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<i>Rynith Baker</i>	7/14/10	11134

# **HAYWOOD COUNTY WHITE OAK LANDFILL OPERATIONS PLAN**

## **APPENDIX 3 EXPLOSIVE GAS CONTROL PLAN**

Original Plan by Municipal Engineering, March 2000  
Revised July 2010 to include reference drawings



July 12, 2010

Ms. Andrea Keller  
Environmental Senior Specialist  
Solid Waste Section  
Division of Waste Management  
North Carolina Department of Environment and Natural Resources  
2090 U.S. Highway 70  
Swannanoa, North Carolina 28778

RE: Updated Landfill Gas Monitoring Plan  
White Oak Municipal Solid Waste Landfill  
Permit # 44-07  
Haywood County, North Carolina

Dear Ms. Keller:

On behalf of Haywood County, North Carolina, please find attached the updated Landfill Gas (LFG) Monitoring Plan for the White Oak MSW Landfill (WOLF). This letter is in response to your follow-up audit at the WOLF on June 11, 2010, in which you requested that the County submit a LFG Monitoring Plan. Attached is the updated plan, which includes the following:

- A site map delineating the location of the LFG monitoring wells and methane monitoring points,
- LFG monitoring reporting form,
- Well construction diagram for the proposed LFG monitoring wells.

As noted in our June 10, 2010 letter to you, the County is still in the process of completing the work associated with the construction of MSW Phase 3, including installation of the necessary LFG monitoring wells. Several of the existing LFG monitoring wells were removed as part of the MSW Phase 3 construction, including LFG's 3, 5, and 6, and will be replaced by proposed LFG monitoring wells 7, 8, 9, and 10. LFG 4 will be relocated as part of the MSW Phase 3 construction, and is shown as LFG 4r on the attached Figure 1.

E n g i n e e r i n g • P l a n n i n g • F i n a n c e

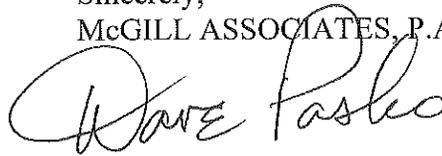
McGill Associates, P.A. • P.O. Box 2259, Asheville, NC 28802 • 55 Broad Street, Asheville, NC 28801

828-252-0575 • Fax: 828-252-2518

Ms. Andrea Keller  
July 12, 2010  
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The County looks forward to completing the installation of the LFG monitoring wells, as well as the groundwater monitoring wells, in the coming weeks. An as-built drawing of the completed environmental monitoring infrastructure at the WOLF will be submitted to the Permitting and Compliance Branches of the Solid Waste Section upon completion of the work. Should you have any questions or require additional information please give us a call.

Sincerely,  
McGILL ASSOCIATES, P.A.

A handwritten signature in black ink that reads "Dave Pasko". The signature is written in a cursive, flowing style.

DAVE PASKO  
Senior Engineering Technician

Enclosure

cc: Mr. Stephen King, Haywood County Solid Waste Director, w/enc  
Mr. Allen Gaither, NCDENR, w/enc

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**HAYWOOD COUNTY  
WHITE OAK LANDFILL  
OPERATIONS PLAN**

**APPENDIX 3  
EXPLOSIVE GAS CONTROL PLAN**

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### Appendix 3

#### EXPLOSIVE GAS CONTROL PLAN FOR - HAYWOOD COUNTY

Quarterly the Haywood County landfill will monitor the explosive gas at the landfill structures and at or near the landfill boundary, as shown on attached Figure 1. The permanent probes will consist of a plastic stand pipe similar to a piezometer used for groundwater detection. A typical permanent methane probe is detailed in the attached Figure 2. The permanent probe will be constructed at a minimum depth of six (6) feet. A minimum 6" diameter hole will contain a one (1) inch slotted PVC pipe. The bottom two (2) feet will be backfilled with non-carbonate pea gravel with a bentonite seal one (1) foot thick above it. The remaining three (3) feet will be backfilled with *in situ* soils. The one (1) inch PVC pipe will be approximately three (3) feet above the existing grade. The PVC pipe will be capped with a one (1) inch PVC cap, one quarter (1/4) inch NPT hose barb, and 1" tubing, plugged or capped. The County is also required to perform quarterly monitoring at all on-site structures. Currently, the on-site structures include the Maintenance Building and the Scale House.

The location and spacing of the methane monitoring probes is somewhat arbitrary. The locations were determined by the relationship of solid waste with property lines and landfill structures. The migration of methane gas is induced by pressure gradients. The methane will move from areas of high pressure to those of low pressure following the path of least resistance. The methane will migrate vertically until it reaches the landfill cap, where it will begin to flow horizontally. This occurs until it finds a pathway out, either by methane collection trenches or migration through the permeable *in situ* soils. Since methane is lighter than air, it wants to escape into the atmosphere. It has been our experience that whenever gas is migrating no matter what the spacing or depth of the monitoring probes, the gas will fill the void created by the monitoring point and an explosive meter will monitor the level. The six foot depth of the monitoring probes is to ensure a stable monitoring point. The only time a shallow monitoring point has not worked is in a very heavy, impermeable clay layer that acts as a seal to the migration of the gas. If a clay layer is encountered during the construction of the monitoring points, it will either be moved beyond the clay or excavated to a depth that is in the conductive zone below the clay.

The permanent probes will surround the active waste areas. Haywood County's landfill is designed with a base liner system and cap system, there should be no migration of methane in the permeable *in situ* soils.

The gas can be detected by use of an instrument that reports the percent of lower explosive limit and the methane gas concentration. The instrument being used is the LandGEM 2000. Observations will be recorded on the attached form.

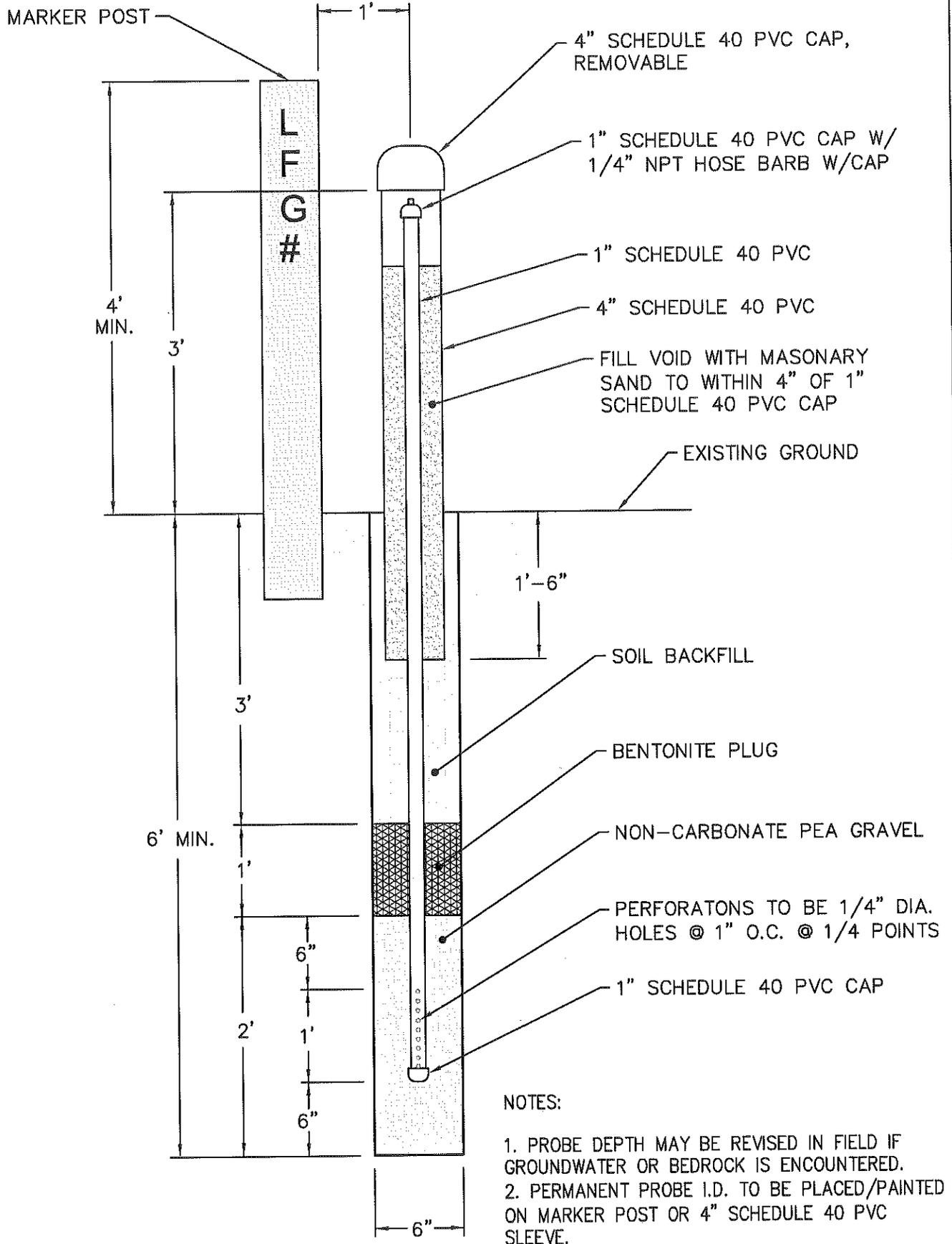
Quarterly, a County employee will visit each monitoring point either the temporary or permanent. The monitoring points consist of all methane probes and on-site structures. Using the detection instrument, he/she will determine if methane gas has filled the probes. If the probe is near the property line and methane gas is detected at or beyond the lower explosive limit (100% LEL), it must then be determined if the gas is migrating across the landfill boundary. If the probe is on the boundary or methane gas has migrated beyond the boundary, a remediation plan must be completed by Haywood County.

At the on-site structures, each structure will be monitored for methane using the following methods:

1. All crawl spaces will be monitored;
2. All corners in the structure will be monitored;
3. Any holes, cracks and pipes through the foundation will be monitored

If methane gas is detected beyond 25% of its lower explosive limit in any structure, check the calibration of the monitor and resample. If the reading is still above 25%, evacuate the building and try to find the source of gas. If the source is found try to remove the source. If this fails a remediation plan is stated in the operational requirements.





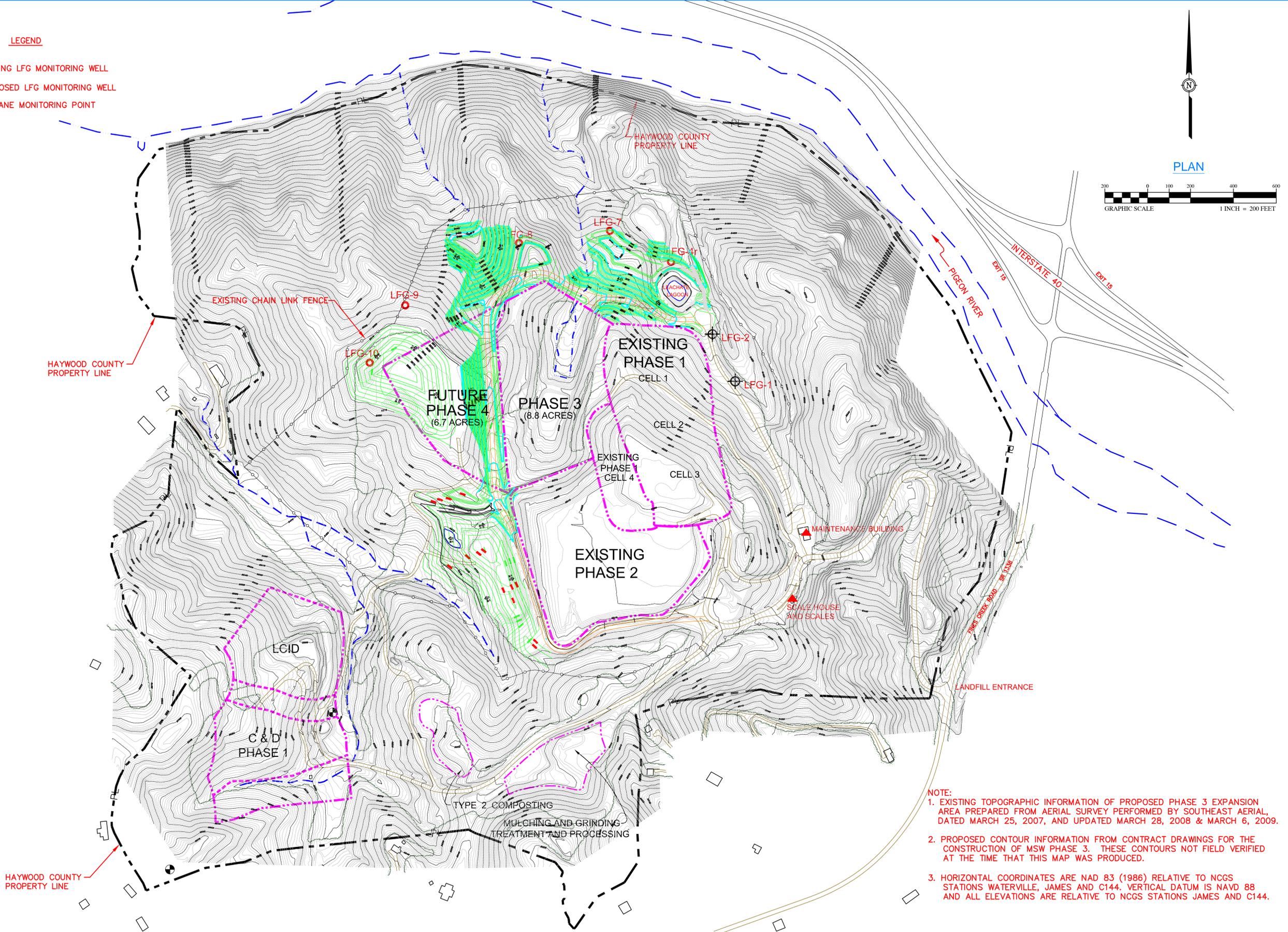
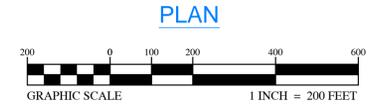
## LANDFILL GAS MONITORING PROBE

NOT TO SCALE

FIGURE 2

**LEGEND**

- ⊕ EXISTING LFG MONITORING WELL
- PROPOSED LFG MONITORING WELL
- ▲ METHANE MONITORING POINT



- NOTE:**
1. EXISTING TOPOGRAPHIC INFORMATION OF PROPOSED PHASE 3 EXPANSION AREA PREPARED FROM AERIAL SURVEY PERFORMED BY SOUTHEAST AERIAL, DATED MARCH 25, 2007, AND UPDATED MARCH 28, 2008 & MARCH 6, 2009.
  2. PROPOSED CONTOUR INFORMATION FROM CONTRACT DRAWINGS FOR THE CONSTRUCTION OF MSW PHASE 3. THESE CONTOURS NOT FIELD VERIFIED AT THE TIME THAT THIS MAP WAS PRODUCED.
  3. HORIZONTAL COORDINATES ARE NAD 83 (1986) RELATIVE TO NCGS STATIONS WATERVILLE, JAMES AND C144. VERTICAL DATUM IS NAVD 88 AND ALL ELEVATIONS ARE RELATIVE TO NCGS STATIONS JAMES AND C144.

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FOR REVIEW ONLY

WHITE OAK MSW LANDFILL  
**HAYWOOD COUNTY**  
 HAYWOOD COUNTY, NORTH CAROLINA

JOB NO.: 07518  
 DATE: JULY 2010  
 DESIGNED BY: DP  
 CADD BY: DP  
 DESIGN REVIEW: \_\_\_\_\_  
 CONST. REVIEW: \_\_\_\_\_  
 FILE NAME: WOLF LFG Monitoring Plan.dwg

LANDFILL GAS MONITORING PLAN

FIGURE  
 1

NO.	DATE	BY	REVISION DESCRIPTION