0	91.2	25.4	7.3	267	0.853	8.62	28.47	7.92	51	0.54	0.3
9/30/2009	10.8	716.0	73.0	27.0	7.0	284	0.789	4.2	19.75	7.12	-41	0.5	0.1
10/26/2009	119.0	721.0	46.0	29.7	7.6	371	0.825	8.91	16.54	8.08	8	0.53	2.6
12/14/2009	336.0	1280.0	704.0	27.2	6.2	465	1.44	8.55	10.2	7.66	-109	0.9	0.5

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Leachate Parameter Results
Leachate Pond

	Lab Parameter (unit)					On-site Testing Parameter (unit)							
Sample Date	BOD5 Day (mg/L)	Conductance (µmho/cm)	COD (mg/L)	Ammonia (mg/L)	pH --	Turbidity (NTU)	Conductance (S/m)	DO (mg/L)	Temp (C)	pH --	ORP (mV)	TDS (g/L)	BOD5/COD
3/8/2010	259.0	1640.0	438.0	44.8	6.9	563	1.6	10.24	13.56	8.41	-118	1	0.6
6/23/2010													
9/23/2010	260.0	1380.0	480.0	32.7	6.8	634	1.26	6.11	22.25	8.29	-149	0.8	0.5
12/23/2010	103.0	1830.0	355.0	59.2	7.2	999	1.61	2.41	5.13	9.16	-91	1	0.3
3/17/2011	179	1460	410	45.7	7.1	999	1.15	3.34	21.85	8.57	-152	0.7	0.4
6/29/2011	52.2	2250	239	79.3	7.7	49.2	2.14	2.69	29.6	7.6	-26	1.4	0.2
9/8/2011	156	2350	421	99.4	7.3		2.04		31.92	6.73	-101	1.3	0.4
12/5/2011	20.6	2400	184	97.7	7.6		2.14		20.32	7.3	-106	1.4	0.1
3/15/2012	39.1	2950	237	103	8						111	1.6	0.2
6/5/2012	40.5	2650	277	99.4	8.2						90	1.7	0.1
9/26/2012	26.5	1520	155	86.7	8.3						-93	1.4	0.2
12/3/2012	18.4	2930	165	147	7.8						81	2	0.1
4/10/2013	103	2930	324	134	7.8						53	1.8	0.3
6/27/2013	332	1970	348	78.4	8.5						22	1.4	1.0

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Liquid Generated at the Leak Detection System

Sample Date	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Pond	Total	Cumulative volume
Dec-07		0	427	0	0	340	0	767	767
Jan-08		0	0	0	0	0	0		767
Feb-08		0	800	0	0	1050	0	1850	2617
Mar-08		0	325	25	175	2150	0	2675	5292
Apr-08		0	100	0	150	775	0	1025	6317
May-08		0	375	0	175	800	0	1350	7667
Jun-08		0	330	0	0	850	0	1180	8847
Aug-08		0	100	0	250	950	0	1300	10147
Aug-08		0	100	0	400	800	0	1300	11447
Sep-08		0	200	0	0	775	0	975	12422
Oct-08		0	300	0	500	800	0	1600	14022
Nov-08		0	275	0	625	800	0	1700	15722
Dec-08		0	200	0	650	725	0	1575	17297
Jan-09		0	200	0	300	650	0	1150	18447
Feb-09		0	150	0	200	400	0	750	19197
Mar-09		0	0	0	0	0	0		19197
Apr-09		0	200	0	225	450	0	875	20072
May-09		0	150	0	375	475	0	1000	21072
Jun-09		0	100	0	200	625	0	925	21997
Jul-09		0	100	0	350	700	0	1150	23147
Aug-09		0	100	0	325	700	0	1125	24272
Sep-09		0	0	0	0	0	0		24272
Oct-09		0	150	0	400	550	0	1100	25372
Nov-09		0	100	0	450	475	0	1025	26397
Dec-09		0	125	0	500	350	0	975	27372
Jan-10		0	125	0	500	350	0	975	28347
Feb-10		0	100	0	500	300	0	900	29247
Mar-10		0	100	0	500	340	0	940	30187
Apr-10		0	80	0	900	320	0	1300	31487
May-10		0	100	0	600	300	0	1000	32487
Jun-10		0	75	0	475	300	0	850	33337
Jul-10		0	100	0	490	300	0	890	34227
Aug-10		0	75	0	500	300	0	875	35102
Sep-10		0	100	0	550	350	0	1000	36102
Oct-10		0	75	0	500	325	0	900	37002
Nov-10		0	50	0	525	350	0	925	37927
Dec-10		0	60	0	425	300	0	785	38712
Jan-11		0	80	0	725	320	0	1125	39837
Feb-11		0	50	0	450	280	0	780	40617
Mar-11		0	75	0	425	325	0	825	41442
Apr-11		15	20	0	475	275	0	785	42227
May-11		15	75	0	275	265	0	630	42857
Jun-11		15	100	0	450	275	0	840	43697
Sep-11		38	75	0	0	300	0	413	44110
Mar-12		25	150	0	800	400	0	1375	45485
Jun-12		30	150	0	675	250	0	1105	46590
Sep-12		40	120	0	200	320	1	680	47270
Dec-12		20	110	1	175	250	2	556	47826
Mar-13		50	150	0	225	200	0	625	48451

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Liquid Generated at the Leak Detection System

Sample Date	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Pond	Total	Cumulative volume
Jun-13		10	125	0	175	300	1	610	49061

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Liquid Generated at the Leak Detection System

BOD5						
Date	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
Sep-11	ND	ND	12.1	ND	ND	36.40
Dec-11	ND	26.60	ND	ND	ND	ND
Mar-12	3.00	4.20	4.2	ND	ND	15.00
Jun-12	ND	2.20	3.7	ND	ND	13.20
Sep-12	ND	3.60	2.2	ND	ND	2.00
Dec-12	ND	ND	ND	ND	ND	13.80
Mar-13	ND	ND	2.6	ND	ND	ND
Jun-13	16.80	ND	ND	ND	ND	ND

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Liquid Generated at the Leak Detection System

Conductance						
Date	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
	(µmho/cm)	(µmho/cm)	(µmho/cm)	(µmho/cm)	(µmho/cm)	(µmho/cm)
Sep-11	156.00	397.00	561	ND	691.00	596.00
Dec-11	135.00	362.00	463	ND	686.00	606.00
Mar-12	163.00	357.00	475	ND	706.00	602.00
Jun-12	183.00	334.00	459	ND	636.00	581.00
Sep-12	158.00	250.00	304	ND	597.00	609.00
Dec-12	133.00	266.00	401	ND	729.00	611.00
Mar-13	291.00	264.00	378	ND	645.00	579.00
Jun-13	151.00	255.00	426	ND	675.00	636.00

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Liquid Generated at the Leak Detection System

COD						
Date	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Sep-11	ND	ND	ND	ND	41.00	ND
Dec-11	ND	ND	40.00	ND	35.00	ND
Mar-12	ND	ND	ND	ND	ND	ND
Jun-12	35.00	28.00	56.00	ND	61.00	58.00
Sep-12	ND	ND	ND	ND	ND	ND
Dec-12	ND	ND	ND	ND	26.00	ND
Mar-13	ND	ND	ND	ND	ND	ND
Jun-13	ND	ND	ND	ND	42.00	26.00

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Liquid Generated at the Leak Detection System

Ammonia						
Date	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Sep-11	ND	0.84	0.42	ND	ND	0.36
Dec-11	0.17	0.62	0.31	ND	ND	0.63
Mar-12	ND	0.42	1.1	ND	ND	0.31
Jun-12	0.16	0.46	0.38	ND	ND	0.44
Sep-12	0.18	0.30	0.2	ND	ND	0.65
Dec-12	0.18	0.26	0.21	ND	ND	0.57
Mar-13	0.17	0.26	0.73	ND	ND	0.47
Jun-13	0.18	0.31	0.34	ND	ND	0.20

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Liquid Generated at the Leak Detection System

pH						
Date	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
	-	-	-	-	-	-
Sep-11	5.50	6.30	6.5	ND	6.40	6.80
Dec-11	5.80	6.40	6.7	ND	6.10	6.90
Mar-12	4.80	5.60	6.1	ND	6.20	6.30
Jun-12	5.50	6.60	6.6	ND	6.80	7.50
Sep-12	7.70	8.20	8	ND	8.40	8.60
Dec-12	5.00	5.60	6.1	ND	6.00	6.30
Mar-13	5.80	5.80	6.9	ND	6.90	7.30
Jun-13	7.20	7.20	7.6	ND	7.40	8.20

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Liquid Generated at the Leak Detection System

ORP						
Date	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6
	(mV)	(mV)	(mV)	(mV)	(mV)	(mV)
Sep-11	94.00	5.00	1	ND	184.00	86.00
Dec-11	96.00	2.00	-37	ND	185.00	-45.00
Mar-12	149.00	4.00	9	ND	252.00	49.00
Jun-12	124.00	-28.00	11	ND	219.00	57.00
Sep-12	65.00	-35.00	5	ND	110.00	-110.00
Dec-12	184.00	4.00	-64	ND	13.00	-89.00
Mar-13	197.00	18.00	-29	ND	145.00	207.00
Jun-13	105.00	-26.00	125	ND	-53.00	283.00

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Settlement Plate Monitoring Data

Date	Settlement Plates (Elevation - ft)										
	SP-1	SP-2	SP-3	SP-4	SP-5	SP-6	SP-7	SP-8	SP-9	SP-10	Cum-set
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Jan-06	0	0	0	0	0	0	0	0	0	0	0
Jul-06	0.10	0.10	0.10	0.09	0.05	0.07	0.00	0.14	0.31	0.16	0.11
Sep-06	0.13	0.14	0.15	0.14	0.08	0.08	-0.01	0.17	0.36	0.18	0.14
Oct-06	0.14	0.14	0.17	0.14	0.10	0.10	0.24	0.18	0.41	0.22	0.18
Nov-06	0.17	0.16	0.19	0.18	0.12	0.10	0.26	0.19	0.45	0.23	0.20
Dec-06	0.18	0.17	0.19	0.18	0.14	0.10	0.30	0.21	0.46	0.23	0.22
Jan-07	0.17	0.17	0.19	0.19	0.15	0.11	0.34	0.22	0.50	0.25	0.23
Feb-07	0.18	0.19	0.20	0.20	0.15	0.16	0.39	0.27	0.56	0.31	0.26
Mar-07	0.19	0.21	0.20	0.21	0.15	0.21	0.43	0.32	0.62	0.37	0.29
Apr-07	0.20	0.23	0.22	0.21	0.15	0.22	0.45	0.33	0.67	0.39	0.31
May-07	0.21	0.24	0.22	0.20	0.14	0.20	0.44	0.31	0.66	0.37	0.30
Jun-07	0.20	0.24	0.20	0.19	0.13	0.19	0.46	0.34	0.68	0.39	0.30
Jul-07	0.21	0.25	0.22	0.22	0.12	0.17	0.46	0.33	0.70	0.40	0.31
Aug-07	0.21	0.24	0.22	0.19	0.12	0.19	0.49	0.35	0.72	0.41	0.31
Sep-07	0.21	0.27	0.21	0.21	0.12	0.18	0.47	0.34	0.72	0.39	0.31
Oct-07	0.22	0.26	0.22	0.22	0.13	0.20	0.49	0.35	0.74	0.39	0.32
Nov-07	0.21	0.26	0.22	0.24	0.12	0.22	0.52	0.38	0.78	0.43	0.34
Dec-07	0.24	0.30	0.26	0.27	0.17	0.20	0.61	0.37	0.79	0.42	0.36
Jan-08	0.25	0.31	0.26	0.29	0.17	0.20	0.53	0.40	0.82	0.44	0.37
Feb-08	0.25	0.31	0.26	0.27	0.18	0.18	0.55	0.41	0.85	0.46	0.37
Mar-08	0.25	0.34	0.28	0.30	0.19	0.24	0.58	0.43	0.89	0.49	0.40
Jun-08	0.26	0.36	0.28	0.29	0.16	0.25	0.63	0.49	0.97	0.53	0.42
Oct-08	0.27	0.37	0.30	0.30	0.17	0.21	0.63	0.47	0.99	0.53	0.42
Feb-09	0.32	0.43	0.34	0.34	0.15	0.22	0.65	0.50	1.06	0.56	0.46
Jun-09	0.34	0.48	0.38	0.38	0.23	0.26	0.75	0.57	1.18	0.64	0.52
Sep-09	0.36	0.51	0.40	0.40	0.24	0.26	0.76	0.58	1.22	0.65	0.54
Jan-10	0.38	0.54	0.43	0.42	0.25	0.28	0.81	0.61	1.32	0.69	0.57
Apr-10	0.40	0.56	0.42	0.42	0.25	0.26	0.80	0.60	1.34	0.69	0.57
Aug-10	0.42	0.57	0.44	0.44	0.25	0.31	0.87	0.67	1.44	0.76	0.62

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Settlement Plate Monitoring Data

Date	Settlement Plates (Elevation - ft)										
	SP-1	SP-2	SP-3	SP-4	SP-5	SP-6	SP-7	SP-8	SP-9	SP-10	Cum-set
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Nov-10	0.45	0.60	0.46	0.45	0.27	0.31	0.89	0.67	1.51	0.77	0.64
Feb-11	0.47	0.63	0.48	0.47	0.29	0.31	0.89	0.70	1.64	0.83	0.67
Mar-11	0.49	0.66	0.51	0.50	0.31	0.29	0.89	0.69	1.66	0.82	0.68
Oct-11	0.51	0.72	0.57	0.55	0.33	0.34	0.98	0.78	1.93	0.97	0.77
Jan-12	0.54	0.77	0.60	0.58	0.36	0.38	1.03	0.83	2.10	1.06	0.83
Jul-12	0.56	0.79	0.61	0.59	0.37	0.36	1.02	0.81	2.29	1.13	0.85
Oct-12	0.58	0.81	0.64	0.62	0.38	0.36	1.04	0.80	2.38	1.21	0.88
Jan-13	0.61	0.84	0.65	0.63	0.40	0.40	1.07	0.83	2.53	1.32	0.93
Apr-13	0.64	0.89	0.69	0.67	0.42	0.45	1.14	0.91	2.73	1.47	1.00
Jul-13	0.65	0.90	0.70	0.67	0.41	0.46	1.16	0.95	2.87	1.58	1.04
Jan 2006 to July 2013	(Inches)	(Inches)	(Inches)	(Inches)	(Inches)	(Inches)	(Inches)	(Inches)	(Inches)	(Inches)	(Inches)
	7.80	10.80	8.40	8.04	4.92	5.52	13.92	11.40	34.44	18.96	12.42

Buncombe County Solid Waste Management Facility
Quarterly Explosive Gas Monitoring

	Scalehouse	Conv. Center	Garage	MMW #2	MMW #1	MMW #3	MMW #4	Trailor	Block Bldg	Office	HHW	Wellhouse
2/23/2001												
Oxygen	19.6%	19.1%	19.8%	19.0%	20.0%			19.8%	19.9%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
2/1/2002												
Oxygen	19.8%	19.8%	19.9%	18.4%	19.9%			20.0%	20.0%	N/A	N/A	N/A
Methane	0.0%	0.1%	0.1%	0.1%	0.1%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	1.5%	0.0%			0.0%	0.0%	N/A	N/A	N/A
4/26/2002												
Oxygen	19.8%	19.8%	19.9%	18.4%	19.9%			20.0%	20.0%	N/A	N/A	N/A
Methane	0.0%	0.1%	0.1%	0.1%	0.1%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
8/13/2002												
Oxygen	19.7%	19.9%	19.9%	19.8%	19.9%			19.7%	19.8%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.1%	0.1%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
4/8/2003												
Oxygen	19.7%	19.6%	19.7%	19.8%	19.9%			19.7%	19.8%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
8/11/2003												
Oxygen	19.8%	19.7%	19.8%	19.9%	19.6%			19.9%	19.8%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
12/3/2003												
Oxygen	19.7%	19.6%	19.9%	19.3%	19.9%			19.8%	19.9%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
12/8/2003												
Oxygen	19.6%	19.1%	19.7%	19.5%	19.8%			19.8%	19.7%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
3/16/2004												
Oxygen	19.7%	19.3%	19.8%	19.7%	19.8%			19.8%	19.6%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
6/8/2004												
Oxygen	19.5%	19.6%	19.6%	19.8%	19.7%			19.8%	19.5%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A

Buncombe County Solid Waste Management Facility
Quarterly Explosive Gas Monitoring

	Scalehouse	Conv. Center	Garage	MMW #2	MMW #1	MMW #3	MMW #4	Trailor	Block Bldg	Office	HHW	Wellhouse
9/1/2004												
Oxygen	19.9%	19.8%	19.9%	19.8%	19.7%			19.7%	19.6%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
12/7/2004												
Oxygen	19.5%	19.7%	19.6%	19.7%	19.5%			19.6%	19.5%	N/A	N/A	N/A
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	N/A	N/A	N/A
3/27/2008												
Oxygen	20.60%	20.60%	20.70%	14.20%	20.10%			20.70%	20.80%	20.60%	20.90%	20.60%
Methane	0%	0%	0%	0%	0%			0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0%	0%	0%	4%	0.6%			0.0%	0.0%	0.0%	0.0%	0.0%
6/30/2008												
Oxygen	20.50%	20.50%	20.40%	16.70%	20.20%			20.30%	20.30%	20.40%	20.50%	20.60%
Methane	0%	0%	0%	0%	0%			0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0%	0%	0%	0%	0%			0.0%	0.0%	0.0%	0.0%	0.0%
9/22/2008												
Oxygen	20.40%	20.50%	20.30%	16.60%	19.60%			20.50%	20.40%	20.40%	20.50%	20.50%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	2.4%	0.4%			0.0%	0.0%	0.0%	0.0%	0.0%
12/16/2008												
Oxygen	20.60%	20.70%	20.50%	20.20%	19.50%			20.50%	20.50%	20.50%	20.80%	20.80%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	0.2%	0.9%			0.0%	0.0%	0.0%	0.0%	0.0%
3/9/2009												
Oxygen	20.40%	20.60%	20.40%	20.60%	20.60%			20.40%	20.40%	20.50%	20.30%	20.60%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	0.0%
6/1/2009												
Oxygen	20.30%	20.10%	20.20%	19.80%	20.20%			20.10%	20.10%	20.20%	20.10%	20.30%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.1%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	0.0%
9/23/2009												
Oxygen	20.00%	19.80%	19.90%	18.30%	4.20%			19.80%	19.60%	19.90%	20.00%	19.80%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%			0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	1.1%	10.7%			0.0%	0.0%	0.0%	0.0%	0.1%
12/7/2009												
Oxygen	19.80%	19.80%	19.90%	14.40%	19.10%			19.80%	19.90%	20.00%	19.90%	19.90%
Methane	0.0%	0.0%	0.1%	0.0%	0.0%			0.0%	0.0%	0.0%	0.1%	0.0%

Buncombe County Solid Waste Management Facility
Quarterly Explosive Gas Monitoring

	Scalehouse	Conv. Center	Garage	MMW #2	MMW #1	MMW #3	MMW #4	Trailor	Block Bldg	Office	HHW	Wellhouse
Carbon Dioxide	0.0%	0.1%	0.0%	3.2%	0.2%			0.0%	0.0%	0.0%	0.0%	0.0%
3/29/2010												
Oxygen	19.80%	19.70%	19.80%	18.70%	18.30%	19.50%	19.70%	19.70%	19.70%	19.70%	19.90%	19.80%
Methane	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	0.8%	1.2%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6/10/2010												
Oxygen	20.40%	20.20%	20.20%	19.30%	19.80%	20.30%	20.10%	20.20%	20.00%	20.30%	20.30%	20.10%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
9/13/2010												
Oxygen	20.10%	20.10%	20.00%	14.70%	17.40%	17.00%	17.50%	20.00%	19.90%	20.20%	19.80%	20.20%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	12.2%	2.0%	2.5%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%
12/29/2010												
Oxygen	20.30%	20.40%	20.20%	20.10%	19.90%	18.20%	19.00%	20.20%	20.30%	20.10%	20.30%	20.40%
Methane	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	0.1%	0.4%	2.3%	1.5%	0.1%	0.0%	0.0%	0.0%	0.0%
3/8/2011												
Oxygen	20.40%	20.40%	20.50%	20.40%	19.60%	19.20%	19.60%	20.70%	20.70%	20.60%	20.70%	20.50%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.6%	0.8%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%
6/21/2011												
Oxygen	19.60%	20.00%	20.00%	6.70%	17.60%	16.80%	16.90%	20.10%	20.00%	20.20%	20.00%	20.00%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	10.6%	1.5%	1.9%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%
9/12/2011												
Oxygen	20.00%	20.00%	20.00%	7.90%	17.60%	18.00%	16.90%	20.10%	20.10%	20.20%	19.90%	20.20%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	10.3%	1.7%	1.1%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%
12/1/2011												
Oxygen	20.50%	20.50%	20.80%	20.70%	20.60%	20.50%	18.60%	20.70%	20.80%	20.70%	20.70%	20.60%
Methane	0.1%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%
3/7/2012												
Oxygen	20.30%	20.30%	20.00%	13.30%	19.50%	17.40%	19.80%	20.10%	20.00%	20.30%	20.30%	20.40%
Methane	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	4.8%	0.4%	2.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
6/27/2012												
Oxygen	20.20%	20.10%	19.60%	19.70%	19.60%	18.50%	16.00%	19.80%	19.70%	19.70%	19.60%	20.10%

Buncombe County Solid Waste Management Facility
Quarterly Explosive Gas Monitoring

	Scalehouse	Conv. Center	Garage	MMW #2	MMW #1	MMW #3	MMW #4	Trailor	Block Bldg	Office	HHW	Wellhouse
Methane	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Carbon Dioxide	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	4.9%	0.0%	0.0%	0.0%	0.0%	0.0%
9/25/2012												
Oxygen	19.70%	19.70%	19.90%	18.70%	17.50%	17.50%	14.80%	20.10%	20.00%	19.80%	20.00%	19.90%
Methane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbon Dioxide	0.00%	0.00%	0.00%	0.70%	2.40%	2.10%	4.90%	0.00%	0.00%	0.00%	0.00%	0.00%
12/12/2012												
Oxygen	20.20%	20.20%	20.40%	17.00%	20.20%	20.00%	16.20%	20.30%	20.30%	20.10%	20.40%	20.20%
Methane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbon Dioxide	0.00%	0.00%	0.00%	3.10%	0.00%	0.00%	4.90%	0.00%	0.00%	0.00%	0.00%	0.00%
3/19/2013												
Oxygen	20.30%	20.30%	20.10%	20.00%	20.10%	6.90%	14.20%	20.20%	20.30%	19.90%	20.40%	20.00%
Methane	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbon Dioxide	0.00%	0.00%	0.00%	0.00%	0.00%	7.30%	4.00%	0.00%	0.00%	0.00%	0.00%	0.00%
6/6/2013												
Oxygen	20.00%	20.00%	20.00%	0.00%	15.40%	10.40%	13.60%	20.10%	20.00%	19.90%	19.60%	20.10%
Methane	0.00%	0.00%	0.00%	1.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Carbon Dioxide	0.00%	0.00%	0.00%	15.60%	3.50%	4.80%	5.30%	0.00%	0.00%	0.00%	0.00%	0.00%

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0007	26-Jan-12	53.9
GW--0008	26-Jan-12	57.6
GW--0009	26-Jan-12	57.3
GW--0010	26-Jan-12	0.1
GW--0011	26-Jan-12	53.7
GW--0012	26-Jan-12	57.1
GW--0014	26-Jan-12	39.9
GW--0018	26-Jan-12	36.9
GW--0013	30-Jan-12	16.4
GW--0017	30-Jan-12	42.4
GW--0018	30-Jan-12	41.2
GW--0023	30-Jan-12	26.8
GW--0023	30-Jan-12	34.8
GW--0024	30-Jan-12	0.1
GW--0025	30-Jan-12	0.8
GW--0021	30-Jan-12	9.6
GW--0017	30-Jan-12	59.2
GAS--06B	31-Jan-12	53.2
GC--0004	31-Jan-12	14.2
GHC--004	31-Jan-12	0
GHC--002	31-Jan-12	0.7
GHC--005	31-Jan-12	58.7
GHC--001	31-Jan-12	11.8
GAS--06A	31-Jan-12	0
GW--0004	31-Jan-12	60.3
GW--0003	31-Jan-12	59.9
GW--0002	31-Jan-12	39.2
GW--0006	31-Jan-12	56
GW--0009	31-Jan-12	1.3
GW--0009	2-Feb-12	56.8
GW--0008	2-Feb-12	8.9
GW--0007	2-Feb-12	1.6
GW--0011	2-Feb-12	4.5
GW--0010	2-Feb-12	0
GW--0014	2-Feb-12	35.7
GW--0018	2-Feb-12	28
GW--0022	2-Feb-12	43.5
GW--0023	2-Feb-12	31.3
GW--0019	2-Feb-12	9.4
GW--0024	2-Feb-12	22
GW--0020	2-Feb-12	0
GW--0025	2-Feb-12	30.1

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0021	2-Feb-12	22.4
GW--0017	2-Feb-12	0
GAS--06B	2-Feb-12	56.5
GW--0001	1-Mar-12	49.4
GW--0002	1-Mar-12	58.2
GW--0003	1-Mar-12	28.1
GW--0004	1-Mar-12	0.7
GW--0005	1-Mar-12	28.8
GW--0006	1-Mar-12	32.1
GW--0009	1-Mar-12	27.5
GAS--06B	1-Mar-12	49.2
GW--0007	1-Mar-12	13.5
GW--0008	1-Mar-12	20.7
GW--0010	1-Mar-12	27.9
GW--0014	1-Mar-12	32.9
GW--0018	1-Mar-12	44.9
GW--0022	1-Mar-12	42.5
GW--0023	1-Mar-12	32.9
GW--0019	1-Mar-12	15.9
GW--0015	1-Mar-12	22.1
GW--0024	1-Mar-12	0.1
GW--0025	1-Mar-12	23.6
GW--0021	1-Mar-12	20.7
GW--0016	1-Mar-12	17.8
GW--0017	1-Mar-12	0.1
GW--0001	6-Mar-12	46.7
GW--0002	6-Mar-12	31.6
GW--0003	6-Mar-12	37.9
GW--0004	6-Mar-12	17.4
GW--0005	6-Mar-12	35.9
GW--0006	6-Mar-12	32.9
GW--0007	6-Mar-12	30.9
GW--0008	6-Mar-12	49.7
GW--0009	6-Mar-12	51.3
GW--0010	6-Mar-12	36.3
GW--0018	6-Mar-12	50.2
GW--0022	6-Mar-12	48.2
GW--0023	6-Mar-12	39.1
GW--0015	6-Mar-12	27.8
GW--0019	6-Mar-12	19.9
GW--0024	6-Mar-12	48.3
GW--0020	6-Mar-12	36.4

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0021	6-Mar-12	45.6
GW--0017	6-Mar-12	59.7
GW--0013	6-Mar-12	54.8
GW--0009	6-Mar-12	55.6
GW--0004	9-Mar-12	26.1
GW--0009	9-Mar-12	47.8
GW--0008	9-Mar-12	55.3
GW--0011	9-Mar-12	48.3
GW--0014	9-Mar-12	44.7
GW--0015	9-Mar-12	56.6
GW--0019	9-Mar-12	49.5
GW--0025	9-Mar-12	55.3
GW--0024	9-Mar-12	56.7
GW--0020	9-Mar-12	33.1
GW--0016	9-Mar-12	49.1
GW--0017	9-Mar-12	0.1
GAS--06B	9-Mar-12	49.7
GW--0003	12-Mar-12	52.3
GW--0002	12-Mar-12	44.8
GW--0001	12-Mar-12	54.4
GW--0005	12-Mar-12	47.3
GW--0006	12-Mar-12	42.7
GW--0009	12-Mar-12	51.8
GW--0008	12-Mar-12	47.7
GW--0019	12-Mar-12	42.5
GW--0010	12-Mar-12	47.6
GW--0014	12-Mar-12	47.5
GW--0018	12-Mar-12	50
GW--0022	12-Mar-12	50.9
GW--0013	12-Mar-12	24.6
GW--0021	12-Mar-12	47.7
GW--0025	12-Mar-12	50.5
GW--0024	12-Mar-12	29.3
GW--0023	12-Mar-12	54.8
GW--0019	12-Mar-12	49.8
GW--0011	12-Mar-12	46.6
GW--0008	12-Mar-12	54.1
GW--0015	12-Mar-12	57.8
GW--0020	12-Mar-12	47.3
GW--0016	12-Mar-12	44
GW--0004	13-Mar-12	55
GW--0003	13-Mar-12	57.7

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0002	13-Mar-12	59.7
GW--0001	13-Mar-12	50
GW--0005	13-Mar-12	36.2
GW--0006	13-Mar-12	48.2
GW--0009	13-Mar-12	55.6
GW--0001	21-Mar-12	51.4
GW--0002	21-Mar-12	23.2
GW--0003	21-Mar-12	31.8
GW--0004	21-Mar-12	37
GW--0009	21-Mar-12	38.9
GW--0006	21-Mar-12	39.9
GW--0005	21-Mar-12	53.5
GW--0008	21-Mar-12	49.6
GW--0011	21-Mar-12	43.8
GW--0010	21-Mar-12	42.6
GW--0014	21-Mar-12	47.8
GW--0018	21-Mar-12	49.5
GW--0022	21-Mar-12	49.4
GW--0023	21-Mar-12	48.1
GW--0019	21-Mar-12	50.4
GW--0015	21-Mar-12	53.1
GW--0024	21-Mar-12	58.6
GW--0020	21-Mar-12	47.8
GW--0013	21-Mar-12	36.4
GW--0013	21-Mar-12	36.4
GW--0016	21-Mar-12	42.8
GW--0025	21-Mar-12	52.3
GW--0021	21-Mar-12	57.9
GW--0017	21-Mar-12	60.2
GAS--06B	22-Mar-12	57.6
GHC--005	26-Mar-12	57.9
GHC--004	26-Mar-12	1.2
GHC--001	26-Mar-12	0
GHC--001	26-Mar-12	19.8
GHC--003	26-Mar-12	0.1
GC--0004	26-Mar-12	4
GAS--06A	26-Mar-12	0
GAS--06B	26-Mar-12	57.3
blower01	26-Mar-12	56.8
blower01	26-Mar-12	55.3
GAS--06B	8-May-12	54.9
GAS--06A	8-May-12	0.1

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GC--0004	8-May-12	5.9
GHC--005	8-May-12	57.8
GHC--004	8-May-12	0.8
GHC--001	8-May-12	13.8
blower01	8-May-12	56.3
GHC--003	8-May-12	0.4
GW--0001	10-May-12	53.9
GW--0002	10-May-12	54.9
GW--0003	10-May-12	53.2
GW--0004	10-May-12	49.4
GW--0006	10-May-12	43.3
GW--0005	10-May-12	38.6
GW--0013	10-May-12	55.6
GW--0009	10-May-12	57.8
GW--0008	10-May-12	51.6
GW--0011	10-May-12	50.8
GW--0007	10-May-12	45.8
GW--0010	10-May-12	53.1
GW--0014	10-May-12	53.1
GW--0018	10-May-12	56.6
GW--0022	10-May-12	58.1
GW--0023	10-May-12	50.8
GW--0019	10-May-12	51.3
GW--0015	10-May-12	58.5
GW--0020	10-May-12	56.9
GW--0024	10-May-12	57.1
GW--0024	10-May-12	57.1
GW--0025	10-May-12	57.8
GW--0021	10-May-12	57.4
GW--0016	10-May-12	46
GW--0017	10-May-12	57.6
GW--0004	17-May-12	55.6
GW--0003	17-May-12	52.6
GW--0002	17-May-12	54.8
GW--0001	17-May-12	53.9
GW--0005	17-May-12	44.1
GW--0006	17-May-12	51.5
GW--0009	17-May-12	60.3
GW--0012	17-May-12	53.4
GW--0008	17-May-12	54
GW--0007	17-May-12	56.8
GW--0010	17-May-12	56

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0014	17-May-12	54.4
GW--0018	17-May-12	53.3
GW--0022	17-May-12	60.9
GW--0023	17-May-12	54.2
GW--0019	17-May-12	54.3
GW--0011	17-May-12	51.2
GW--0015	17-May-12	61.1
GW--0024	17-May-12	58.8
GW--0020	17-May-12	59.3
GW--0025	17-May-12	58.4
GW--0021	17-May-12	60.2
GW--0017	17-May-12	59.8
GW--0013	17-May-12	59.1
blower01	17-May-12	58
GHC--005	7-Jun-12	57.6
GAS--06B	7-Jun-12	54.4
blower01	7-Jun-12	58.8
GW--0004	7-Jun-12	59.4
GW--0003	7-Jun-12	50.5
GW--0002	7-Jun-12	56.4
GW--0001	7-Jun-12	49
GW--0005	7-Jun-12	44.9
GW--0009	7-Jun-12	59.9
GW--0012	7-Jun-12	53.9
GW--0008	7-Jun-12	54.5
GW--0015	7-Jun-12	58.9
GW--0020	7-Jun-12	58.3
GW--0024	7-Jun-12	58.6
GW--0019	7-Jun-12	57.7
GW--0023	7-Jun-12	55.3
GW--0022	7-Jun-12	59.6
GW--0018	7-Jun-12	57.6
GW--0018	7-Jun-12	57.6
GW--0014	7-Jun-12	55.2
GW--0010	7-Jun-12	55.6
GW--0010	7-Jun-12	55.6
GW--0007	7-Jun-12	57.6
GW--0025	7-Jun-12	57
GW--0021	7-Jun-12	59.5
GW--0016	7-Jun-12	53.7
GW--0017	7-Jun-12	59.7
GW--0013	7-Jun-12	58.7

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
blower01	19-Jun-12	58.6
GHC--005	20-Jun-12	57
GW--0001	20-Jun-12	62.3
GW--0002	20-Jun-12	<<<
GW--0001	21-Jun-12	48.5
GW--0002	21-Jun-12	54.2
GW--0003	21-Jun-12	52
GW--0004	21-Jun-12	61.1
GW--0006	21-Jun-12	55.7
GW--0005	21-Jun-12	50.4
GW--0007	21-Jun-12	60.4
GW--0010	21-Jun-12	57.9
GW--0014	21-Jun-12	59.3
GW--0018	21-Jun-12	56.5
GW--0022	21-Jun-12	60.4
GW--0023	21-Jun-12	59.2
GW--0019	21-Jun-12	59.2
GW--0011	21-Jun-12	58.9
GW--0008	21-Jun-12	58.7
GW--0017	21-Jun-12	60.9
GW--0020	21-Jun-12	59.3
GW--0024	21-Jun-12	59.5
GW--0025	21-Jun-12	57.1
GW--0021	21-Jun-12	58.5
GW--0016	21-Jun-12	59.8
GW--0017	21-Jun-12	59.9
GW--0013	21-Jun-12	59.4
GW--0012	21-Jun-12	54
GW--0009	21-Jun-12	59.3
GAS--06B	21-Jun-12	57.6
GHC--005	10-Jul-12	58
GAS--06B	10-Jul-12	57.8
GW--0001	10-Jul-12	52.4
GW--0002	10-Jul-12	54.6
GW--0003	10-Jul-12	59.9
GW--0004	10-Jul-12	51.3
GW--0009	10-Jul-12	60.6
GW--0006	10-Jul-12	58.9
GW--0005	10-Jul-12	57.9
blower01	16-Jul-12	58
GW--0023	16-Jul-12	57.5
GW--0022	16-Jul-12	60.5

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0018	16-Jul-12	59.9
GW--0014	16-Jul-12	56.3
GW--0010	16-Jul-12	54.9
GW--0007	16-Jul-12	51.2
GW--0008	16-Jul-12	57.9
GW--0011	16-Jul-12	60.6
GW--0015	16-Jul-12	60.4
GW--0020	16-Jul-12	60.3
GW--0024	16-Jul-12	59.7
GW--0025	16-Jul-12	53.6
GW--0017	16-Jul-12	60.1
GW--0013	16-Jul-12	59.9
GW--0009	16-Jul-12	57.6
GW--0012	16-Jul-12	55.7
GW--0016	16-Jul-12	44.5
GW--0001	17-Jul-12	50.5
GW--0002	17-Jul-12	52.7
GW--0003	17-Jul-12	54.6
GW--0004	18-Jul-12	54.3
GW--0009	18-Jul-12	58.9
GW--0006	18-Jul-12	46.8
GW--0005	18-Jul-12	42.3
GAS--06A	18-Jul-12	0.4
GW--0001	30-Jul-12	51.6
GW--0001	30-Jul-12	51.5
GW--0002	30-Jul-12	49.5
GW--0002	30-Jul-12	48.9
GW--0003	30-Jul-12	48.4
GW--0004	30-Jul-12	53.9
GW--0006	30-Jul-12	41.8
GW--0006	30-Jul-12	44.4
GW--0005	30-Jul-12	44.2
GW--0007	30-Jul-12	49.5
GW--0010	30-Jul-12	53.2
GW--0014	30-Jul-12	52.1
GW--0018	30-Jul-12	55
GW--0022	30-Jul-12	59.7
GW--0023	30-Jul-12	52.7
GW--0019	30-Jul-12	54.6
GW--0011	30-Jul-12	55
GW--0008	30-Jul-12	52.3
GW--0015	30-Jul-12	60.6

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0020	30-Jul-12	60.3
GW--0009	30-Jul-12	59.4
GW--0013	30-Jul-12	60.4
GW--0017	30-Jul-12	59.5
GW--0021	30-Jul-12	53.7
GW--0025	30-Jul-12	49.5
GW--0024	30-Jul-12	59.8
GW--0016	30-Jul-12	59.6
GW--0012	30-Jul-12	50.6
GW--0009	30-Jul-12	57.9
GAS--06A	30-Jul-12	0.8
GAS--06B	30-Jul-12	56.6
GHC--005	30-Jul-12	58.1
blower01	30-Jul-12	52.2
GW--0019	2-Aug-12	56.5
GW--0019	2-Aug-12	56.1
GW--0015	2-Aug-12	60.2
GW--0019	2-Aug-12	56.5
blower01	5-Sep-12	53.7
GHC--005	5-Sep-12	59.6
GAS--06A	5-Sep-12	0.5
GAS--06B	5-Sep-12	57.5
GW--0020	5-Sep-12	59.3
GW--0015	5-Sep-12	59.6
GW--0008	5-Sep-12	57.7
GW--0011	5-Sep-12	59.1
GW--0019	5-Sep-12	59.1
GW--0023	5-Sep-12	55.1
GW--0022	5-Sep-12	60
GW--0018	5-Sep-12	58.4
GW--0014	5-Sep-12	54.4
GW--0010	5-Sep-12	52.7
GW--0007	5-Sep-12	54
GW--0005	5-Sep-12	50.3
GW--0001	5-Sep-12	56.5
GW--0002	6-Sep-12	53.9
GW--0003	6-Sep-12	48.6
GW--0004	6-Sep-12	58.4
blower01	19-Sep-12	52.9
GW--0013	19-Sep-12	59.9
GW--0017	19-Sep-12	59.1
GW--0017	19-Sep-12	59.1

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GAS--06A	19-Sep-12	0.2
GW--0001	19-Sep-12	50.7
GW--0002	19-Sep-12	48.6
GW--0003	19-Sep-12	60.2
GW--0004	19-Sep-12	51.3
GW--0013	19-Sep-12	59
GW--0017	19-Sep-12	58.7
GW--0021	19-Sep-12	55.6
GW--0025	19-Sep-12	48
GW--0025	19-Sep-12	48
GW--0020	19-Sep-12	57.9
GW--0016	19-Sep-12	44.2
GW--0012	19-Sep-12	49.7
GW--0009	19-Sep-12	56.1
GW--0009	19-Sep-12	56.1
GW--0006	19-Sep-12	48.9
GW--0006	19-Sep-12	47.9
GW--0005	19-Sep-12	43
GW--0007	19-Sep-12	47.2
GW--0010	19-Sep-12	52.8
GW--0014	19-Sep-12	50.8
GW--0018	19-Sep-12	55.5
GW--0023	20-Sep-12	48.4
GW--0019	20-Sep-12	53
GW--0011	20-Sep-12	55.2
GW--0008	20-Sep-12	54.6
GW--0015	20-Sep-12	59.4
GW--0024	20-Sep-12	58.9
GHC--005	20-Sep-12	61.1
GAS--06B	20-Sep-12	58.2
blower01	20-Sep-12	49.3
GW--0019	21-Sep-12	53
GW--0015	21-Sep-12	58.7
GHC--005	16-Oct-12	58.1
GC--0004	16-Oct-12	0.5
GHC--001	16-Oct-12	12.7
GHC--003	16-Oct-12	0.8
GHC--004	16-Oct-12	11.7
GAS--06A	16-Oct-12	0.3
GAS--06B	16-Oct-12	55.1
GW--0001	16-Oct-12	51.2
GW--0002	16-Oct-12	50.2

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0003	16-Oct-12	45
GW--0004	16-Oct-12	45.2
GW--0006	16-Oct-12	52.1
GW--0005	16-Oct-12	43.9
GW--0007	16-Oct-12	56.9
GW--0010	16-Oct-12	55.7
GW--0014	16-Oct-12	60.7
GW--0023	16-Oct-12	59.4
GW--0022	16-Oct-12	59.9
GW--0018	16-Oct-12	59.6
GW--0019	16-Oct-12	58.9
GW--0011	16-Oct-12	59.4
GW--0008	16-Oct-12	59.9
GW--0015	16-Oct-12	59.7
GW--0020	16-Oct-12	58.9
GW--0024	16-Oct-12	57.7
GW--0013	23-Oct-12	58.3
GW--0017	23-Oct-12	58.5
GW--0021	23-Oct-12	57.8
GW--0025	23-Oct-12	58.6
GW--0016	23-Oct-12	56.6
GW--0012	23-Oct-12	57.7
GW--0009	23-Oct-12	58.8
GHC--005	26-Nov-12	57.3
GHC--002	26-Nov-12	0.8
GHC--001	26-Nov-12	15.8
GHC--003	26-Nov-12	2
GHC--004	26-Nov-12	12.5
GAS--06A	26-Nov-12	57.8
GAS--06B	26-Nov-12	51.4
GW--0001	26-Nov-12	40
GW--0002	26-Nov-12	44.7
GW--0003	26-Nov-12	41.3
GW--0004	26-Nov-12	60.1
GW--0006	26-Nov-12	36
GW--0005	26-Nov-12	35.7
GW--0007	26-Nov-12	38.4
GW--0010	26-Nov-12	48.1
GW--0014	26-Nov-12	47.9
GW--0023	26-Nov-12	50.8
GW--0022	26-Nov-12	58.6
GW--0018	26-Nov-12	53.5

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0019	26-Nov-12	52.2
GW--0011	26-Nov-12	49.6
GW--0008	26-Nov-12	50
GW--0012	26-Nov-12	48.4
GW--0015	26-Nov-12	58.6
GW--0020	26-Nov-12	58
GW--0009	3-Dec-12	58
GW--0012	3-Dec-12	48.3
GW--0016	3-Dec-12	37.9
GW--0020	3-Dec-12	57.6
GW--0025	3-Dec-12	48.5
GW--0021	3-Dec-12	54.4
GW--0017	3-Dec-12	57.7
GW--0013	3-Dec-12	58.4
GHC--002	8-Jan-13	0.4
GHC--001	8-Jan-13	4.3
GHC--003	8-Jan-13	0.8
GHC--004	8-Jan-13	10.1
GAS--06B	8-Jan-13	42.9
GW--0019	8-Jan-13	45.2
GW--0011	8-Jan-13	41.7
GW--0008	8-Jan-13	47.2
GW--0020	8-Jan-13	55.9
GW--0025	8-Jan-13	51.3
GW--0021	8-Jan-13	55.5
GW--0017	8-Jan-13	57.7
GW--0013	8-Jan-13	57.2
GW--0012	8-Jan-13	48.7
GW--0016	8-Jan-13	32.8
GW--0023	9-Jan-13	45
GW--0022	9-Jan-13	57.7
GW--0018	9-Jan-13	52.6
GW--0014	9-Jan-13	46.8
GW--0010	9-Jan-13	45.1
GW--0007	9-Jan-13	38.6
GW--0002	9-Jan-13	47.6
GW--0003	9-Jan-13	48.4
GW--0004	9-Jan-13	47.9
GW--0006	9-Jan-13	40.2
GW--0011	9-Jan-13	43.8
GW--0019	9-Jan-13	44.2
GW--0019	29-Jan-13	57.2

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0011	29-Jan-13	56.7
GW--0008	29-Jan-13	56.2
GW--0015	29-Jan-13	58.5
GW--0020	29-Jan-13	57.8
GW--0025	29-Jan-13	56.1
GW--0021	29-Jan-13	53.7
GW--0017	29-Jan-13	52.9
GW--0013	29-Jan-13	53.2
GW--0009	29-Jan-13	59.1
GW--0012	29-Jan-13	56.7
GW--0016	29-Jan-13	4
GW--0023	29-Jan-13	55.1
GW--0022	29-Jan-13	57.7
GW--0018	29-Jan-13	56.7
GW--0014	29-Jan-13	56.2
GW--0010	29-Jan-13	54.7
GW--0007	29-Jan-13	57.2
GW--0005	29-Jan-13	54.2
GW--0006	29-Jan-13	56.9
GW--0004	29-Jan-13	55.2
GW--0003	29-Jan-13	55.2
GW--0002	29-Jan-13	54.9
GW--0001	29-Jan-13	51
GW--0025	29-Jan-13	53.6
GHC--005	29-Jan-13	56.4
GHC--002	29-Jan-13	0.8
GHC--001	29-Jan-13	10.9
GHC--003	29-Jan-13	0.7
GHC--004	29-Jan-13	12.8
GAS--06A	29-Jan-13	5.8
GAS--06B	29-Jan-13	51.2
GW--0001	19-Feb-13	45.2
GW--0002	19-Feb-13	55.6
GW--0003	19-Feb-13	54.1
GW--0004	19-Feb-13	52.9
GW--0006	19-Feb-13	48
GW--0005	19-Feb-13	47.6
GW--0007	19-Feb-13	48.6
GW--0010	19-Feb-13	49.8
GW--0018	19-Feb-13	52.3
GW--0022	19-Feb-13	57.7
GW--0023	19-Feb-13	50.3

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0014	19-Feb-13	49.1
GW--0019	20-Feb-13	51.8
GW--0011	20-Feb-13	50.6
GW--0008	20-Feb-13	53.8
GW--0015	20-Feb-13	58.7
GW--0020	20-Feb-13	57.7
GW--0024	20-Feb-13	58
GW--0025	20-Feb-13	52.8
GW--0021	20-Feb-13	57.4
GW--0017	20-Feb-13	58.1
GW--0013	20-Feb-13	55.6
GW--0009	20-Feb-13	58.4
GW--0012	20-Feb-13	54.4
GW--0016	20-Feb-13	4.4
GW--0020	20-Feb-13	58.3
GHC--005	20-Feb-13	56.3
GHC--002	20-Feb-13	0.4
GHC--001	20-Feb-13	2.7
GHC--003	20-Feb-13	3.3
GHC--004	20-Feb-13	2.6
GAS--06A	20-Feb-13	48.8
GAS--06B	20-Feb-13	54.4
GHC--005	13-Mar-13	56.3
GHC--002	13-Mar-13	0.6
GHC--001	13-Mar-13	1.1
GHC--003	13-Mar-13	1.7
GHC--004	13-Mar-13	4.3
GAS--06A	13-Mar-13	56.2
GAS--06B	13-Mar-13	44.5
GW--0019	13-Mar-13	50.4
GW--0011	13-Mar-13	49.8
GW--0008	13-Mar-13	53.4
GW--0015	13-Mar-13	57.9
GW--0020	13-Mar-13	57.6
GW--0024	13-Mar-13	58.1
GW--0024	13-Mar-13	49.7
GAS--06B	13-Mar-13	49.2
GW--0023	14-Mar-13	49.6
GW--0022	14-Mar-13	58
GW--0018	14-Mar-13	53.2
GW--0014	14-Mar-13	46.7
GW--0010	14-Mar-13	48

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GW--0007	14-Mar-13	27.3
GW--0005	14-Mar-13	45.6
GW--0001	14-Mar-13	37.6
GW--0002	14-Mar-13	57.9
GW--0003	14-Mar-13	53.4
GW--0004	14-Mar-13	53.5
GW--0009	14-Mar-13	59.3
GW--0006	14-Mar-13	36.9
GW--0016	19-Mar-13	57.3
GW--0012	19-Mar-13	51.5
GW--0013	19-Mar-13	58.6
GW--0017	19-Mar-13	57.8
GW--0021	19-Mar-13	58.6
GW--0025	19-Mar-13	52.9
GAS--06B	19-Mar-13	53.1
GW--0022	8-Apr-13	55
GW--0023	8-Apr-13	50.9
GW--0018	8-Apr-13	52.1
GW--0014	8-Apr-13	50.5
GW--0010	8-Apr-13	52
GW--0007	8-Apr-13	55.8
GW--0005	8-Apr-13	50.3
GW--0001	8-Apr-13	37
GW--0002	8-Apr-13	59
GW--0003	8-Apr-13	55.9
GW--0004	8-Apr-13	55.6
GW--0009	8-Apr-13	60.7
GW--0006	8-Apr-13	49.4
GW--0008	8-Apr-13	54.2
GW--0011	8-Apr-13	51.8
GW--0015	8-Apr-13	60.1
GW--0019	9-Apr-13	53
GW--0024	9-Apr-13	59.2
GW--0020	9-Apr-13	58.7
GW--0025	9-Apr-13	57
GW--0021	9-Apr-13	58.1
GW--0017	9-Apr-13	59
GW--0013	9-Apr-13	58.3
GW--0012	9-Apr-13	54.2
GW--0016	9-Apr-13	59.2
GW--0016	9-Apr-13	59.2
GW--0020	9-Apr-13	59.5

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GHC--005	9-Apr-13	58.5
GHC--002	9-Apr-13	0.7
GHC--001	9-Apr-13	0.5
GHC--003	9-Apr-13	1.1
GC--0004	9-Apr-13	9
GAS--06A	9-Apr-13	58.1
GW--0022	13-May-13	56.2
GW--0019	13-May-13	54.2
GW--0011	13-May-13	53.9
GW--0008	13-May-13	53.4
GW--0015	13-May-13	59.4
GW--0020	13-May-13	58.4
GW--0024	13-May-13	58.9
GW--0023	13-May-13	55.8
GW--0018	13-May-13	55.4
GW--0014	13-May-13	53.5
GW--0010	13-May-13	55.6
GW--0007	13-May-13	45
GW--0005	13-May-13	52.1
GW--0006	13-May-13	42
GW--0009	13-May-13	59.7
GW--0004	13-May-13	55.9
GW--0003	13-May-13	54.9
GW--0001	13-May-13	49.7
GHC--005	14-May-13	57.5
GHC--002	14-May-13	0.6
GHC--001	14-May-13	7.9
GHC--003	14-May-13	2.8
GC--0004	14-May-13	6.6
GAS--06A	14-May-13	55.9
GAS--06B	14-May-13	54.6
GW--0012	15-May-13	53.4
GW--0013	15-May-13	59
GW--0017	15-May-13	58.5
GW--0021	15-May-13	58.2
GW--0016	15-May-13	50.7
GW--0025	15-May-13	53
GHC--005	5-Jun-13	57.7
GHC--002	5-Jun-13	0.4
GHC--001	5-Jun-13	2.5
GHC--003	5-Jun-13	2.7
GC--0004	5-Jun-13	4.8

Buncombe County Solid Waste Management Facility
Subtitle D Landfill
Gas Composition Data at Well Heads

Gas wells/ Blowers	Date	% Methane
GAS--06A	5-Jun-13	58.5
GAS--06B	5-Jun-13	55.5
GW--0023	5-Jun-13	52.6
GW--0018	5-Jun-13	50.6
GW--0014	5-Jun-13	49.2
GW--0010	5-Jun-13	51.9
GW--0007	5-Jun-13	56.8
GW--0005	5-Jun-13	48.6
GW--0006	5-Jun-13	37.9
GW--0008	5-Jun-13	55.8
GW--0004	5-Jun-13	48.2
GW--0003	5-Jun-13	41.1
GW--0002	5-Jun-13	55
GW--0001	5-Jun-13	49.8
GW--0008	5-Jun-13	50.9
GW--0011	5-Jun-13	52
GW--0015	5-Jun-13	58.5
GW--0019	5-Jun-13	49
GW--0020	5-Jun-13	57.5
GW--0024	5-Jun-13	57.3
GW--0016	5-Jun-13	48.7
GW--0012	5-Jun-13	48.2
GW--0013	5-Jun-13	57.3
GW--0017	5-Jun-13	56.3
GW--0021	5-Jun-13	55.3
GW--0025	5-Jun-13	49.4
GW--0022	10-Jun-13	58.9

CDM Smith

cdmsmith.com