

OPERATION/CONSTRUCTION MANAGERS

CIVIL/SANITARY ENGINEERS

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APPROVED

DIVISION OF WASTE MANAGEMENT

SOLID WASTE SECTION

DATE July 26, 2010 BY Brian Wootton

TO **Brian Wootton, Hydrogeologist**
NCDENR-Solid Waste Section
401 Oberlin Road
Raleigh, NC 27605

DATE	7/19/2010	PROJ. NO.	G10105.0
ATTN:	Mr. Wootton		
RE:	Iredell County Methane Monitoring Plan		
	[Revised]		

Please find enclosed:

COPIES	DATE	NO.	DESCRIPTION
1	7/19/2010	R1	Iredell County Methane Monitoring Plan
1	7/19/2010	R1	Proposed Methane Monitoring Probe Location Map

For your Review and Approval

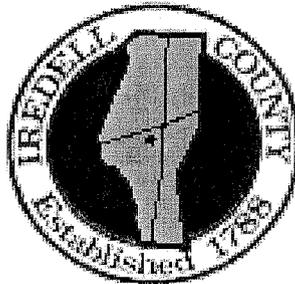
Please see the revised Methane Monitoring Plan including a revised Probe Location Map as discussed on Friday. If you have any questions or need any additional info please give us a call.

TRANSMITTED BY: Mark Brown, Garner Office



**IREDELL COUNTY
SOLID WASTE**

**METHANE MONITORING PLAN
CLOSED LANDFILL
PERMIT # 49-01**



March 20, 2010
David Lambert

Updated July 15, 2010

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I INTRODUCTION

The pre Sub-title D landfill operated by Iredell County, Permit #49-01 ceased to accept waste in October 1993. It was capped and closed with official notice of approval by NCDENR in September of 1995. A landfill gas collection system was installed in 1996 and is still in operation on a continual basis. The system consists of 45 vertical wells which are linked together with vacuum applied to remove gas and is piped into a candlestick flare for destruction. The county has methane alarms installed in all buildings located on the landfill property. These alarms are AC powered and monitor continuously. They are designed to trigger an alarm at the lower explosive limits. The alarms are tested once per year by a licensed electrician from the County's Facility Services department. All personnel who work in the affected buildings have been provided with written instructions regarding what to do in the event an alarm is triggered. Upon approval of this plan by the Solid Waste Section monitoring probes will be installed per the details of this plan.

II EXPLOSIVE GAS CONTROL PLAN

Quarterly the Iredell County landfill will monitor the explosive gas at the landfill structures and at or near the landfill boundary. 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 operation drawings. Hollow stem augers (augers) or direct push technology (DPT) will be used to advance a soil boring at each location to an elevation spanning most of the localized vadose (unsaturated) zone. A licensed geologist, professional engineer, or his/her representative will be present to "log the boring" and supervise and document the well installation. Standard penetration testing ("blow counts") will not be required during auger advancement. Starting approximately one foot above the estimated seasonal high water table level, the well will be constructed of one-inch diameter Schedule 40 PVC slotted screen with sufficient matching riser to bring the well approximately three feet above the ground surface. Number 2 filter sand or non-carbonate pea gravel will be used to fill the bottom foot of the boring annular space up to a height approximately one foot above the top of the screen. Approximately one foot of bentonite will be placed on top of the sand or gravel to seal the well, and the remaining height to ground surface (minimum 2 feet) will be backfilled with cement grout slurry. The top of the cement grout should be constructed to promote surface water runoff and prevent other physical conditions from compromising the well's integrity. The well will extend approximately three feet above the ground surface and be equipped with a stopcock valve and NPT barb connection to facilitate a gas meter's inlet tube. Where appropriate, the County might choose to include a steel outer casing to protect and secure the well. At those locations, the casing will be stabilized in a 2 x 2 foot, 4-inch thick concrete pad.

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. Monitor wells will be spaced 400 to 500 feet

apart. 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 the installed 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. Wells will be constructed to span the unsaturated zone. Where vadose zones exceed 45 feet, nested pairs, using the estimated bottom elevation of the shallow well screen to serve as the estimated bottom elevation of a riser and the estimated top elevation of the deeper well screen, will be constructed.

The permanent probes will surround the perimeter of all waste disposal areas and will be located inside property boundaries. The gas can be detected by use of an instrument that reports the percent of lower explosive limit.

Quarterly, a County employee will visit each monitoring point either the temporary or permanent. Using the detection instrument, he 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 Iredell County.

Other points of monitoring will be the landfill 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.

Explosive gases control

A. Iredell County must ensure that:

- i. The concentration of methane gas generated by the landfill does not exceed 25 percent of the lower explosive limit for methane in landfill structures (excluding gas control or recovery system components); and
- ii. The concentration of methane gas does not exceed 100 percent of the lower explosive limit for methane at the landfill property boundary.

B Iredell County will implement a routine methane monitoring program to ensure that the standards of 4 (a) are met. (Section 5.5-Appendix III)

- i. The type and frequency of monitoring must be determined based on the following factors:
 - I. Soil conditions;
 - II. The hydrogeologic conditions surrounding the facility;
 - III. The hydraulic conditions surrounding the facility;
 - IV. The location of facility structures and property boundaries.

- ii. The minimum frequency of monitoring will be quarterly.
- c. If methane gas levels exceeding the limits specified in 4 (a) are detected, the owner or operator will:
 - i. Immediately take all necessary steps to ensure protection of human health, i.e. no smoking, temporarily abandon the structure and notify the Division of Solid Waste Management.
 - ii. Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health; and
 - iii. Within 60 days of detection, implement a remediation plan for the methane gas releases, place a copy of the plan in the operating record, and notify the Division of Solid Waste Management that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.
- d. "Lower explosive limit" means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25° C and atmospheric pressure.

III GENERAL GUIDELINES IF ALARM IS TRIGGERED

If the methane alarm sounds:

- Evacuate the building immediately.
- Do not turn electrical switches on or off.
- Do not use a phone or a cellular phone inside the building.
- Do not use any potential ignition sources or open flames.
- Shut off electrical energy and natural gas supply if and only if a remote shut off is located outside of the building.
- Use common sense and never take risks that may endanger you or others, do not return to the building unless advised to do so by the Department Director (this should be his/her responsibility after the all clear from fire department).
- If it is possible, open the doors and windows, to ventilate the building. However, do not spend additional time opening doors or windows if there is an imminent danger of explosion or fire that would jeopardize your safety.
- Always leave the building quickly by the fastest possible route.
- Follow the emergency procedures listed below.

EMERGENCY PROCEDURES

When you suspect or detect a methane gas presence or observe a flammable material spill, follow the emergency procedures listed below regardless of intensity of odor or size of spill.

IF YOU DETECT OR SUSPECT PRESENCE OF METHANE GAS

1. Leave the area.
2. Immediately evacuate the building via the shortest and safest exit route. If possible to accomplish within seconds, leave windows and exterior doors open to ventilate the area.
3. Do not use elevators; always use stairs.

4. Go to a safe area or to a pre-assigned exterior assembly area for your building. Assembly areas should be located away from the building on higher elevation as possible.
5. Call 9-1-1 from the nearest phone in safe area immediately. After making the 9-1-1- call, notify your Department Director immediately.

The Emergency Communications Center should notify the Solid Waste Director, the Facility Services Director, County Fire Marshal and the Emergency Management Director **immediately** after dispatch.

6. Await emergency response personnel at safe location.
7. If you know or suspect that someone is missing or trapped, tell the emergency telecommunicator at 9-1-1- during the initial call and also contact the emergency personnel outside the building upon their arrival.
8. If you are trapped during a gas release/emergency, close all doors between you and the gas leak. Stuff the cracks around the doors. Open windows or other exterior openings for fresh air and ventilation. Wait at a safe window and signal/call for help.
9. In the event of exposure the victim should be removed to an area of fresh air with first aid administered as appropriate.

IV MONITORING RECORD

IREDELL COUNTY METHANE PROBE MONITORING

Date: _____

Conducted By: _____

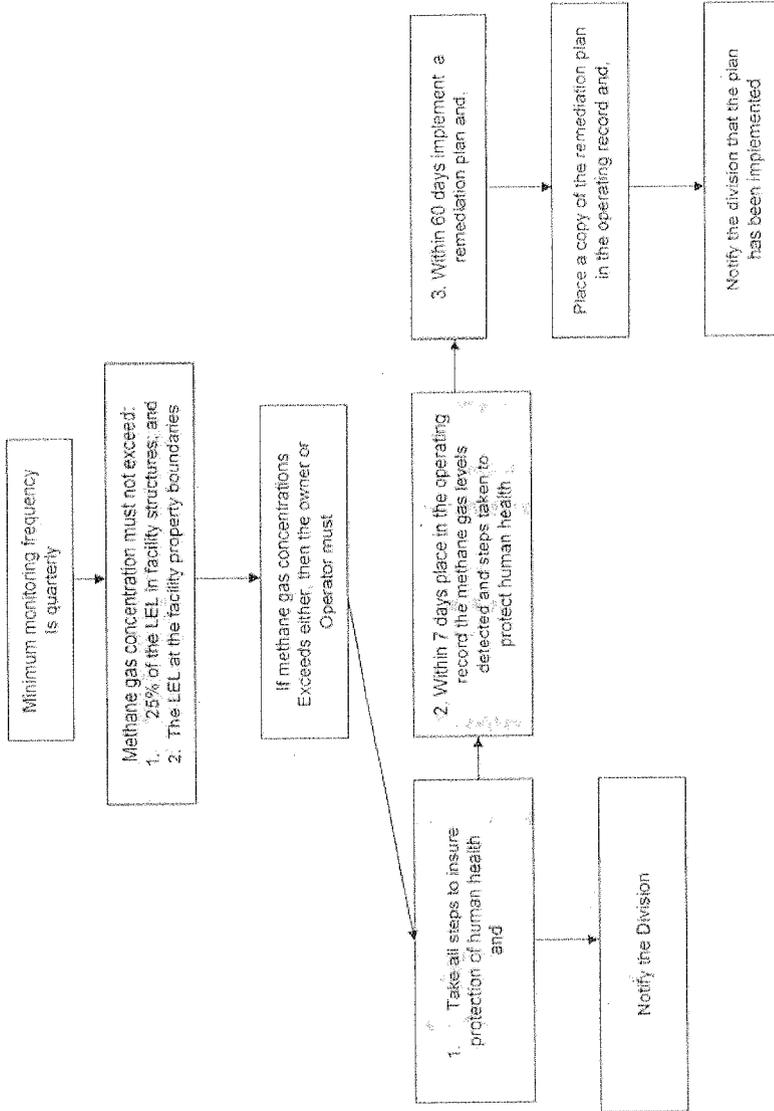
Instrument: _____

Calibration Date: _____

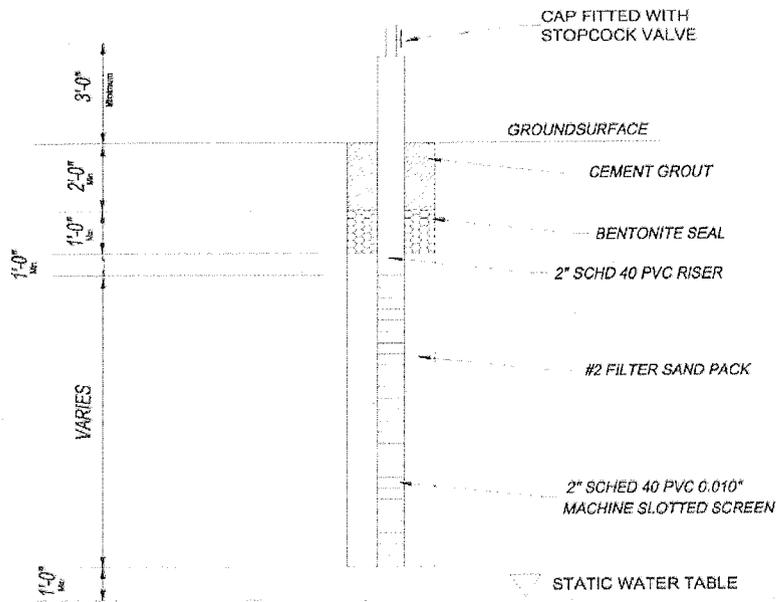
Methane Probe	CH4 (LEL)	O2 (%)	H2S (ppm)	CO2 (ppm)	Barometric Pressure	Comments
Baseline Reading						
MMP-1						
MMP-2						
MMP-3						
MMP-4						
MMP-5						
MMP-6						
MMP-7						
MMP-8						
MMP-9						
MMP-10						
<u>Structures</u>						
Animal Shelter						
Group Home						
Facility Services						

V MONITORING REQUIREMENT FLOWCHART

METHANE MONITORING REQUIREMENTS



VI PROBE CONSTRUCTION DETAIL



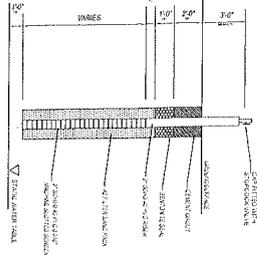
METHANE GAS MONITORING PROBE

Copied from NCDENR Guidance Document

VII SITE PLAN/PROBE LOCATIONS

LEGEND

- EXISTING CONTOURS
- - - PROPERTY LINE
- - - BUFFER ZONE
- - - PHASE LIMITS
- - - CREEK
- - - TIE LINE
- ⊙ MW-4 ADMINICING WELL
- ⊙ MW-1 SURFACE WATER LOCATION
- △ MW-2 METHANE PROBE



METHANE GAS MONITORING PROBE

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THIS GRAPHIC MAP WAS PROVIDED BY
DARRIN S. MILLER, P.E. ON 12/29/07
BY
MUNICIPAL ENGINEERING SERVICES, P.A.

NO.	DATE	BY	DESCRIPTION
1	12/29/07	DM	PROPOSED METHANE PROBE LOCATION MAP

**MUNICIPAL SOLID WASTE LANDFILL FACILITY
OLD CLOSED MSW LANDFILL
IREDELL COUNTY
NORTH CAROLINA**

LICENSE NUMBER: C-9281

Municipal Services  **Engineering Company, P.A.**

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