Taylor, Dianna

From: Matoska, Maria
Sent: Tuesday, February 16, 2016 3:53 PM
To: Taylor, Dianna; Leamons, Bryan
Subject: FW: Explosive Gas Monitoring Plan - Ozark Ridge
Attachments: EGMP-Ozark DRAFT 2016.pdf

From: Taylor, Jodi [mailto:jtaylo28@wm.com]
Sent: Tuesday, February 16, 2016 3:35 PM
To: Matoska, Maria
Cc: Jackson, Wendy; Walker, Austin; Phillips, David
Subject: Explosive Gas Monitoring Plan - Ozark Ridge

Hi, Maria! Attached please find the revised Explosive Gas Monitoring Plan for the **Ozark Ridge Landfill** for your review and approval. We had to make some minor revisions to the text of the document (i.e., the landfill was still referenced as Yell County) and the general format of the plan. Please do not hesitate to contact me should you have questions or require additional information. Thank you!

Jodi

Jodi Taylor
Environmental Protection Manager – Arkansas
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Waste is a resource. Waste Management captures value from waste streams by recycling and generating clean, renewable energy. Surprised? Learn how at www.wm.com.

Explosive Gas Monitoring Plan

Ozark Ridge Landfill
Danville, AR

Permit No. 0225-S1-R5
AFIN: 75-00046

February 2016

Prepared for:

Waste Management of Arkansas, Inc.
10140 Ozark Ridge Access Lane
Danville, Arkansas 72833
(479) 576-2776

Table of Contents

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Attachments

1.0 INTRODUCTION

This Explosive Gas Monitoring Plan for the Ozark Ridge Landfill (Facility) was prepared in general accordance with Regulation 22.415 of *Arkansas Regulation 22* and 40 CFR 258.23. According to EPA 40 CFR 258.23 and Regulation 22.415, owners and/or operators of permitted landfills must ensure that:

- The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit (LEL)[1] for methane in facility structures (excluding gas control or recovery system components); and
- The concentration of methane gas does not exceed the lower explosive limit for methane at the facility property boundary.

1.1 ADEQ Regulation 22

Section (c) of Regulation 22.415 states "the owner or operator of an existing or new facility shall prepare and submit to the Department for review and approval a gas monitoring plan demonstrating how the requirements of this section will be met. The plan shall include a preliminary action plan outlining immediate steps that will be taken to protect human health and safety should methane gas levels exceeding the limits specified in paragraph (a) of this section are detected. The plan shall include at a minimum the following information:

- Site specific factors affecting landfill gas migration;
- Site conditions, landfill history, site design and construction practices;
- Proximity and construction of on-site and off-site structures within 1/4 mile of the limits of refuse;
- Monitoring system design rationale and methodology that includes detailed location and design plans for in-soil gas probes; narrative description of rationale for location and depths of the gas probes; narrative, schedules and specifications for the construction of the probes and implementation of an approved monitoring routine;
- A description of the monitoring points in structures, and equipment locations;
- Monitoring procedures including permanent probe monitoring, barhole probe description, monitor calibration, recordkeeping, etc.

[1] "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.

2.0 SITE INFORMATION

The Facility currently owns, operates, and maintains a Class 1 Landfill facility (Ozark Ridge Landfill) which is located on a 445± tract of land southwest of Centerville, Arkansas. More specifically, the Facility is located in the following topographic quadrangle map location: Section 14, of Township 5 North, Range 21 West in Yell County, Arkansas.. The Class 1 Landfill operated under the Arkansas Department of Environmental Quality (ADEQ) Solid Waste Permit No. 022250-S1-R5, issued on July 16, 2004. The permitted waste disposal area is 147 acres.

2.1 Landfill History and Configuration

The Ozark Ridge Landfill was originally permitted to receive solid waste in November of 1979, and has subsequently expanded in phases over the years. A summary of expansion activities is presented in the table, below. In addition, a diagram of the Landfill is included as **Figure 1**.

Permit Number	Date Issued	Permit Action
0225-S	4.22.86	Construction of original landfill-32.6 acres
0225-SR-1	7.17.90	Name change from Yell Co. LF to Yell Co LF, Inc.
0225-S1-R2	9.25.93	Lateral expansion - increased to 42.5 acres
0225-S1-R3	6.13.00	Construction of Subtitle D liner over Phase 4 (trenches 1-17)
0225-S1-R4	7.31.03	Name change from Yell County to Ozark Ridge Landfill, Inc. WMA
0225-S1-R5	7.16.04	Lateral expansion-increase to 66 acres

2.2 Site-Specific Factors Affecting Landfill Gas Migration

The Ozark Ridge Landfill is positioned within the southern margins of the Arkoma Basin physiographic province, approximately five miles north of the Frontal Ouachita province. The site is located within the interior of the broad structural feature known as the Ranger Anticline. Regionally, Atoka sands and shales are present creating structurally positioned, long, linear ridges, trending generally east-west, with intervening narrow to broad valleys and floodplains, respectively.

Locally, stratigraphic and structural relationships are difficult to discern because of the lack of rock outcrop. Sufficient evidence exists, however, that suggests the ridges bounding the site are composed of near vertical sandstone beds with shale beds between ridges. The vertical orientation of the bedding is related either to folding and/or minor thrust faulting in the area.

2.3 Potential for Gas Migration

Because the design and construction of some of the existing Ozark Ridge Landfill waste disposal units predated Arkansas Regulation 22 and Subtitle D, a potential exists for lateral gas migration. However, the predominately clay and shale lithology beneath and adjacent to the site is expected to limit gas migration.

Because expansion areas are constructed with a composite liner system and the facility operates a landfill gas collection and control system (GCCS), the potential for gas migration from the site should be minimal. Additionally, the potential for gas migration to impact local residences is very unlikely as the surrounding land use is wood or used for pasture.

The probability for gas migration through the base liner system will increase during the post-closure period, as the entire landfill will have received final cover, thus restricting gas migration through the surface of the landfill. Anaerobic gas activity and associated pressure build up will increase initially during the post closure period and taper off as the waste material decomposes and the landfill stabilizes. The Facility's GCCS reduces the potential for subsurface migration of landfill gas from the waste disposal areas.

2.4 Proximity and Construction of Structures within ¼ Mile of Refuse Limits

The Ozark Ridge Landfill is located in a rural area approximately four miles south of Centerville, AR and four miles north of Ola, AR. The Landfill was first developed in 1985 on a tract of wooded land and pastureland. The area is sparsely populated with single-family residential dwellings and industry. The Landfill is adjoined to the north, east and west by wooded land and to the south by industrial development.

3.0 LANDFILL GAS MONITORING PROGRAM

Owners or operators of permitted landfills must implement a routine methane monitoring program to ensure that the standards provided in Section 1.0 are met. The type and frequency of monitoring must be determined based on the following factors:

- Soil conditions;
- The hydrogeologic conditions surrounding the facility;
- The hydraulic conditions surrounding the facility; and
- The location of facility structures and property boundaries.

Regular quarterly landfill gas monitoring has been performed at the Ozark Ridge Landfill and will continue throughout the active life of the Facility and during the post-closure period.

3.1 Monitoring System Design Rationale and Methodology

The accumulation of methane in MSWL structures can potentially result in fire and explosions that can endanger employees, users of the disposal site, and occupants of nearby structures, or cause damage to landfill containment structures. In accordance with 40 CFR 258.23 and *Arkansas Regulation 22*, the following information outlines the procedures that will be implemented at the facility to help ensure that hazardous/dangerous levels of methane are not exceeded at the facility property boundary and/or in structures on site.

- Quarterly monitoring for landfill related landfill gas in gas probes and landfill structures (methane);
- Immediate steps are to be taken to protect human health in the event of methane gas levels exceeding 25% of the LEL in the facility structures and/or the concentration of methane gas exceeds the LEL of methane at the facility property boundary (*Reg.22.415 (d)*);
- Immediate notification to the ADEQ if methane levels exceed 25% of the LEL in facility structures or the LEL at methane monitoring probes installed at the property boundary (see **Figure 1**) (*Reg.22.415 (d)*);
- Within seven days of detection, a letter will be submitted to the ADEQ summarizing the results and the emergency response action taken. A copy of the letter will be retained in the facility permanent operating record. The contingency plan, as outlined in later sections will be immediately implemented; and
- Within 60 days of detection, the facility will implement a corrective action plan for the methane gas migration, notify the ADEQ, and place a copy of the corrective action plan in the facility permanent operating record. The plan shall describe the nature and extent of the problem and the proposed remedy.

3.2 Methane Monitoring Points

As stated in Section 2.0, the Ozark Ridge Landfill monitors ten permanent gas probes located across the Facility. Gas Probes (GP) 2R, 3R, 4 and 5, as well as the maintenance barn (GP-10) are located in the northern portion of the Facility. GP-1 is situated in the western portion of the Facility. The eastern portion of the Landfill is monitored by GP-6, GP-7 and GP-9. GP-8 is located at the southern portion of the landfill area, near Stormwater Basin 2. The scalehouse is designated as GP-11. GP-12 is noted here to designated a future planned breakroom, as depicted on the Explosive Gas Monitoring Exhibit.

Gas Probe	Location Description
GP-1	Southwest corner of landfill, near entrance road
GP-2R	Northwest landfill boundary
GP-3R	North boundary of landfill
GP-4	North boundary of landfill
GP-5	Northeast corner of landfill area
GP-6	Eastern boundary of Cell 2
GP-7	Southeast corner of landfill area
GP-8	Southern portion of landfill, near basin 2
GP-9	Eastern boundary of Cell 2
GP-10	Maintenance Barn
GP-11	Scalehouse (portable building)
GP-12	Future breakroom (portable building)

3.3 Methane Monitoring Procedures

To demonstrate compliance with the requirements of 40 CFR 258.23, and *Arkansas Regulation 22*, the Facility routinely monitors air quality inside the scalehouse/office/breakroom, maintenance barn and other facility structure where methane gas could potentially accumulate. The person conducting the monitoring is trained in the proper use of the gas monitoring equipment, including calibration procedures. Prior to performing each quarterly landfill gas monitoring event, the qualified operator calibrates the methane detector and record the applicable weather conditions. WM has developed and trained gas technicians on Standard Operating Procedures (SOP) for explosive gas monitoring. A copy of the SOP is included as **Attachment 3**.

Monitoring within facility structures will consist of recording the concentration of methane (in % LEL) in each room of the facility utilizing an explosive gas analyzer calibrated to methane. When possible, readings are taken in enclosed areas, near electrical outlets, or floor drains, which could potentially be sites for landfill gas migration into the structure. At each location, the operator records the time, methane (% LEL), and oxygen (%). If no methane is detected in the room, a "non- detect (ND)" will be entered for that point on the landfill gas record form.

Routine sampling procedures are exercised at the 16 gas monitoring probe locations, and includes at

least the following procedures:

- Record the date, weather conditions, and monitoring equipment operator;
- Calibrate explosive gas analyzer to methane and oxygen;
- Inspect and record the integrity of gas probe;
- Unlock padlocks and take off the protective hood;
- Open the well or valve and allow the well sufficient time to equilibrate;
- Place explosive gas analyzer on the probe opening or place the end of the meter's input tube and record gas concentration in % LEL and % oxygen;
- Record gas and oxygen concentrations;
- Close well opening once all measurements have been completed; and
- Detach explosive gas analyzer and put protective hood casing back over the gas probe and secure casing with padlocks.

3.4 Landfill Gas Monitoring Equipment

Landfill gas measurements are collected at each location with an infrared gas monitoring instrument (Landtec GEM 500, an equivalent or better). The instrument is capable of recording the concentration of methane in "percent LEL". The instrument is calibrated to methane prior to each monitoring event as outlined in the equipment manufacturer's literature. Manufacturers' information and specifications associated with the landfill gas detection equipment is maintained in the facility permanent operating record and/or the LGMS system. This information includes calibration procedures and maintenance information that helps to ensure the equipment is in proper working condition.

4.0 CONTINGENCY PLANS

If methane gas levels exceeding the limits specified above are detected, the owner or operator must:

- Immediately take all necessary steps to insure protection of human health and notify the Arkansas Department of Environmental Quality (ADEQ) Director;
- Within seven days of detection, the owner/operator must place in the permanent operating record the methane gas levels detected and a description of the steps taken to protect human health;
- Within 60 days of detection, a remediation plan must be implemented for methane gas releases. The plan shall describe the nature and extent of the problem and the proposed remedy. This plan must be submitted to ADEQ for review and approval. Also a copy of the plan must be retained in the permanent operating record; and
- The Director may establish alternative schedules for demonstrating compliance with these regulations. For the purposes of this program, the lower explosive limit means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25 degrees Celsius and atmospheric pressure.


FINAL COVER IN PLACE
(3.5 ACRES)
FINAL COVER IN PLACE
(6.5 ACRES)
GP-4
GP-3R
GP-10
FUEL STORAGE
LFG FLARE
STATION
GP-5
PASSIVE GAS
COLLECTION
SYSTEM
NORTH
N.T.S.
PET
SOLUTIONS
GP-2R
MW-10R
PHASE 2
PHASE 1
001A
STORMWATER
BASIN NO. 1
MW-11R
PHASE 3
PHASE 4
CELL 1A
(2007)
(4.5 Acres)
GP-9
003A
STORMWATER
BASIN NO. 3
GP-6
ZONE H
ZONE G
ZONE F
ZONE E
ZONE D
ZONE C
ZONE B
ZONE A
GP-11
CELL 1B
(6.0 Acres)
LEACHATE
STORAGE
TANKS
GP-12
(FUTURE BLDG.)
MW-12R
CELL 4
(4.1 Acres)
CELL 3
(2014)
(4.3 Acres)
CELL 2
(2012)
(6.3 Acres)
CELL 5
(6.3 Acres)
GP-1
OFFICE /
SCALEHOUSE
GP-8
GP-7
002A
EXISTING WETLAND
LEGEND - ENVIRONMENTAL MONITORING
GROUNDWATER MONITORING WELLS (5)
LANDFILL GAS MONITORING PROBES (9)
SURFACE WATER MONITORING POINTS (1)
LEACHATE INJECTION WELLS - NESTED PAIRS (4)
OZARK RIDGE LANDFILL
JANUARY 15, 2015 AERIAL PHOTO
WASTE MANAGEMENT OF ARKANSAS
Ozark Ridge Landfill
Explosive Gas Monitoring Exhibit

Attachment A

Landfill Gas Monitoring Record Form

Monitoring Forms are automatically generated from LGMS when data is downloaded into the program.

Attachment B
Landfill Gas Probe As-Builts

GEC GENESIS ENVIRONMENTAL CONSULTING, INC.
11400 West Baseline Road
Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-1 PAGE: 1 of 2

TOTAL DEPTH: 32.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: YELL COUNTY LANDFILL
JOB NO.: 062-019-02067-002	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: BILL SADLER	DRILLER: GARRY MOYERS
DATE DRILLED: 9/4/02	RIG TYPE: CME-55

DRILLING METHOD: SOLID FLIGHT AUGERS (6 1/4" OD)

SAMPLING METHOD: CUTTINGS

N: E: TOC:

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
				TOC (BELOW VALVE) 2.9' ABOVE GROUND SURFACE	VALVE
0		Silty Clay, brown, with small amount of angular sandstone gravel, moist		1" pvc riser pipe 2.9' AGS to 2.5' BGS Concrete 0 to 0.5' BGS Bentonite 0.5 to 1.8' BGS	
5		- tan, slightly moist		Groundwater level rose to 7.3' BGS. See note at bottom	▽
10				Pea Gravel 1.8 to 33' BGS 1" pvc pipe with drilled holes 2.5 to 30' BGS	
15		- hard layer			
20		- weathered shale fragments			

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-1 PAGE: 2 of 2

TOTAL DEPTH: 32.5 FEET BELOW GROUND SURFACE (BGS)

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol		Well Comments	Well Construction
		Shale, gray, soft, slightly moist, easy drilling				
		- hard layer				
30		- moist				
		Total Borehole Depth = 32.5'				
		Note: No wet cuttings or water on auger as pulled out of borehole. However, the following day groundwater level was 7.3' BGS				
35						
40						
45						
50						
55						

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-2 PAGE: 1 of 1

TOTAL DEPTH: 18.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: YELL COUNTY LANDFILL
JOB NO.: 062-019-02067-003	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: BILL SADLER	DRILLER: GARRY MOYERS
DATE DRILLED: 9/4/02	RIG TYPE: CME-55

DRILLING METHOD: SOLID FLIGHT AUGERS (6 1/4" OD)

SAMPLING METHOD: CUTTINGS

Depth BGS	Sample Interval	N: E: TOC: DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
				TOC (BELOW VALVE) 2.9' ABOVE GROUND SURFACE	VALVE
0		Silty Clay, brown, moist		1" pvc riser pipe 2.9' AGS to 2.5' BGS	
		- tan with shale fragments		Concrete 0 to 0.5' BGS	
5				Bentonite 0.5 to 2' BGS	
				Pea Gravel 2 to 18.5' BGS	
10				1" pvc pipe with drilled holes 2.5 to 18.5' BGS	
				Groundwater level rose to 12.2' BGS. See note at bottom	▽
15					
		Shale, gray, soft, slightly moist, easy drilling			
20		- harder drilling 20 to 21' BGS			
		Total Borehole Depth = 23'		Slough 18.5 to 23' BGS	
		Note: No wet cuttings or water on auger as pulled out of borehole. However, the following day groundwater level was 12.2' BGS			

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-3 PAGE: 1 of 1

TOTAL DEPTH: 21 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: YELL COUNTY LANDFILL
JOB NO.: 062-019-02067-004	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: BILL SADLER	DRILLER: GARRY MOYERS
DATE DRILLED: 9/4/02	RIG TYPE: CME-55

DRILLING METHOD: SOLID FLIGHT AUGERS (6 1/4" OD)

SAMPLING METHOD: CUTTINGS

N: E: TOC:

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
				TOC (BELOW VALVE) 2.7' ABOVE GROUND SURFACE	VALVE
0		Clay with gravel, light brown, moist		1" pvc riser pipe 2.7' AGS to 2.5' BGS Concrete 0 to 0.5' BGS	
5		Sandstone, brown to white, highly cemented, hard drilling		Bentonite 0.5 to 2' BGS	
		Weathered shale, dark brown, soft, moist to slightly moist, easy drilling		Groundwater level rose to 5.9' BGS. See note at bottom Pea Gravel 2 to 21' BGS 1" pvc pipe with drilled holes 2.5 to 20' BGS	
10					
15					
		Shale, gray, soft, slightly moist, easy drilling			
20		Total Borehole Depth = 23'		Slough 21 to 23' BGS	
		Note: No wet cuttings or water on auger as pulled out of borehole. However, the following day groundwater level was 5.9' BGS			

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-4 PAGE: 1 of 2

TOTAL DEPTH: 32 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: YELL COUNTY LANDFILL
JOB NO.: 062-019-02067-005	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: BILL SADLER	DRILLER: GARRY MOYERS
DATE DRILLED: 9/4/02	RIG TYPE: CME-55

DRILLING METHOD: SOLID FLIGHT AUGERS (6 1/4" OD)

SAMPLING METHOD: CUTTINGS

Depth BGS	Sample Interval	N: E: TOC: DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
				TOC (BELOW VALVE) 2.7' ABOVE GROUND SURFACE	VALVE
0		Gravelly Clay, light brown, moist, gravel is broken angular sandstone		1" pvc riser pipe 2.7' AGS to 2.5' BGS Concrete 0 to 0.5' BGS Bentonite 0.5 to 2.5' BGS	
5		Clay, tan, moist, few shale fragments		Groundwater level rose to 8.1' BGS. See note at bottom	
10		Weathered shale, gray, soft, slightly moist		Pea Gravel 2.5 to 32' BGS 1" pvc pipe with drilled holes 2.5 to 30' BGS	
15					
20					
		Shale, dark gray to black, competent, moist			

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-4 PAGE: 2 of 2

TOTAL DEPTH: 32 FEET BELOW GROUND SURFACE (BGS)

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol		Well Comments	Well Construction
30						
		Total Borehole Depth = 32' Note: No water or wet cuttings came to surface during drilling. However, the bottom 11 feet of auger was wet when pulled out of borehole. The following day, the groundwater level was 8.1' BGS.				
35						
0						
45						
50						
55						

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FIELD BORING LOG

BORING NO.: GP-5 PAGE: 1 of 2

TOTAL DEPTH: 39 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: YELL COUNTY LANDFILL
JOB NO.: 062-019-02067-006	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: BILL SADLER	DRILLER: GARRY MOYERS
DATE DRILLED: 9/4/02	RIG TYPE: CME-55

DRILLING METHOD: SOLID FLIGHT AUGERS (6 1/4" OD)

SAMPLING METHOD: CUTTINGS

N: E: TOC:

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
				TOC (BELOW VALVE) 3.0' ABOVE GROUND SURFACE	VALVE
0		Alternating beds of shale, siltstone, and sandstone. Clay - light brown, moist. Alternating easy and hard drilling		1" pvc riser pipe 3.0' AGS to 2.5' BGS Concrete 0 to 0.5' BGS Bentonite 0.5 to 2.4' BGS	
5					
10				Pea Gravel 2.4 to 39' BGS 1" pvc pipe with drilled holes 2.5 to 39' BGS	
		Clay, weathered shale, tan, slightly moist, easy drilling			
15					
20		- sandstone layer 20.5 to 21' BGS. Very hard drilling. Then returned to clay/weathered shale			

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FIELD BORING LOG

BORING NO.: GP-5 PAGE: 2 of 2

TOTAL DEPTH: 39 FEET BELOW GROUND SURFACE (BGS)

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol		Well Comments	Well Construction
30		- dark brown, less weathered shale			Groundwater level rose to 34' BGS. See note at bottom	▽
35		Shale, gray, slightly moist, harder drilling			Slough 39 to 43' BGS	
40		Total Borehole Depth = 43'				
45		Note: no wet cuttings or water on auger as pulled out of borehole. However, the following day, groundwater level was 34.0' BGS				
50						
55						

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-6 PAGE: 1 of 2

TOTAL DEPTH: 42 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: YELL COUNTY LANDFILL
JOB NO.: 062-019-02067-007	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: BILL SADLER	DRILLER: GARRY MOYERS
DATE DRILLED: 9/5/02	RIG TYPE: CME-55

DRILLING METHOD: SOLID FLIGHT AUGERS (6 1/4" OD)

SAMPLING METHOD: CUTTINGS

N: E: TOC:

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
				TOC (BELOW VALVE) 2.4' ABOVE GROUND SURFACE	VALVE
0		Clay, light brown, with angular sandstone and siltstone gravel fragments, moist - orange red		1" pvc riser pipe 2.4' AGS to 2.5' BGS Concrete 0 to 0.5' BGS Bentonite 0.5 to 1.9' BGS Pea Gravel 1.9 to 42' BGS 1" pvc pipe with drilled holes 2.5 to 40' BGS	
10		Weathered shale/clay, tan, moist, easy drilling		Groundwater level rose to 14.1 BGS. See note at bottom	
20		- moderate amount of siltstone/ sandstone within shale between 2 and 30' BGS			

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-6 PAGE: 2 of 2

TOTAL DEPTH: 42 FEET BELOW GROUND SURFACE (BGS)

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
30		Shale, gray, soft, slightly moist			
35		- moist			
		- wet		Slough 42 to 44' BGS	
45		Total Borehole Depth = 44'			
		Note: Wet cuttings were seen only near end of borehole while drilling. However, the bottom 22 feet of auger was wet when pulled out of borehole. The following day, the groundwater level was 14.1' BGS			
50					
55					

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-7 PAGE: 1 of 1

TOTAL DEPTH: 21 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: YELL COUNTY LANDFILL
JOB NO.: 062-019-02067-008	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: BILL SADLER	DRILLER: GARRY MOYERS
DATE DRILLED: 9/5/02	RIG TYPE: CME-55

DRILLING METHOD: SOLID FLIGHT AUGERS (6 1/4" OD)

SAMPLING METHOD: CUTTINGS

N: E: TOC:

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
				TOC (BELOW VALVE) 2.3' ABOVE GROUND SURFACE	VALVE
0		Clay soil, brown, moist		1" pvc riser pipe 2.3' AGS to 2.5' BGS	
		Clay, orange-red, moist		Concrete 0 to 0.5' BGS	
5				Bentonite 0.5 to 2.1' BGS	
				Groundwater level rose to 8.8 BGS. See note at bottom	▽
10				Pea Gravel 2.1 to 21' BGS	
		Weathered shale, light brown, soft, slightly moist		1" pvc pipe with drilled holes 2.5 to 20' BGS	
15					
20		Note: No wet cuttings or water on auger as pulled out of borehole. However, the following day, groundwater level was 8.8' BGS		Slough 21 to 25' BGS	
		Total Borehole Depth = 25'			

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Little Rock, AR 72209

FIELD BORING LOG

BORING NO.: GP-8 PAGE: 1 of 2

TOTAL DEPTH: 31 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: YELL COUNTY LANDFILL
JOB NO.: 062-019-02067-009	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: BILL SADLER	DRILLER: GARRY MOYERS
DATE DRILLED: 9/4/02	RIG TYPE: CME-55

DRILLING METHOD: SOLID FLIGHT AUGERS (6 1/4" OD)

SAMPLING METHOD: CUTTINGS

Depth BGS	Sample Interval	N: E: TOC: DESCRIPTION	Litho. Symbol	Well Comments	Well Construction
				TOC (BELOW VALVE) 2.4' ABOVE GROUND SURFACE	VALVE
0		Silty Clay, tan, with sandstone and shale fragments, moist		1" pvc riser pipe 2.4' AGS to 2.5' BGS Concrete 0 to 0.5' BGS Bentonite 0.5 to 2' BGS Pea Gravel 2 to 31' BGS 1" pvc pipe with drilled holes 2.5 to 30' BGS	
5					
10		- end of sandstone fragments			
15				Groundwater level rose to 15.2 BGS. See note at bottom	▽
20		Shale, gray, weathered, soft, slightly moist			

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FIELD BORING LOG

BORING NO.: GP-8 PAGE: 2 of 2

TOTAL DEPTH: 31 FEET BELOW GROUND SURFACE (BGS)

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol		Well Comments	Well Construction
30					Slough 31 to 34' BGS	
35		Total Borehole Depth = 34' Note: No wet cuttings or water on auger as pulled out of borehole. However, the following day, groundwater level was 15.2' BGS				
40						
45						
50						
55						

LOG OF WELL NO. GP-9

CLIENT **Waste Management**

SITE **Yell County, Centerville, Arkansas**

PROJECT **Ozark Ridge Landfill**

Boring Location: North of GP-6

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	0.5 **FILL: SILTY CLAY** brown, dry				FA					
	FILL: SILTY CLAY red, dry	5			FA					
	10.5 **SILTY CLAY** tan, dry	10			FA					
	20	15								
	BOTTOM OF BORING AT 20 FEET	20								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi).

WATER LEVEL OBSERVATIONS, ft		
WL	▽ DRY	▼
WL	▼	▼
WL		

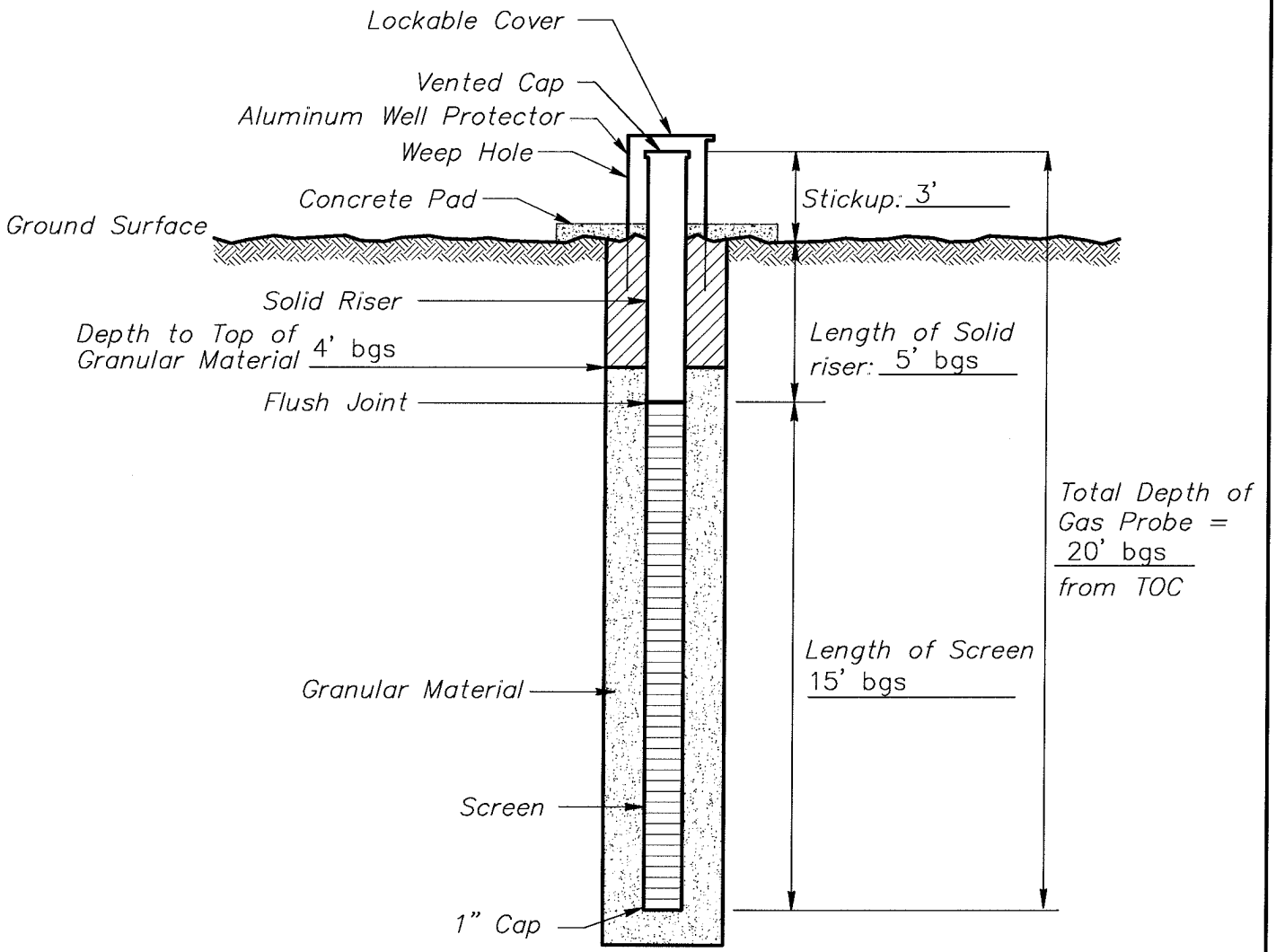
Terracon

BORING STARTED	1-22-07		
BORING COMPLETED	1-22-07		
RIG	Simco 2400	FOREMAN	DS
APPROVED	RF	JOB #	35077006

BOREHOLE 99 35077006.GPJ TERRACON.GDT 1/25/07

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT - OZARK RIDGE Well Number GP-9
Installation Date 1/22/07 Location OZARK RIDGE LANDFILL
Datum Elevation N/A Surface Elevation N/A
Screen Diameter & Material 1" PVC Borehole Diameter 4.25"
Riser Diameter & Material 1" PVC Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL Northing N/A Easting N/A
Drilling Method FLIGHT AUGER Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

Terracon
Consulting Engineers and Scientists
11400 WEST BASELINE ROAD LITTLE ROCK, AR. 72209
PH. (501) 455-2199 FAX. (501) 455-4547

GAS PROBE INSTALLATION RECORD
PROJECT NUMBER: 3062-019-5077006
WELL NUMBER: GP-9
DRAWING NUMBER: 001 CHECKED BY: RF

Attachment C

WM Landfill Gas Migration Monitoring SOP (SOP-LFG-1)

WASTE MANAGEMENT **SOP-LFG-1**	**Landfill Gas Migration Monitoring** **Standard Operating Procedure**	**Rev:** 0 **Date:** 1/08/2013

Application: Use this as the standard operating procedure (SOP) to obtain LFG migration monitoring readings from within the vadose zone in soil at established points. Monitoring points may also include structures in addition to permanent probes or bar hole probes at the perimeter of the facility (or other regulatory point).

General Description: Federal Regulations 40 CFR 258.23 and State regulations promulgated under Subtitle D require solid waste disposal facilities to control lateral migration of gas (methane). WM LFG migration monitoring is to be performed using this standard procedure unless otherwise stipulated by site specific permit conditions or other state/provincial regulations or requirements.

General Requirements:

40 CFR 258.23 includes several key requirements:

- Minimum frequency of monitoring shall be quarterly, unless site-specific permits specify otherwise. ***To prevent missed events, do not wait until the last month of the quarter to perform the monitoring.***
- Take immediate steps to protect human health in the event methane levels in structures exceed 25% of the LEL (1.25% methane by volume). Immediately evacuate personnel within the structure and notify the site manager and MAGOM and implement contingency plans. It is required that the agency be notified of such an occurrence, by the appropriate WM personnel, within the mandated timeline (*Check site permit for mandated reporting requirements to the regulator.*).
- The limit for methane detection at the property boundary is 100% of the LEL (5% methane by volume). Notify the appropriate site management, EP and MAGOM immediately when levels meet or exceed this value. It is a requirement that the agency be also be notified of such an occurrence, by the appropriate WM personnel, within the mandated timeline.
- WM approved LFG monitoring instruments are the CES-LANDTEC GEM-2000 and GEM-5000 or WM approved alternative. Alternative instruments must be approved in writing by the appropriate Corporate GOM.
- All migration monitoring data, regardless of purpose, shall be uploaded to LGMS in accordance with the Landfill Gas Management System (LGMS) and Data Collection Policy.

The following parameters shall be monitored and uploaded to LGMS whenever migration monitoring occurs:

- Identification of person taking the reading
- Identification of person uploading the readings to the LGMS

- Date and Time of Reading
- Barometric Pressure (1 Time/Reading Day)
- Ambient Temperature (1 Time/Reading Day)
- Precipitation (1 Time/Reading Day)
- Wind Direction (1 Time/Reading Day)
- Instrument Identification
- All other monitored parameters
- Appropriate Comments

Up to five questions can be pre-programmed into the GEM instrument to allow for monitoring for VOCs, H_2S, water levels, etc. as required by permit.

Appropriate comments shall be included with each reading. Typical comments include, but are not limited to, signs of vegetation damage or stress, ground cover and soil conditions (e.g. snow, frozen ground, saturated soil, etc.), audible or visual indications of gas venting (especially in standing water), and the presence of water and level within the probe where required.

As a means to prevent missed readings and to promote an efficient field event, it is important to properly sequence the monitoring order of points within LGMS (prior to the monitoring event).

Probe Monitoring:

Note: Each probe must have a proper sampling port installed to allow readings for methane without air intrusion (see Typical LFG Monitoring Probe Drawing No. P-9 of the GCCS Design & Installation Guidance Manual and associated detail included herewith). If it is required (by permit or regulation) to determine the pressure at the probe, the probe must have a petcock type ball valve or quick connect coupling be installed on the cap. Grainger Item No. 3CGK1 and 3CGP5 are recommended if clearance tolerances allow within the protective casing. The Landtec quick coupling-Female (Part No. 3-00000-1201) with vinyl cap (Part No. 3-00000-0215) is allowed if preferred. If the water level is required, it shall be measured after all other measurements are taken. Bubbler tubes such as those provided in the attached detail are the preferred system for measuring water levels due to ease and accuracy. The QED Digital Level Meter (cut sheet attached) is the preferred device for use with the bubbler tubing to depths of 80 feet. Refer to the attached table for state specific water level monitoring requirements.

1. All migration monitoring probes shall be designated as “Probes” within LGMS.
2. Upload relevant site probe IDs to the GEM in GA mode prior to departure to the field.
3. Calibrate the GEM (or other approved instrument) in accordance with manufacturer’s recommendations. For GEM devices, use 15% methane calibration gas as this provides increased low range accuracy. For other approved instruments, the calibration gas concentration shall be approximately 10 – 20% methane unless the manufacturer’s recommendations state otherwise.
4. After calibration is complete, document calibration zero and span accuracy by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Configure specific “Sample Port” IDs in LGMS for this purpose. Suggested ID names are FRESHAIR for air and CAL15CH4 for 15% methane calibration gas.

5. Set the GEM to Gas Analyzer (GA mode) for all probe measurements. This mode measures and stores the relative pressure within the probe prior to starting the sampling so an accurate pressure measurement is obtained. Do not use the GEM mode when measuring probes. A water trap and new (each day) carbon filter are required to protect instrumentation from damage and to remove trace compounds such as ethane that can cause inaccurately high methane measurements.
6. Inspect the probe and area around the probe for hazards or issues such as broken or worn components, damage, safety hazards, or signs of subsurface LFG migration. Include any issues in the reading comments.

7. Connect the sample hose (with carbon filter and water trap) to the instrument. Purge the instrument and sample hose with fresh air and select the appropriate probe ID.

8. Connect the sample hose to the probe sample point and ensure the hose is securely attached to the fitting. **Do not connect the sample hose to the sampling point of the probe before connecting to the instrument as this could release pressure and LFG from the probe and prevent proper monitoring.**

9. Open the petcock valve on the sample point. As soon as the valve is opened, the relative/static pressure reading will be displayed on the instrument. Allow 5-10 seconds for the pressure to stabilize before starting the sample pump. The instrument (in GA mode) automatically stores the relative pressure before starting the sample pump. **The relative pressure reading will not change while the sample is taken.** When the pressure is stabilized, start the pump.
10. Observe the methane values visible on the GEM (if any) and allow readings to stabilize. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** A stable reading should occur within 90 seconds.

Note: The US EPA and many states stipulate that purging the probe is not necessary due to the small volume of the probe and, because methane is lighter than air, it collects in the head space of the probe. However, some states and other regulatory jurisdictions require purging. The standard WM procedure is not to purge the probe unless stipulated by regulation, permit, or other similar requirement because this simulates LFG buildup within a closed space and is therefore a more conservative approach. Refer to the attached table for state specific purging requirements.

11. If required, measure the water level within the probe and record the value using a pre-programmed question in the GEM. Use caution to prevent any cross-contamination between probes from contaminated water level detection devices. Bubbler tube use is recommended as noted above.
12. Some states require the instrument calibration to be verified at the end of the day to help ensure accurate readings. If required, document calibration zero and span accuracy at the end of the day by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Use the same "Sample Port" IDs as for the original calibration documentation. Refer to the attached table for state specific

requirements regarding end of day calibration checks.

13. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. If methane concentrations of 5% by volume (100% of the LEL) or greater were measured, promptly notify site management, EP and the MAGOM.
14. DO NOT resume monitoring of LFG wells until another calibration of the device is performed using 50% methane.

Structure Monitoring:

BMP-LFG-104 clarifies when fixed Building Monitors should be incorporated within site structures. Sufficient building monitors may preclude the need for additional monitoring with the GEM (or other approved instrument). Building Monitor calibration checks are required per manufacturer's recommendations. Records documenting Building Monitor calibration and any detections of methane are to be maintained and uploaded to the "Documents" page within LGMS no less frequently than quarterly.

Where required (and when Building Monitors are not in place), methane gas accumulation shall be monitored within areas where LFG is likely to enter and collect within the structure such as confined areas, corners, crawl spaces, attics, underground utility runs, sumps, and underground utility penetrations.

1. LGMS IDs shall be established for each monitoring location within each structure to enable proper documentation within LGMS and to prevent missed readings.
2. All monitoring locations shall be designated as "Sample Ports" within LGMS.
3. Sequence the monitoring locations order within LGMS to aid in the field and as a means to prevent missed points.
4. Upload relevant site IDs to the GEM in GA mode prior to departure to the field.
5. When monitoring combustible gas in buildings or structures, use the rigid probe attachment to the GEM as appropriate to allow easy access to narrow spaces.
6. Calibrate the GEM (or other approved instrument) in accordance with manufacturer's recommendations. For GEM devices, use 15% methane calibration gas as this provides increased low range accuracy. For other approved instruments, the calibration gas concentration shall be approximately 10 – 20% methane unless the manufacturer's recommendations state otherwise.
7. After calibration is complete, document calibration zero and span accuracy by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Configure specific "Sample Port" IDs in LGMS for this purpose. Suggested ID names are FRESHAIR for air and CAL15CH4 for 15% methane calibration gas.
8. Set the GEM instrument to GA mode. A water trap and new (each day) carbon filter are required to protect instrumentation from damage and to remove trace compounds such as ethane that can cause inaccurately high methane measurements.
9. Initiate monitoring and observe the methane values on the GEM (if any). Allow enough time for readings to stabilize at each monitoring point. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note that the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed. **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** When actually sampling a crack or joint in a structure or performing a "floor scan", stop and let the device process the sample prior to moving to the next sampling

location. A stable reading should occur within 90 seconds.

10. Take immediate steps to protect personnel if methane levels exceeding 25% of the LEL (1.25% methane by volume) are detected. Immediately evacuate all personnel from within the structure. Do not turn any lights or other electrical equipment on or off or use the telephone. After the building has been evacuated and you are outside, use your cell phone or a telephone within another structure to immediately notify the site manager, EP and MA GOM.
11. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. Provide any required notifications to site management, EP and the MAGOM.
12. DO NOT resume monitoring of wells until another calibration of the device is performed using 50% methane.

Bar Hole Monitoring:

Note: Bar hole probing is performed using a plunger bar to drive a small diameter hole to a depth of about 3 feet into the ground. **Use caution to ensure areas to be monitored have no underground utilities or other hazards prior to performing the work.** Bar hole punching requires soils conducive to this technique such as sands, sandy loams and some silty soils without high amounts of clay or rock. Bar hole probe readings are typically performed near structures or along the perimeter of a landfill to determine whether landfill gas is migrating off site. It may also be useful to confirm landfill gas migration in areas with stressed vegetation, as "burned out" areas may be indications of landfill gas migration near the surface.

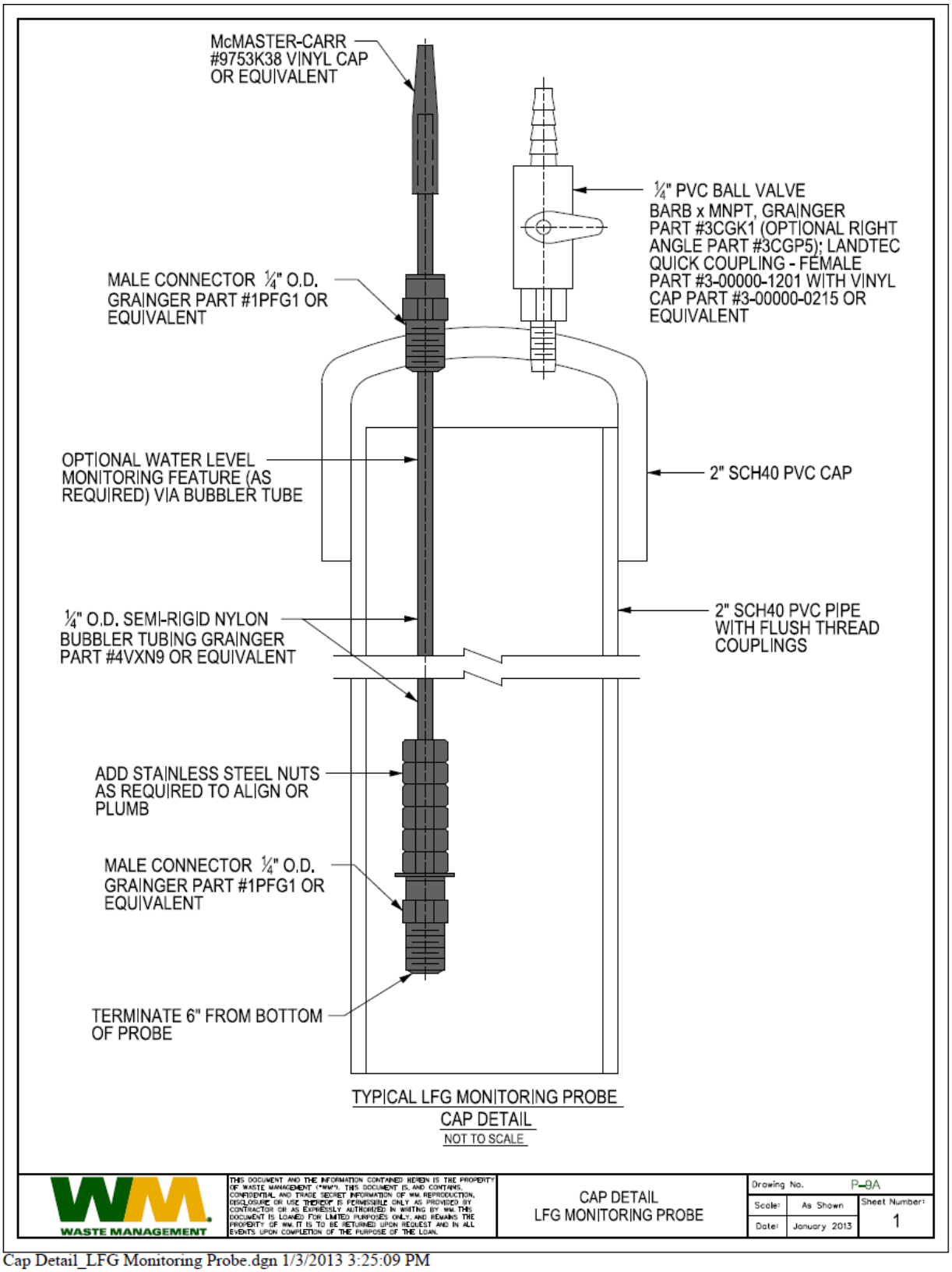
1. Create the bar hole at the desired location using a commercially available (from companies such as Forestry Suppliers, Inc.) "slide", "punch", "slam" or "drive" bar (such as the Geoprobe Manual Slide Hammer) or fence post driver (Grainger Part No. 4LVN8) with a ½ inch diameter rod or using the GASTEC Model No. 361 boring rod (33.5 inches long). If this location is to be monitored more than once, it may prove helpful to insert a nominal ½ inch diameter plastic PVC pipe (cut 12-18 inches in length) into the hole. The pipe will readily accept a compression type, expanding, rubber stopper to provide an air tight seal at the top.
2. Follow Probe Monitoring steps 1-8 listed above. However, to sample the hole for the presence of methane, remove the plunger bar and immediately insert the sample probe for the GEM (or other approved instrument). Seal the surface around the sample probe to minimize air infiltration into the bar hole using an appropriately sized rubber stopper with a sample probe inserted through the center of the rubber stopper. Once sealed, immediately start the sampling.
3. Start the instrument sample pump and observe the methane values visible on the GEM (if any) and allow readings to stabilize. **Note: Use caution with respect to liquids entering the tubing as the GEM will be seriously damaged if liquid enters the instrument.**
4. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note that the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed. **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** A stable reading should occur within 90 seconds. Some states require the instrument calibration to be verified at the end of the day to help ensure accurate readings. If required, document calibration zero and span accuracy

at the end of the day by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Use the same "Sample Port" IDs as for the original calibration documentation. Refer to the attached table for state specific requirements regarding end of day calibration checks

5. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. If methane concentrations of 5% by volume (100% of the LEL) or greater were measured, promptly notify site management, EP and the MAGOM.
6. DO NOT resume monitoring of LFG wells until another calibration of the device is performed using 50% methane.

Reference/Links:

- **Landfill Gas Management System (LGMS) and Data Collection Policy**
- **BMP-LFG-104 Building Monitors**
- **Site Specific LFG Migration Monitoring Plans**



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EASY LEVEL

Liquid Level Measurement for Landfill Gas Wells with Digital Level Meter

Safe and easy measurement of liquid height in landfill gas wells, even under vacuum or pressure conditions.

The Digital Level Meter allows you to easily and accurately measure liquid levels in gas wells equipped with an Easy Level Indicator or a down-well bubbler tube. There is no need to open the well to take a reading, so gas collection is not stopped and workers are not exposed to gas or leachate.

The Digital Level Meter is capable of measuring liquid depths up to 100 ft. above the liquid level probe, and automatically compensates for pressure or vacuum conditions above the liquid. The light-weight hip pack also houses a small compressor powered by a rechargeable, removable battery. A spare battery and AC battery charger are provided. The entire unit weighs only 9lbs. and includes an adjustable shoulder strap.

To measure the liquid level, the Digital Level Meter's quick connect fittings are attached to the ports of an Easy Level Indicator or a dedicated bubbler tube, and the meter's air source is then activated. The level meter displays the liquid depth over the probe, without false readings in foaming wells.

Digital Level Meter Advantages:

- Compact and light-weight
- Rechargeable batteries
- No air enters the well
- Gas collection is not interrupted
- No false readings in foaming wells
- Easily transported from well to well
- Personnel are not exposed to landfill gases or leachate
- Accuracy is not affected by vacuum or pressure in the well

QED Environmental Systems

P.O. Box 3726 Ann Arbor, MI 48106-3726 USA • Phone (800) 624-2026 • Fax (734) 995-1170
info@qedenv.com • www.qedenv.com

Federal Regulations For Explosive Gas Monitoring

§ 258.23 Explosive gases control.

(a) Owners or operators of all MSWLF units must ensure that:
   1) The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit for methane in facility structures (excluding gas control or recovery system components); and
   2) The concentration of methane gas does not exceed the lower explosive limit for methane at the facility property boundary.

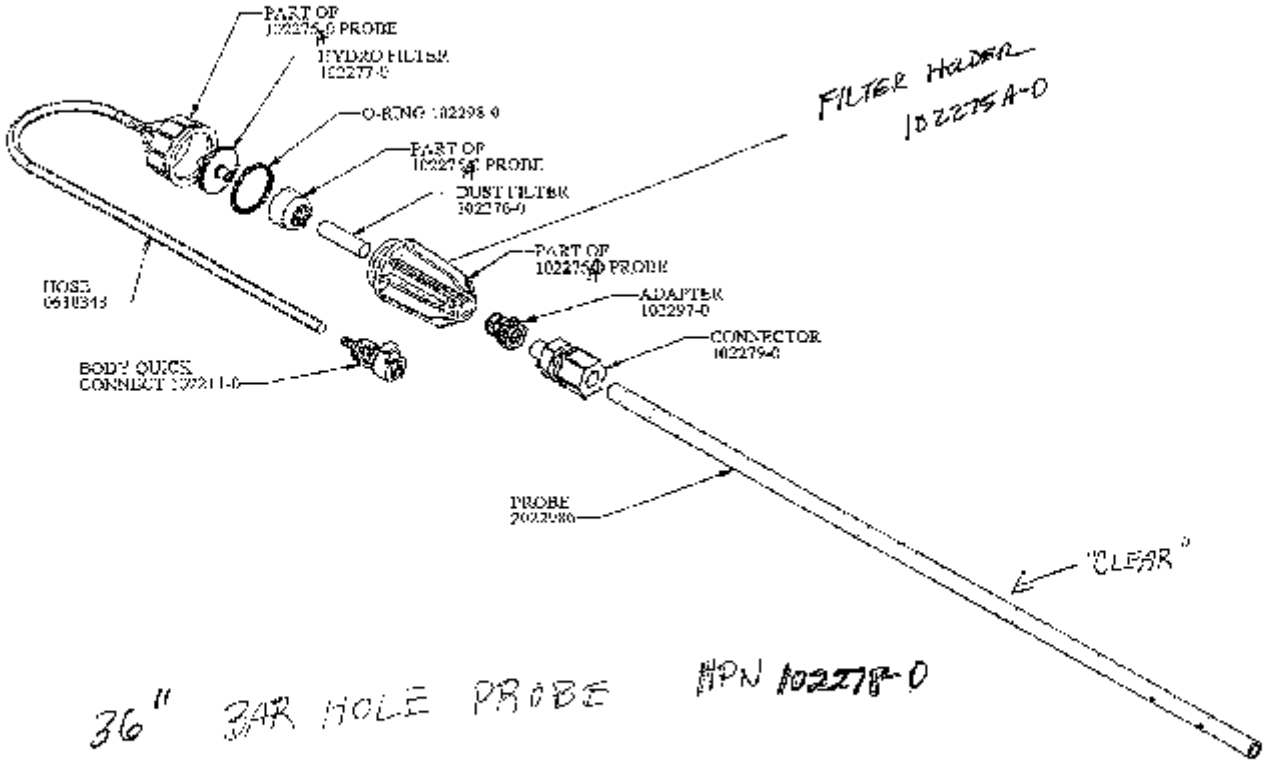
(b) Owners or operators of all MSWLF units must implement a routine methane monitoring program to ensure that the standards of paragraph (a) of this section are met.
   1) The type and frequency of monitoring must be determined based on the following factors:
      i. Soil conditions;
      ii. The hydrogeologic conditions surrounding the facility;
      iii. The hydraulic conditions surrounding the facility; and
      iv. The location of facility structures and property boundaries.
   2) The minimum frequency of monitoring shall be quarterly.

(c) If methane gas levels exceeding the limits specified in paragraph (a) of this section are detected, the owner or operator must:
   1) Immediately take all necessary steps to ensure protection of human health and notify the State Director;
   2) 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
   3) 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 State Director that the plan has been implemented. The plan shall describe the nature and extent of the problem and the proposed remedy.
   4) The Director of an approved State may establish alternative schedules for demonstrating compliance with paragraphs (c) (2) and (3) of this section.

(d) For purposes of this section, *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.

(e) The Director of an approved State may establish alternative frequencies for the monitoring requirement of paragraph (b)(2) of this section, after public review and comment, for any owners or operators of MSWLFs that dispose of 20 tons of municipal solid waste per day or less, based on an annual average. Any alternative monitoring frequencies established under this paragraph must:
   1) Consider the unique characteristics of small communities;
   2) Take into account climatic and hydrogeologic conditions; and
   3) Be protective of human health and the environment.

[56 FR 51016, Oct. 9, 1991, as amended at 62 FR 40713, July 29, 1997]



36" BAR HOLE PROBE MPN 102278-0

State or Province Specific LFG Migration Monitoring Requirements (current on 11/1/12)

State or Province	Regs?	Guidance	Purge	Water Levels?	End of Day Calibration Check?	Notes:
AL	YES	NO	NO	NO	NO	
AK	NO	NO	NO	NO	NO	
AZ	YES	NO	NO	NO	NO	
AR	YES	NO	NO	NO	NO	State regulation 22 Section 22.415
CA	YES	YES	YES	NO	NO	Consult site specific permits for purge and sampling details
CO	YES	NO	NO	YES	NO	
CT	YES	NO	NO	NO	NO	
DE	YES	NO	NO	NO	NO	Required quarterly by permit.
FL	YES	NO	NO	NO	NO	62-701.530 - Sampling shall be conducted in the headspace of the monitoring probe without purging the gas before collecting the sample.
GA	YES	YES	NO	NO	NO	Sampling must be conducted under normal /average conditions of temperature pressure and climate for the season. In addition all sampling must be performed after 12:00 pm and the readings submitted on the state form SWM-19. To sample the well, the cap is removed and the GEM 2000 hose is attached to the sample port and the percent methane and oxygen is recorded.
HI	Yes	NO	NO	NO	NO	
ID	X	X	X	X	X	**No landfills**
IL	NO *	NO	NO	NO	NO	* Only the monitoring frequency
IN	NO	YES	NO	YES	NO	Water level (if applicable).
IA	NO	NO	NO	NO	NO	
KS	NO	NO	NO	NO	NO	
KY	NO	YES	NO	NO	NO	The explosive meter should read "percent lower explosive limit" and should have a flexible probe capable of bing placed in subsurface holes made by the bar hole punch. For surface testing this method consists of placing the probe in areas in and around the landfill vicinity and simply drawing a sufficient amount of air to obtain a reading.
LA	YES	NO	NO	NO	NO	
ME	YES	NO	NO	NO	NO	Regulations: 06-096
MD	NO	NO	NO	NO	NO	
MA	NO	YES	YES	NO	NO	Sample prior to purging then after. Purge two well volumes. Provide houirly barometric pressure readings for the day of sampling 12-hours before and for the entire event.
MI	NO	NO	NO	NO	NO	
MN	NO	NO	NO	NO	NO	Elk River CUP/License agreement with City says we will take daily barometric pressure and temperature readings for 3 days prior to sampling and the day of sampling. Use site weather station data. Also want pressure reading if methane present in probe.
MS	YES	NO	NO	NO	NO	
MO	NO	YES	NO	NO	NO	Record stabilized reading. (One that does not vary over 0.5 percent.)
MT	X	X	X	X	X	**No landfills**

State or Province	Regs?	Guidance	Purge	Water Levels?	End of Day Recalibration?	Notes:
NE	NO	YES	NO	NO	YES	Record stabilized reading. (One that does not vary over 0.5 percent.)
NV	X	X	X	X	X	**No landfills**
NH	YES	NO	NO	NO	NO	Env-Sw 806.07
NJ	YES	NO	NO	NO	NO	Required quarterly by permit.
NM	YES	YES	YES	YES	NO	
NY	NO	NO	NO	NO	NO	
NC	NO	YES	YES	NO	NO	Stopcock valve required. Purge for at least one minute
ND	NO	NO	NO	NO	NO	
OH	YES	NO	YES	NO	NO	Ohio guidance is to follow the procedures outlined in each sites specific Landfill Gas Monitoring Plan.
OK	YES	NO	YES	YES	NO	
OR	YES	NO	NO	NO	NO	
PA	YES	NO	NO	NO	NO	Required quarterly by permit.
RI	X	X	X	X	X	**No landfills**
SC	YES	NO	NO	YES	NO	Record stabilized reading. (Not defined)
SD	X	X	X	X	X	**No landfills**
TN	YES	NO	NO	NO	NO	1200-01-07-.04(5)(a)5 Must be sampled quarterly and the following information recorded: (I) the date, exact place, and time of sampling or measurements; (II) The individual(s) who performed the sampling or measurements; (III) The date(s) analyses were performed; (IV) The individual(s) who performed the analyses; (V) The analytical techniques or methods used (including equipment used); and (VI) The results of such analyses. There are no regulations/guidance on how to properly sample the probes. All sampling for landfill gas requires insturment calibration with methane cal gas. You must record calibration activities (i.e. instrument, cal gas lot number, etc.)
TX	YES	YES	NO	YES	NO	30 TAC 330.731 for Regs. & TCEQ website for guidance
UT	YES	NO	NO	NO	NO	
VT	X	X	X	X	X	**No landfills**
VA	NO	NO	NO	NO	NO	
WA	YES	NO	NO	NO	NO	
WV	NO	NO	NO	NO	NO	
WI	YES	NO	NO	NO	NO	NR 507.22 - Initial and stabilized methane levels to be recorded unless the stabilized reading drops to zero.
WY	X	X	X	X	X	**No landfills**
Canada:						
Ontario	YES	NO	NO	NO	NO	Per Env. Monitoring Plan
Quebec	YES	NO	NO	NO	NO	
ALB	YES	NO	NO	NO	NO	Per Env. Monitoring Plan, lower explosive limits than US
BC						**No landfills**
MAN						**No landfills**
SAS						**No landfills**