

# Landfill Gas Monitoring Plan

## Anderson Creek Landfill Harnett County

Prepared for:

**Harnett County**  
**P.O. Box 940**  
**Lillington, North Carolina**



**August 2013**

Prepared by:

NC LIC. NO. C-0828 (ENGINEERING)

**SMITH+GARDNER**

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577



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# Landfill Gas Monitoring Plan

**Anderson Creek Landfill  
Harnett County North Carolina**

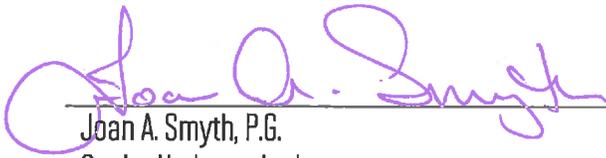
Prepared For:

**Harnett County**

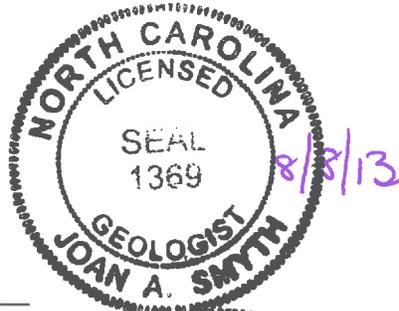
**P.O. Box 940**

**Lillington, North Carolina**

**S+G Project No. Harnett-13-2**



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**August 2013**

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# Anderson Creek Landfill Harnett County North Carolina

## Landfill Gas Monitoring Plan

### Table of Contents

	<u>Page</u>
<b>1.0 INTRODUCTION</b> .....	<b>1</b>
1.1 Regulatory Requirements – C&D Landfills .....	1
1.2 Guidance Document .....	2
1.3 Contact Information .....	2
1.3.1 Owner .....	2
1.3.2 Engineer .....	2
1.3.3 North Carolina Department of Environment and Natural Resources .....	2
1.4 Existing Site Conditions.....	3
1.4.1 Site Geology.....	3
1.4.2 Local Groundwater Regime .....	3
<b>2.0 MONITORING PROGRAM</b> .....	<b>4</b>
2.1 Monitoring Wells .....	4
2.1.1 Proposed LFG Monitoring Wells.....	4
2.1.2 LFG Monitoring Well Construction .....	4
2.2 Monitoring of Facility Structures .....	5
2.3 Monitoring and Reporting .....	5
2.3.1 Frequency.....	5
2.3.2 Personnel .....	5
2.3.3 Equipment .....	5
2.3.4 Procedures .....	6
2.3.5 Precautionary Action Plan .....	7
2.3.6 Record Keeping .....	7
2.4 Maintenance .....	8
<b>3.0 CONTINGENCY PLAN</b> .....	<b>9</b>
3.1 Immediate Action Plan .....	9
3.1.1 Reporting and Documentation.....	9
3.2 Remediation Plan .....	9

### FIGURE

Figure 1	Site Vicinity Map
Figure 2	Site Plan
Figure 3	Flowchart of Methane Monitoring Requirements

### APPENDIX

Appendix A	Reporting Form
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## 1.0 INTRODUCTION

This Landfill Gas (LFG) Monitoring Plan (plan) was prepared by Smith Gardner, Inc. to describe the LFG monitoring program at the Anderson Creek Landfill Facility (NC Solid Waste Permit 43-03), which is located on Poplar Drive Spring Lake, North Carolina. This landfill facility includes an active C&D landfill, a closed MSW landfill, and a closed C&D landfill. This plan describes the necessary procedures to satisfy applicable regulatory requirements (see **Section 1.1**) for landfill gas monitoring.

The Engineer has utilized the best available site data, practices, experience, and judgment to develop this plan. However, the plan may require modifications over time to accommodate changing landfill conditions, changing receptors in areas adjacent to and around the landfill, or other conditions that cannot be fully anticipated.

Uncontrolled migration of LFG (particularly methane (CH<sub>4</sub>)) can result in, loss of life, injury, loss of property, vegetative damage, and intolerable odors. Landfill monitoring includes exposure to explosive gases. Monitoring personnel should be specifically trained in the management and response for situations such as fire or explosion and confined space entry and possess an awareness of changing conditions around the landfill.

Note that this plan does not address landfill gas collection and control, air quality, or other related landfill gas regulations or requirements which may be applicable to this site at present or in the future.

### 1.1 Regulatory Requirements – C&D Landfills

Rule 15A NCAC 13B.0544(d) of the North Carolina Solid Waste Management Rules requires the following for facilities having a C&D landfill:

- Owners or operators of MSW landfill units must ensure that:
  - the concentration of methane gas or other explosive gases generated by the facility does not exceed 25 percent of the lower explosive limit in on-site facility structures (excluding gas control or recovery system components);
  - the concentration of methane gas or other explosive gases does not exceed the lower explosive limit for methane or other explosive gases at the facility property boundary; and
  - the facility does not release methane gas or other explosive gases in any concentration that can be detected in offsite structures.
- Owners or operators of C&D landfill units must implement a routine methane monitoring program and perform monitoring on at least a quarterly basis.
- If regulatory limits for methane gas concentrations are exceeded, a contingency plan must be implemented for the protection of human health and safety.

## 1.2 Guidance Document

This plan was developed generally following the Landfill Gas Monitoring Guidance document prepared by the North Carolina Department of Environment and Natural Resources (NC DENR), Division of Waste Management (DWM)<sup>1</sup>.

## 1.3 Contact Information

All correspondence and questions concerning this plan should be directed to the appropriate contact below:

### 1.3.1 Owner

#### **Harnett County**

Solid Waste Department

P.O. Box 940

Lillington, North Carolina 27546

Phone: (919) 814-6156

Contacts: Amanda Bader, P.E., County Engineer

[abader@harnett.org](mailto:abader@harnett.org)

Randy Smith, Solid Waste Operations Manager

[rsmith@harnett.org](mailto:rsmith@harnett.org)

### 1.3.2 Engineer

#### **Smith Gardner, Inc.**

14 N. Boylan Avenue

Raleigh, North Carolina 27603

Phone: (919) 828-0577

Contacts: Joan A. Smyth, P.G., Senior Hydrogeologist

[joan@smithgardnerinc.com](mailto:joan@smithgardnerinc.com)

Pieter K. Scheer, P.E., Project Manager

[pieter@smithgardnerinc.com](mailto:pieter@smithgardnerinc.com)

### 1.3.3 North Carolina Department of Environment and Natural Resources

#### **North Carolina DENR - Raleigh Central Office (RCO)**

217 W Jones Street

Raleigh, North Carolina 27603

Phone: (919) 707-8200

Contact: Ms. Elizabeth Werner

[elizabeth.werner@ncdenr.gov](mailto:elizabeth.werner@ncdenr.gov)

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<sup>1</sup> NC DENR DWM (2010), "Landfill Gas Monitoring Guidance", NC DENR DWM Solid Waste Section, November 2010.

## 1.4 Existing Site Conditions

The facility is located approximately 15 miles southwest of Lillington on Poplar Drive in Spring Lake, North Carolina. The surrounding area primarily undeveloped tracts of land with some residential development primarily to the northeast and east.

The facility is located on approximately 223 acres owned by Harnett County. The site location, with a 1-mile radius is provided as **Figure 1**. The site is bound to the north by undeveloped land and perennial streams with the exception of the northeast corner which is adjacent to a residential subdivision, to the east by undeveloped land, perennial streams and residential subdivisions, the south by undeveloped land and perennial streams with the exception of the southeast corner which appears to have a building on the adjacent property, and to the west by undeveloped property and perennial streams. As shown on the figure, there are perennial streams surrounding a significant portion of the site. These existing water features create a natural barrier to LFG migration.

### 1.4.1 Site Geology

The Anderson Creek Landfill facility is located in the Coastal Plain Physiographic Province of North Carolina. The Geologic Map of North Carolina (*USGS, 1985*) indicates that the site lies within the Middendorf Formation. The Middendorf formation consists of fine sandy clays grading to coarse clayey sands.

The Middendorf formation is located above the Cape Fear Formation at the site. The Cape Fear lithology at the site consists of gray silty clays with some clayey silt. The Cape Fear sediments extend at least 50 feet below the Middendorf Formation.

### 1.4.2 Local Groundwater Regime

The primary aquifer at the site is generally unconfined, surficial, unconsolidated sands and clays. McLeod Creek is located along the western property boundary. McLeod Creek flows southward into Jumping Run Creek and eventually into the Little River approximately 6 miles from the site. McLeod Creek and other unnamed tributaries serve as groundwater discharge features at the site. Groundwater occurs between elevations 307 and 242 ft msl.

## 2.0 MONITORING PROGRAM

There is currently no monitoring program for the site. The plan contained herein includes the installation of landfill gas monitoring wells to monitor for subsurface landfill gas migration. The plan also covers landfill gas monitoring in on-site structures.

### 2.1 Monitoring Wells

Proposed monitoring wells are shown on **Figure 1**.

#### 2.1.1 Proposed LFG Monitoring Wells

The close location of streams to the north, west and south of the site limit the possibility of landfill gas migration in these directions. Therefore, landfill gas monitoring points are focused along the eastern property line where residential development is more predominant. The proposed landfill gas monitoring network will include the wells summarized below:

LFG Monitoring Well	Screened Interval	Total Depth
LFG-1	TBD	TBD
LFG-2	TBD	TBD
LFG-3	TBD	TBD
LFG-4	TBD	TBD

The proposed monitoring wells are shown on **Figure 2**.

#### 2.1.2 LFG Monitoring Well Construction

The LFG monitoring wells will be installed in accordance with 15A NCAC 2C. Wells will be advanced using HSA drilling technology and constructed of two-inch diameter, manufactured PVC well screens with 10-slot per inch intake spacing and solid PVC riser pipe. A sand filter pack will be placed around the screened interval, to a height of up to two feet above the screen, and a hydrated bentonite plug of two to five feet in thickness will be positioned above the sand pack to seal each well. A protective steel casing and a cement pad for surface protection will also be installed. Quick-connect fittings or stopcock valves will be installed in accordance with SWS guidance on the PVC portion of the well or in the cap as a monitoring port.

The proposed monitoring wells will be installed to approximately the depth of groundwater. In this case depth to groundwater will be estimated from nearby groundwater monitoring wells. Wells will be screened from the total well depth to between 5 feet and 10 feet below grade.

## **2.2 Monitoring of Facility Structures**

The following facility structures will be monitored:

- Scalehouse; and
- Transfer Station Building.

If desired by the County, a dedicated methane monitor may be installed within one or more of these structures. Otherwise, monitoring will be conducted quarterly with the landfill gas monitoring wells.

## **2.3 Monitoring and Reporting**

Monitoring and reporting of LFG concentrations will be performed as outlined below.

### **2.3.1 Frequency**

Routine LFG monitoring will be conducted on a quarterly basis.

### **2.3.2 Personnel**

LFG monitoring will be performed by personnel who are familiar with the requirements of this plan and who are trained in LFG hazards and explosive gas meter use. As practical, a designated technician will be assigned to regular LFG monitoring duty.

### **2.3.3 Equipment**

A Landtec™ GEM-2000 infrared portable gas analyzer (or equivalent) will be used to monitor probes and LFGCCS components. This analyzer, which is calibrated to methane (CH<sub>4</sub>), operates using the infrared spectral property of methane to measure concentrations in air. Measurements of oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) will also be made with this meter. This meter may be used in oxygen deficient areas (less than 10% O<sub>2</sub>) since oxygen is not required for a chemical combustion of flammable gases within the meter.

On the day of monitoring, prior to monitoring activities, this meter will be field calibrated. Additionally, all monitoring equipment should be regularly calibrated in accordance with manufacturer's specifications and operated only as instructed.

### 2.3.4 Procedures

Prior to each monitoring event, the portable gas analyzer will be calibrated with a known calibration standard in accordance with manufacturer's recommendations. General information related to the monitoring event, equipment used, calibration procedures, weather conditions, and results for each monitoring event will be recorded on the landfill gas monitoring data form (see **Appendix A**).

The following steps outline the procedure for the monitoring of LFG wells and facility structures:

- Check calibration date on the meter and calibrate according to manufacturers instructions; allowing equipment to warm up properly prior to use, per manufacturers direction.
- Purge sample tube for one minute before monitoring.

#### LFG Monitoring Wells:

- Connect instrument tubing to sample port on the monitoring well without removing the cap.
- Open the valve and record both the initial and stabilized methane concentrations. A stabilized concentration will not vary more than 0.5 percent by volume on the instrument's scale. Also record the oxygen concentration (at two percent per volume or less to indicate air is not being drawn into the system and providing false readings) and the carbon dioxide concentration.
- Close the valve and disconnect the tubing.
- Record monitoring data on the LFG monitoring data form provided in **Appendix A**.
- If any methane concentration is **greater than 50% of the LEL (2.5% CH<sub>4</sub>)**, monitoring personnel should implement the Precautionary Action Plan (see **Section 2.3.5**).
- If both initial and stabilized methane concentrations are less than 50% of the LEL (2.5% CH<sub>4</sub>), move to next LFG monitoring well.

#### Structures:

- Walk through the facility structure with a methane analyzer and monitor the perimeter wall interface of the structure, the floor to wall interface in hallways and rooms, and any floor penetrations in the structure. Record the initial and stabilized methane concentrations, oxygen concentration, and carbon dioxide concentration.
- Record monitoring data on the LFG monitoring data form provided in **Appendix A**.

- Notify the Landfill Superintendent and the Engineer for any methane concentration greater than 0% of the LEL.

***IF A STABILIZED METHANE CONCENTRATION IS GREATER THAN 100% OF THE LEL IN A LFG MONITORING WELL OR GREATER THAN 25% OF THE LEL IN A FACILITY STRUCTURE, THE FOLLOWING ACTIONS WILL BE IMPLEMENTED:***

- 1) Recalibrate monitoring equipment and confirm results.
- 2) If results are confirmed, **IMMEDIATELY** contact the Landfill Manager and the Engineer.
- 3) Implement the Compliance Action Plan located in **Section 3.1**.

A flowchart of actions to be taken if exceedances are noted is included as **Figure 3**.

#### 2.3.5 Precautionary Action Plan

If an initial or stabilized methane concentration is equal to or greater than 50% of the LEL in a LFG monitoring well, monitoring personnel should perform the following additional steps at this location:

- Measure gas pressure in the well head (in inches of water) using magnehelic gauge or other appropriate metering device.
- Record at least one additional methane concentration measurement, inside the well just below the top of casing.
- Evaluate the surrounding area for potential receptors to or signs of LFG migration. LFG can stress vegetation and can kill trees and grass by root asphyxiation. Note stressed/dead vegetation areas on the monitoring form.
- Notify the Landfill Manager and the Engineer for further evaluation.

#### 2.3.6 Record Keeping

Routine LFG monitoring events will be documented on the LFG monitoring data form provided in **Appendix A**. Completed forms will be placed in the landfill operating record located at 103 E. Ivey Street Lillington, North Carolina 27546. These forms will be available for review by DWM personnel on request.

Documentation of any contingency plan actions (see **Section 3.0**) will also be kept in the operating record.

## 2.4 Maintenance

Periodic maintenance and site observations will be conducted routinely to address monitoring program components (at a minimum):

- Maintain access to LFG monitoring locations.
- Perform LFG monitoring well maintenance (maintain well locks, steel casing, concrete pad, etc.).
- Observe landfill cover conditions, areas of dead vegetation, leachate seeps, odors, etc. as indications of potential LFG-related problems.

Note deficiencies on the monitoring forms and report to the Solid Waste Operations Manager for repair or replacement as necessary.

### 3.0 CONTINGENCY PLAN

If a stabilized methane concentration is **greater than 100% of the LEL in a LFG monitoring well or greater than 25% of the LEL in a facility structure**, the County will perform both an immediate action and plan and a remediation plan as described below.

#### 3.1 Immediate Action Plan

The Solid Waste Operations Manager will perform the following actions for the protection of human health and safety:

- 1) Evacuate affected facility structures and the immediately surrounding area.
- 2) Determine nearby potential receptors (facility and off-site structures).
- 3) Perform monitoring in any other facility structure near the monitoring location having the high concentration.
- 4) Contact the County Fire Department (911). Coordinate evaluation of potentially affected off-site structures with the Fire Department.
- 5) Verbally notify the County Engineer, or their designee.
- 6) Verbally notify the NCDENR DWM (see **Section 1.1**) as soon as practical.
- 7) Investigate and identify the potential source(s) and conduit(s) for LFG migration that may have caused the high concentration (i.e. the path that the LFG may be taking to the monitoring location).
- 8) Identify the LFG extent using bar hole punch sampling methodology or other applicable alternative method as practical.
- 9) As appropriate, begin corrective action to control methane concentrations in structures surrounding the landfill site.

##### 3.1.1 Reporting and Documentation

Within seven days of the detection of a high methane concentration, the County will prepare and submit an Environmental Monitoring Reporting Form (see **Appendix A**) with the results of the monitoring event to the DWM. The County will also place a description of the actions performed to protect human health in the operating record.

#### 3.2 Remediation Plan

Within sixty days of the detection of a high methane concentration, a remediation plan describing the problem nature, extent, and proposed remedy will be submitted to NCDENR for approval. Upon approval the plan will be implemented and a copy will be placed in the operating record. The DWM will also be notified the plan has been implemented.

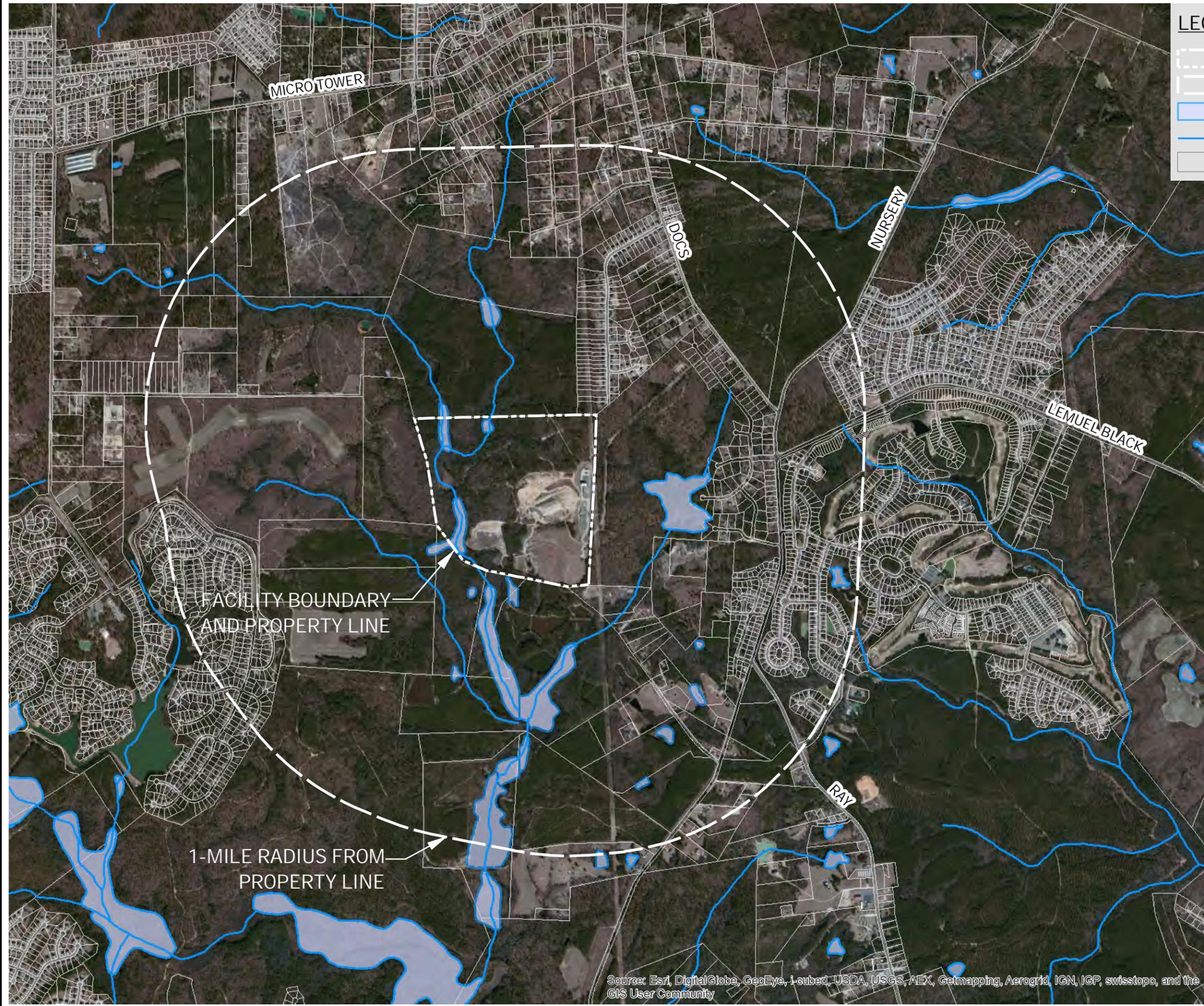
An extension may be granted by the DWM on written request and depending on severity of the situation.

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## **Figures**

**Landfill Gas Monitoring Plan  
Anderson Creek Landfill  
Harnett County, NC**

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**LEGEND**

- FACILITY BOUNDARY & PROPERTY LINE
- 1-MILE RADIUS FROM PROPERTY LINE
- WATER FEATURE (SEE REFERENCE 2)
- STREAM LOCATION (SEE REFERENCE 2)
- PARCEL BOUNDARY (SEE REFERENCE 1)

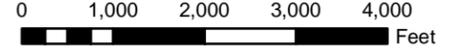


FACILITY BOUNDARY AND PROPERTY LINE

1-MILE RADIUS FROM PROPERTY LINE

Source: Esri, DigitalGlobe, GeoEye, Earthstar, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

- REFERENCES:**
1. PARCEL BOUNDARIES FROM HARNETT COUNTY GIS DEPARTMENT. PARCEL INFORMATION DATED JULY, 2013
  2. STREAM AND WATER FEATURES FROM U.S.G.S. 7.5 MIN. QUADRANGLES "ANDERSON CREEK" AND "OLIVIA".



NC LIC. NO. C-0828 (ENGINEERING)

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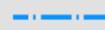
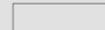
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SCALE:	AS SHOWN
APPROVED:	K.C.B.
PROJECT NO.:	HARNETT 13-2
FILENAME:	HARNETT-B0002
DRAWN:	C.T.J.
DATE:	Aug. 2013

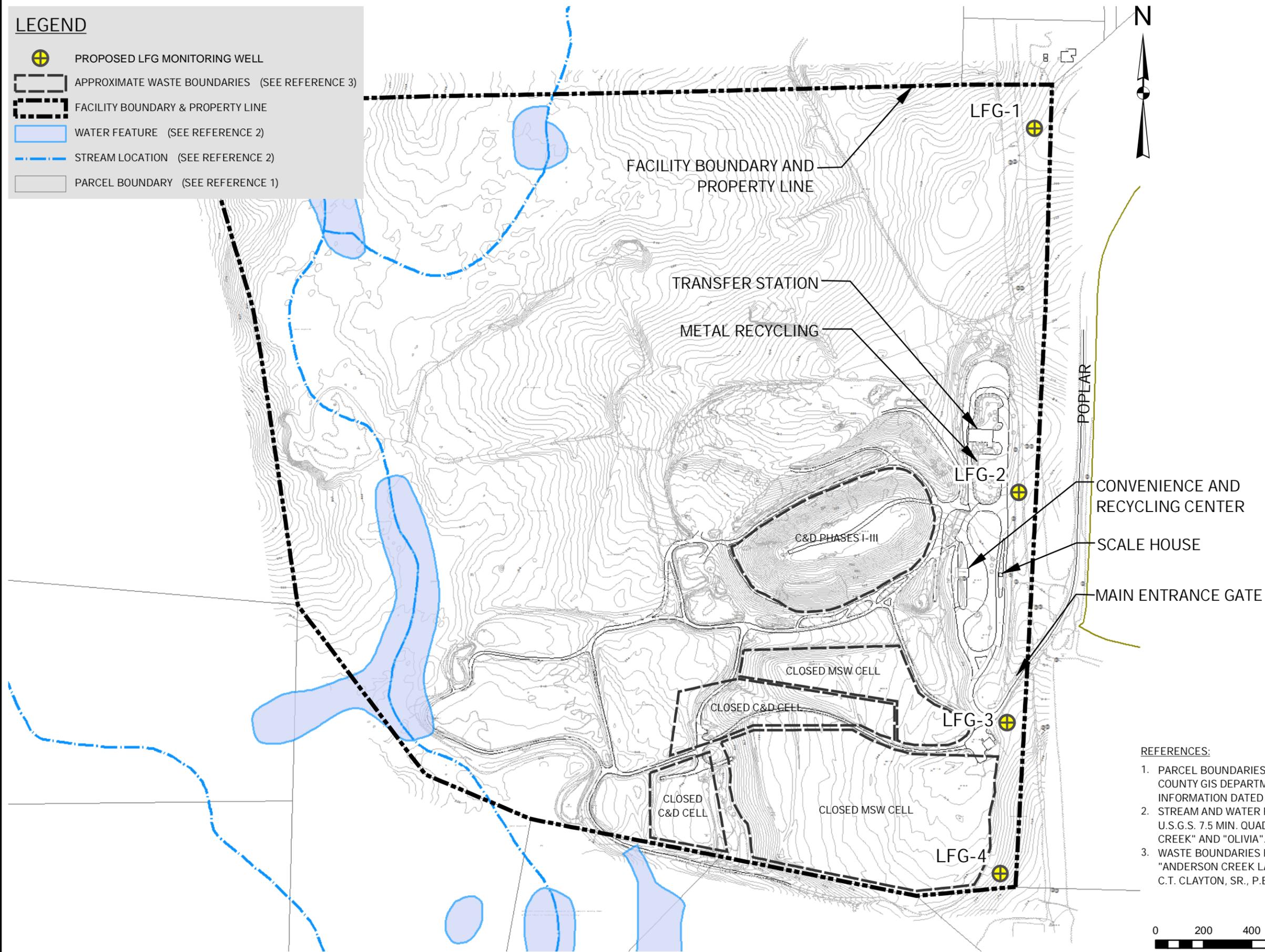
**HARNETT COUNTY  
ANDERSON CREEK LANDFILL  
SITE VICINITY MAP**

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**LEGEND**

-  PROPOSED LFG MONITORING WELL
-  APPROXIMATE WASTE BOUNDARIES (SEE REFERENCE 3)
-  FACILITY BOUNDARY & PROPERTY LINE
-  WATER FEATURE (SEE REFERENCE 2)
-  STREAM LOCATION (SEE REFERENCE 2)
-  PARCEL BOUNDARY (SEE REFERENCE 1)



- REFERENCES:**
1. PARCEL BOUNDARIES FROM HARNETT COUNTY GIS DEPARTMENT. PARCEL INFORMATION DATED JULY, 2013
  2. STREAM AND WATER FEATURES FROM U.S.G.S. 7.5 MIN. QUADRANGLES "ANDERSON CREEK" AND "OLIVIA".
  3. WASTE BOUNDARIES FROM DRAWING "ANDERSON CREEK LANDFILL" PREPARED BY C.T. CLAYTON, SR., P.E., INC., DATED 7/31/13.



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DRAWN: C.T.J.	APPROVED: J.A.S.	SCALE: AS SHOWN	FIGURE NO.: 2
DATE: Aug. 2013		PROJECT NO.: HARNETT 13-2	FILENAME: HARNETT-B0003

## HARNETT COUNTY ANDERSON CREEK LANDFILL SITE PLAN

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MONITORING FREQUENCY IS QUARTERLY

METHANE CONCENTRATION MUST NOT EXCEED:  
1. 25% OF THE LEL IN FACILITY STRUCTURES; AND  
2. 100% OF THE LEL AT THE FACILITY PROPERTY BOUNDARY.

IF METHANE CONCENTRATION EXCEEDS EITHER OF THE ABOVE, THE OWNER MUST:

RECALIBRATE METER AND CONFIRM READINGS  
(SEE SECTION 2.3.4 OF LFG MANAGEMENT PLAN)

IF CONFIRMED READINGS EXCEED LIMITS,  
(SEE SECTION 3.0 OF THE LFG MANAGEMENT PLAN) AND:

1. IMMEDIATELY:  
TAKE STEPS TO ENSURE PROTECTION OF HUMAN HEALTH AND SAFETY

2. WITHIN 7 DAYS:  
PLACE THE METHANE READINGS AND STEPS TAKEN TO PROTECT HUMAN HEALTH IN THE OPERATING RECORD

3. WITHIN 60 DAYS:  
PREPARE A REMEDIATION PLAN. SUBMIT PLAN TO NCDENR FOR APPROVAL. UPON APPROVAL, IMPLEMENT PLAN.

**SMITH+GARDNER** ENGINEERS  
NOTIFY THE ENGINEER AND DIVISION WITHIN 24 HOURS  


PLACE A COPY OF THE REMEDIATION PLAN IN THE OPERATING RECORD, AND

EVALUATE THE NEED FOR ADDITIONAL MONITORING

NOTIFY THE DIVISION THAT THE PLAN HAS BEEN IMPLEMENTED

PREPARED FOR:

**FLOWCHART OF  
METHANE MONITORING REQUIREMENTS  
ANDERSON CREEK LANDFILL  
HARNETT COUNTY, NC**

PREPARED BY:

NC LIC. NO. C-0828 [ENGINEERING]

**SMITH+GARDNER**

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

DRAWN:

K.C.B.

APPROVED:

J.A.S.

SCALE:

N.T.S.

DATE:

Aug 2013

PROJECT NO.:

HARNETT 13-2

FIGURE NO.:

3

FILE NAME:

HARNETT-A0004

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# **Appendix A**

## **Reporting Forms**

**Landfill Gas Monitoring Plan  
Anderson Creek Landfill  
Harnett County, NC**

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