GAS MONITORING PLAN

McGILL ROAD LANDFILL
JACKSON, MICHIGAN

Prepared for:

McGill Landfill, Inc.

December 2003
Revised April 2007
Revised September 2007
Revised June 2009
Revised July 2023
Revised December 2024

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McGILL ROAD LANDFILL
GAS MONITORING PLAN

1.0 INTRODUCTION

This document presents the Landfill Gas Monitoring Plan (Plan) for the McGill Road Landfill (MRL). The MRL facility is subject to the operating requirements of Part 115 Administrative Rules of the Natural Resources and Environmental Protection Act, 1994, PA 451.

The purpose of this Plan is to provide guidance to ensure compliance with Rule 299.4433 Type II landfill operation; explosive gas control and monitoring. This plan establishes a program to monitor the presence of landfill gas along site property lines and to monitor the potential for gas accumulation within on-site structures. If monitoring indicates the possibility of off-site migration, additional monitoring will be performed to determine the extent of migration beyond the property line(s) and also the potential for accumulation within off-site structures (i.e., buildings, sub-grade utilities, etc.)

This plan provides site-specific information on the gas monitoring system, including locations of monitoring points, methods and procedures of monitoring, equipment, monitoring frequency and plan distribution.

1.1 REGULATORY REQUIREMENTS

The following sections detail the regulatory requirements for landfill gas monitoring.

1.1.1 State Requirements

Explosive gas control and monitoring is regulated by Rule 433 of the Part 115 Administrative Rules. A copy of Rule 433 is included in Appendix A. This gas monitoring plan addresses these State requirements.

1.1.2 Federal Requirements

The State of Michigan's Part 115 Program is authorized by the USEPA; therefore the federal Subtitle D regulations are met or exceeded by the State Regulations. A copy of Title 40 Code of Federal Regulations, Part 258 – Criteria for Municipal Solid Waste Landfills, Section 258.23 – Explosive gases control, is included in Appendix A.

1.2 PLAN DISTRIBUTION

Copies of this plan have been distributed to:

- Site Engineer
- Operations Manager

1.3 PLAN REVISIONS / AMENDMENTS

Revisions of this plan are the responsibility of the MRL site engineer. This plan will be revised or amended whenever one or more of the conditions listed below is met:

- A change in system design
- An addition or deletion of system components
- A change in Michigan regulation
- A change in facility information

Copies of the revised or amended plans will be forwarded to the distribution list.

2.0 GENERAL FACILITY INFORMATION

Information in this section provides the facility address and location, access routes, and some general background information on the MRL facility.

2.1 FACILITY OWNER NAME & ADDRESS

McGill Landfill, Inc.
3895 McGill Road
Jackson, Michigan 49201
(517) 789-9871

2.2 SITE LOCATION

The MRL facility is located within Section 24, Township 2 South, Range 1 West, Blackman Township, and Section 19, T2S, R1E, Leoni Township, Jackson County, Michigan. Plate 1, Site Location Map, depicts the location of the MRL facility within Blackman and Leoni Townships, Michigan referenced to major roadways and topographic features. The area surrounding the site is primarily used for agricultural and residential purposes.

2.3 SITE DESCRIPTION

The MRL facility is a Type II and Type III solid waste landfill located at 3895 McGill Road, Jackson, Michigan. The facility occupies a total area of approximately 134 acres, which includes closed disposal areas, active fill areas, future fill areas and isolation and ancillary areas. MRL consists of two closed Type III units identified as Phases I and II, a closed Type II area consisting of Phases III and IV, and an active Type II area identified as Phase V. A planned future Type II area identified as Phase VI will consist of fill placed in the valleys between the existing units and overlying portions of each of the existing phases.

Phase I includes 8 cells (Cells 1 through 8) with a total area of approximately 8.79 acres. Phase II area consists of a single cell (Cell 1) with an area approximately 4.11 acres. Phase III has four cells (Cells 1, 1A, 2 and 4) occupying a total area of approximately 12.33 acres. Phase IV includes Cells 1 and 1A and occupies an area of approximately 2.78 acres. Phase V is the only active portion of MRL and occupies approximately 15.2 acres on east side of the facility divided into five individual cells (Cells 1A, 1B, 1C, 1D, and 1E).

Other MRL areas include maintenance buildings, a facility office building, ticket office, and leachate loadout building. Plate 2, Gas Monitoring Probe Location Plan, depicts the landfill phase boundaries, facility building locations and access roads.

All stormwater from the active work areas is routed through sedimentation control features and discharged to the State Lateral Drain or a wetland area at the northern end of the site. Water flows from the State Lateral Drain to Thompson Lake Drain, which empties into the Portage River about 1.5 miles north of the site. The wetland area drains into the Ruel Drain, which flows into the Thompson Lake Drain.

Leachate from the landfills is pumped from each collection sump through double-contained piping to on-site storage tanks. From the tanks, the leachate is hauled to a wastewater treatment plant or recirculated into the landfill.

2.4 FACILITY UTILITIES

The site utilities consist of underground and overhead electrical lines and an underground leachate forcemain. The locations of these utilities are shown on Plate 2. As several of these supply lines are underground, the locations will be noted by monitoring personnel, should bar hole probing be necessary.

2.5 FACILITY OPERATIONS

Operations at the Phases I through IV areas consist of post-closure care. Standard operations at Phase V include disposal of Type II waste. These activities require the use of heavy construction equipment, on-site equipment maintenance, and refueling.

Maintenance operations include repair and/or replacement of damaged equipment, cleaning of the equipment, parts cleaning, and replacement of automotive fluids such as motor oil, hydraulic fluid, antifreeze, and transmission fluids.

2.6 FACILITY ACCESS & SECURITY

The MRL facility is secured by perimeter fencing and gates. The site is accessed through gated entry from McGill Road. The entrance gate is locked during non-business hours. Customer traffic must pass by a scale/ticket house before being routed to the open landfill to dump. Traffic entering and leaving the site is routinely monitored at the office building and ticket house by MRL personnel. If a security problem is noted, the local police are notified.

3.0 SITE ENGINEERING & HYDROGEOLOGY

3.1 SITE ENGINEERING

3.1.1 Phase I Area

The closed Phase I landfill accepted Type III wastes from 1987 to 1993. During this time, construction and demolition waste was placed into eight individual cells, with a total area of 8.79 acres. The waste was initially placed in the central cells and waste placement then proceeded to the north and south ends of the unit. The northern cells were the last operational portions of the Phase I landfill. The Phase I landfill is unlined.

Closure of the Phase I landfill included construction of an engineered cap consisting of (from top to bottom) a vegetation soil layer underlain by a 15-inch thick protective layer. The vegetation and protective layer are underlain by a drainage layer and a composite liner consisting of a 40-mil polyvinyl chloride (PVC) membrane liner and 24 inches of compacted clay.

3.1.2 Phase II Area

The Phase II landfill accepted Type III waste from 1993 to 1996 and was certified closed in April 1997. This area consists of a single cell (Cell 1) with an area of 4.11 acres. The Phase II area is constructed with a double-composite liner system underlain by native soils. The liner system includes (from top to bottom) a 24-inch thick granular soil drainage layer, a synthetic drainage layer consisting of a geonet and geotextile, a primary composite liner consisting of a 30-mil PVC geomembrane underlain by a geosynthetic clay liner (GCL), a secondary geonet, and a secondary composite liner consisting of a 30-mil PVC geomembrane underlain by a GCL.

3.1.3 Phase III and IV Areas

The Phase III and IV landfill accepted Type II municipal solid waste from 1995 to 2008 and was certified closed in July 2009. Phase III consists of four cells (Cells 1,1A, 2, and 4) with a total area of 12.21 acres. The Phase IV area consists of two cells (Cells 1 and 1A) with a total area of 2.78 acres. Phases III and IV are constructed with a double composite liner, similar to that described for the Phase II area.

3.1.4 Phase V Area

The Phase V landfill has accepted Type II municipal solid waste since 2007. This area is divided into five cells (Cells 1A though 1E), with a total area of 15.2 acres. Phase V is constructed with a double-composite liner system underlain by native soils. The liner and leachate collection system includes (from top to bottom) a 12-inch thick granular soil drainage layer, with a synthetic drainage layer consisting of a geonet and geotextile, a primary composite liner consisting of a 60-mil HDPE geomembrane underlain by a geosynthetic clay liner (GCL), a secondary geonet (which constitutes the secondary collection layer), and a secondary composite liner consisting of a 60-mil HDPE geomembrane underlain by a GCL.

3.1.5 Phase VI Area and Vertical Expansions

The proposed Phase VI expansion is primarily a vertical expansion of Type II waste fill areas above portions of the existing Phase I through V fill areas. The total overfill area will occupy a total of approximately 15.41 acres. To facilitate placement of waste above the existing phases, the proposed Phase VI expansion also includes lateral expansion into the "valleys" between the existing phases. The lateral expansion areas occupy a total of approximately 2.14 acres. The Phase VI expansion does not extend beyond the overall footprint of the existing Phase I through V waste boundaries.

The proposed liner system for the lateral expansion areas between the existing landfill areas are double-composite and will include (from top to bottom) a layer of protective soil, primary geocomposite drainage layer, geomembrane (either 30-mil PVC or 60-mil HDPE), GCL, secondary geocomposite drainage layer, secondary geomembrane (either 30-mil PVC or 60-mil HDPE) and secondary GCL.

Vertical expansion over existing non-Type II-lined Phase I requires a new composite overfill liner system in accordance with Rule 419(4)(b). The proposed overfill liner system includes (from bottom to top) a GCL, a geomembrane, a geocomposite drainage layer, and a 12-inch granular protective cover layer.

Vertical expansion over existing double-composite lined Phases II-IV does not require an overfill liner. However, to manage the newly generated leachate and to limit the effects of the proposed vertical development on the existing Phases II-IV infrastructure, the existing final cover system in-place will be repurposed as an overfill liner to direct leachate to either the Phase VI West (west half) liner system or the Phase VI East (east half) liner system. Leachate collected above the Phase VI East liner system is routed to the existing Phase V sump.

Because existing Phases II through IV are double-composite-lined, an overfill liner system is not required for vertical expansion over these areas. However, re-use of the existing composite cover system as an overfill liner system is proposed to enhance leachate collection in the vertical expansion above Phases II through IV. The proposed Phases II through IV overfill liner system includes from bottom to top) the existing cover soil, existing GCL, existing geomembrane (30-mil PVC), existing geocomposite drainage layer, and existing protective cover soil (with overlying topsoil removed).

3.2 HYDROGEOLOGIC CONDITIONS

The geologic conditions have direct effects on the potential and direction of landfill gas migration. The following sections present a review of site (i.e., local) and regional hydrogeologic conditions at and surrounding the MRL. A more detailed description of these conditions is included in the Report on Hydrogeologic Investigation for the site.

3.2.1 Regional Geology & Hydrogeology

The geology of the regional area consists of unconsolidated granular deposits overlying sedimentary bedrock. Glacial deposits in Blackman Township are composed of glacial outwash and outwash channel deposits consisting of interbedded fine sand, sand, and gravel with varying silt content. These outwash deposits may also contain discontinuous seams of silt and silty clay soils. Glacial drift thickness in the area north of Jackson ranges from 51 to 100 feet. Underlying the glacial soils is the Parma Sandstone, a member of the Pennsylvanian Saginaw Formation. Generally, bedrock is encountered at an elevation of 900 feet msl.

The regional direction of groundwater flow is to the northwest based on surface topography and visible expressions of the water table (such as lakes, streams and wetlands) presented on the U.S. Geological Quadrangle maps. This is consistent with bedrock groundwater elevations recorded at the site. Groundwater within the bedrock likely discharges to the Portage and Grand Rivers, situated north and west of the site. Recharge to the bedrock likely occurs as surface infiltration through unconsolidated glacial deposits.

3.2.2 Site Geology

Generally, the site geology consists of approximately 30 to 50 feet of unconsolidated granular deposits overlying sedimentary bedrock. The uppermost portion of this unconsolidated deposit is described as brown silty sand extending to a general depth of approximately 38 feet below grade. This uppermost portion is underlain by intermediate granular deposits comprised of dense gray silt which ranges from 0.5 to 4 feet thick and is underlain by a gray silty sand and gravel unit. Some deposits of clay and silt materials also occur, but are isolated within the predominately sandy matrix. The finer materials are not correlative across the site, suggesting these low permeability units are isolated, laterally discontinuous lenses. Granular materials appear to become increasingly coarse with depth across the site. The underlying rock formation consists of the Parma Sandstone and Mississippian Bayport Limestone. These rock formations extend to an approximate depth of 90 feet below ground surface.

Surface runoff in the southern half of the site flows southwest to a sedimentation basin located near the southwest corner of the property. Similarly, in the northern half of the site, surface runoff flows northwest to a sedimentation basin located at the northwest corner of the site. Some of the surface runoff from areas outside of the active work area flows to a low-lying area at the northeast corner of the site.

3.2.3 Site Hydrogeology

Groundwater occurs in the unconsolidated glacial deposits under water table conditions down to bedrock. There are no laterally extensive confining zones within these glacial deposits, as evidenced by only a few isolated, discontinuous deposits of clay and silt materials (i.e., lenses) that exist at the site. The water table surface occurs at depths ranging from approximately 10 to 45 feet below ground surface because of the variation in topography. At the site, groundwater elevations range from approximately 925 to 955 feet mean sea level. Horizontal hydraulic gradients range from 0.003 to 0.010 ft/ft across the site. The gradient is lower in the southeast portion of the site and is higher as groundwater flows toward the northwest. The general direction of groundwater movement is to the northwest, north, and northeast. The hydraulic conductivity of the water-bearing granular zone is approximately 0.6 feet/day (2.1×10^{-4} cm/sec) and the average horizontal groundwater velocity in the aquifer is 0.03 ft/day.

4.0 LANDFILL GAS MONITORING PROGRAM

4.1 LANDFILL GAS MANAGEMENT SYSTEM

The landfill gas management system for the closed Phase I and II areas consists of passive gas vents. An active gas collection system was installed in the Phase III and Phase IV areas in the fall of 2007 prior to closure of those areas. An active gas collection system is being installed in Phase V as filling operations progress.

The following sections detail the landfill gas monitoring program at the MRL facility. The Site Engineer is responsible for the implementation of the Gas Monitoring Program.

4.2 MONITORING LOCATIONS

Currently, there are eighteen (18) permanent gas probes in place at MRL to monitor gas concentrations surrounding the disposal areas. The locations of the existing and proposed gas probes, designated as MP-1 and MP-5 through MP-21 are presented in Plate 2. Additionally, gas-monitoring devices are mounted and maintained in the buildings on site. In the event that the permanent gas monitoring probes, except those at northern boundary of the site, indicate methane gas concentrations above the lower explosive limit (LEL) in the probes or above 25% of the LEL in structures, bar hole probing will be used at the property boundary to determine if off-site migration of gas is occurring.

The methane concentrations measured from the gas probes located at northern portion of the facility are normally higher than LEL. A gas migration study completed by McNeely and Lincoln Associates, Inc. (September 1998) and an alternate source demonstration (landfill gas investigation) by NTH Consultants, Ltd. (March 2002) indicate that the high methane concentrations at this area are attributed to the Jackson County landfill located immediately north of MRL. Therefore, the gas levels measured from those probes at the northern boundary will not be subjected to the LEL criteria stated above and will be evaluated on a case-by-case basis.

4.3 MONITORING FREQUENCY

Consistent with the State of Michigan regulations, landfill gas monitoring at the MRL facility is performed quarterly. MRL has monitored monthly since original exceedances that triggered the 1998 investigation study.

5.0 LANDFILL GAS TESTING PROCEDURES

Specifics of the monitoring and testing procedures are included in this section. The text presents a detailed description of the procedures to be followed in accordance with company guidelines.

5.1 GAS PROBE MONITORING PROCEDURES

Probes will be monitored for combustible gas concentrations, using a dual range, natural gas indicator or equivalent instrument that measures concentrations as percent by volume of methane equivalents. Two ranges of detection are available on the selected meter: 0 to 100% LEL (5% methane by volume), and 0 to 100% methane by volume.

A device such as a GAS-TECH Innova-LS (Appendix B) will be used to monitor the probes. At a minimum, the combustible gas indicator will be calibrated on a quarterly basis in accordance with the manufacturer's specifications. The amount of monitoring and the handling of the meter will dictate if the calibration frequency will be increased.

The instrument will not be used at locations where compounds such as tetraethyl lead, or hydraulic fluids or lubricants, which contain silane silicates, or silicones, may be present in the atmosphere. These chemicals contaminate the sensor and thus reduce measurement accuracy. If it is suspected that such compounds exist in the test area, the calibration of the instrument will be checked after making a maximum of five measurements.

5.2 BUILDING MONITORING PROCEDURES

SEC 1500 Gas Detectors are currently installed in the office building, scale house, and leachate storage facility. Sierra (2001 Model) Gas Detectors are located in the Sump 3 and 4 buildings. Continuous monitors are replaced in accordance with manufacturers' recommendations. Inspection and calibration of these monitors is to be recorded annually.

In the event a monitor indicates the presence of combustible gas greater than 25% of the LEL (1.25% by volume) in the structure, the structure is to be evacuated, and the Operations Manager and Site Engineer are notified. The affected structure should be ventilated and portable gas probes used to verify safe atmosphere prior to re-entry by staff.

If monitors continue to indicate the presence of landfill gas in a structure, evaluation of the exterior portion of the building using bar hole probes will be undertaken. If warranted, a mitigation investigation plan will be developed and implemented.

For structures not normally occupied, atmospheric monitoring for landfill gas is recommended before personnel entry and during cutting and or welding activities.

6.0 DATA COLLECTION & REPORTING

The gas monitoring performed at the permanent probes located at MRL will be recorded on the McGill Road Landfill, Explosive Gas Monitoring Results form (Appendix C). There are eighteen (18) permanent gas detection probes installed around the perimeter of the MRL facility. Monitoring personnel, as assigned by the Site Engineer, will record the results on the form.

Site Engineer will be notified immediately if gas levels exceed allowable levels. Site Engineer will notify EGLE if required by Rule 433. Copies of the completed gas monitoring reports will be forwarded to the Site Engineer, who will determine if additional or revised monitoring is required. The gas monitoring reports will be filed in the facility operating record.

Personnel designated to perform the monitoring and reporting of data will be trained in the operation, maintenance, and calibration of all monitoring equipment. To encourage consistency of data, all monitoring will typically be performed by the same technician who is familiar with site-specific conditions and historical results.

If gas concentrations exceed 25% LEL (1.25% by volume) within a structure, monitoring personnel must also identify these locations on the report. If gas concentrations observed from gas probes, except those in northern portion of the facility, at the facility property boundary exceed the LEL (5% by volume), they must be recorded on the monitoring report. The facility must immediately take all necessary steps to ensure protection of human health, notify the EGLE director, and then bar hole probing will be performed at the property boundary to determine if off-site migration has occurred.

Within seven (7) days of detection, the recorded levels of methane gas that exceed the regulated levels (25% LEL in structures and the LEL at the property boundary) must be recorded and placed in the operating record. Within sixty (60) days of detection of gas levels above the regulated limits, a remediation plan for methane gas releases must be implemented.

7.0 SAFETY

When performing gas monitoring, the monitoring technicians should be alert to the hazards caused by the presence of potentially combustible landfill gas. Hazards that might occur could be one or more of the following:

- Fires may start from exposed and/or decomposing solid wastes.
- Fires and explosions may occur from the presence of landfill gas and methane as CH_4 gas, which is also known as methyl hydride. Methane is a flammable, odorless and tasteless gas.
- Landfill gas may cause an oxygen deficiency in underground trenches, culverts, conduits, structures and confined space entry procedures should be followed. Hydrogen Sulfide (H_2S) may also be present. H_2S is a colorless, very flammable gas, which, in low concentrations has an offensive odor similar to that of rotten eggs. H_2S can be highly toxic. Although the odor of H_2S is recognizable at 1/1400 of the lowest possible amount

that can cause injurious effects, sense of smell is lost within 2 to 15 minutes of exposure. At higher concentrations, it will instantly deaden the sense of smell and can cause death within seconds by terminating the function of the nerve and motor center in the brain.

The following safety precautions will be implemented by personnel when monitoring for combustible gas:

- Absolutely no smoking at any time.
- A fire extinguisher must be readily available, especially when monitoring gas concentrations within structures and/or confined spaces.
- The site specific landfill safety program will be followed. As an odorless, tasteless gas, methane is undetectable by the human senses. Therefore, sampling personnel must continually be aware of and avoid all potential sources of ignition. When monitoring in confined areas, it is recommended that a Gas Tech GX82 Tritector continuous monitor be used to continually monitor the gas levels within the working area. The Tritector will monitor for methane, oxygen, and hydrogen sulfide and will provide both visual and audible alarm if gas concentrations exceed or drop below a set level.

Bar hole probing will not be conducted near buildings unless:

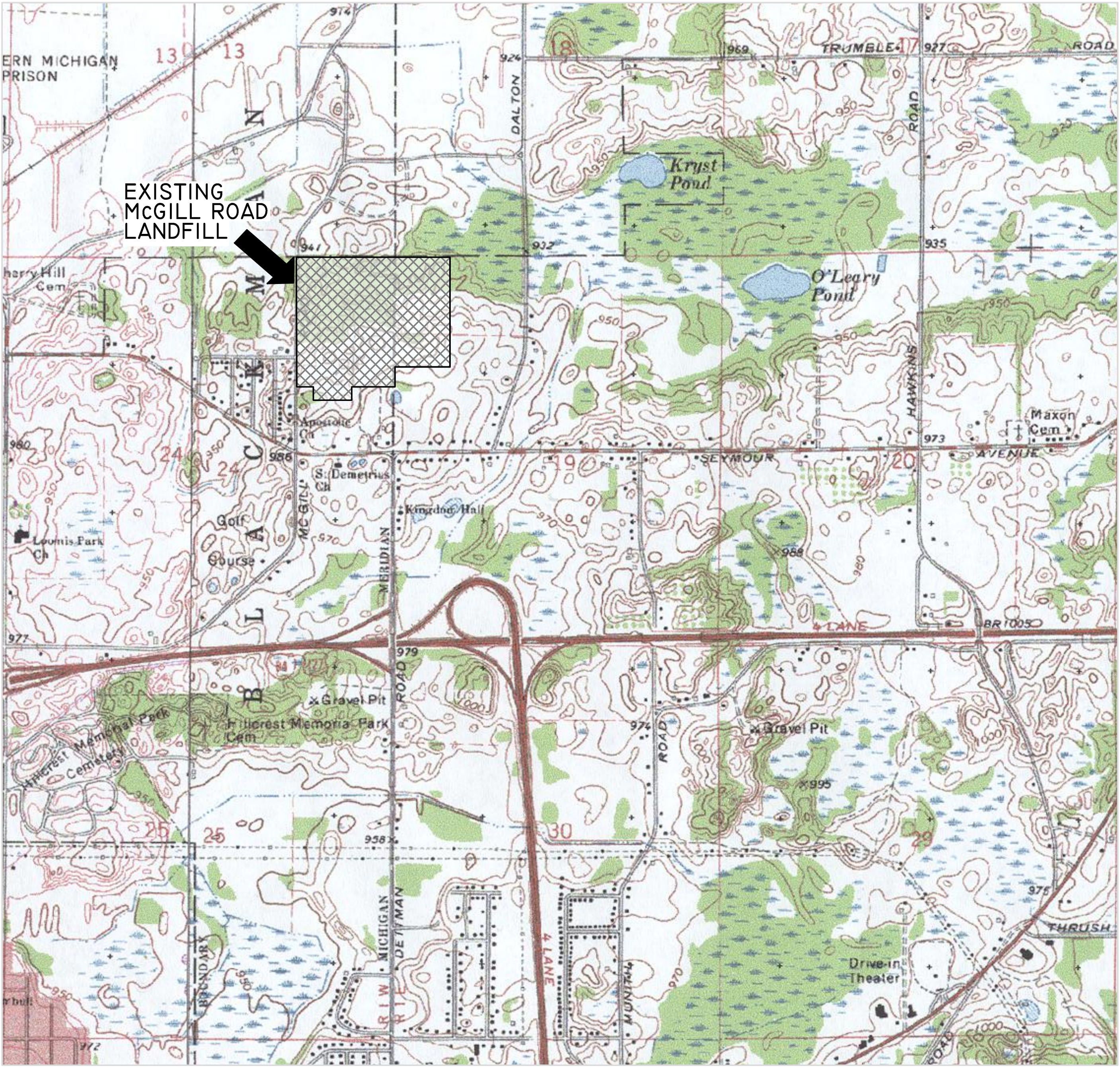
- Subgrade utility lines are located and clearly marked.
- A person with knowledge of all sub-grade utility lines is present at the time of the monitoring event.
- Monitoring personnel are in receipt of an accurate site utility plan/map.

8.0 FLAMMABLE PROPERTIES OF METHANE

When methane is introduced into an area, fresh air is gradually displaced until the area may be completely filled with the gas. During this process, the air/methane mixture passes through three specific ranges: lean, explosive and rich.

Mixtures within the lean range, which extends from fresh air to the lower explosive limit (LEL), contain too little gas in relation to the amount of air to burn (that is, propagation of flame does not occur in contact with a source of ignition). A mixture of the LEL, which is 5% by volume, is the lowest concentration of methane in air that will explode or burn when ignited. Mixtures in the explosive or flammable range, which extends from the LEL to the upper explosive limit (UEL, 15% by volume), will propagate flame. Large volumes of combustible gasses or vapors in these concentrations, if ignited, can cause damage and personal injury. Mixtures in the rich range, which extends from the LEL to 100 % methane, contain too much gas in relation to air to be combustible. However, since the addition of air to these high concentrations of methane creates mixtures in the flammable region, they must be considered equally dangerous.

A Material Safety Data Sheet (MSDS) for Methane is in Appendix D.



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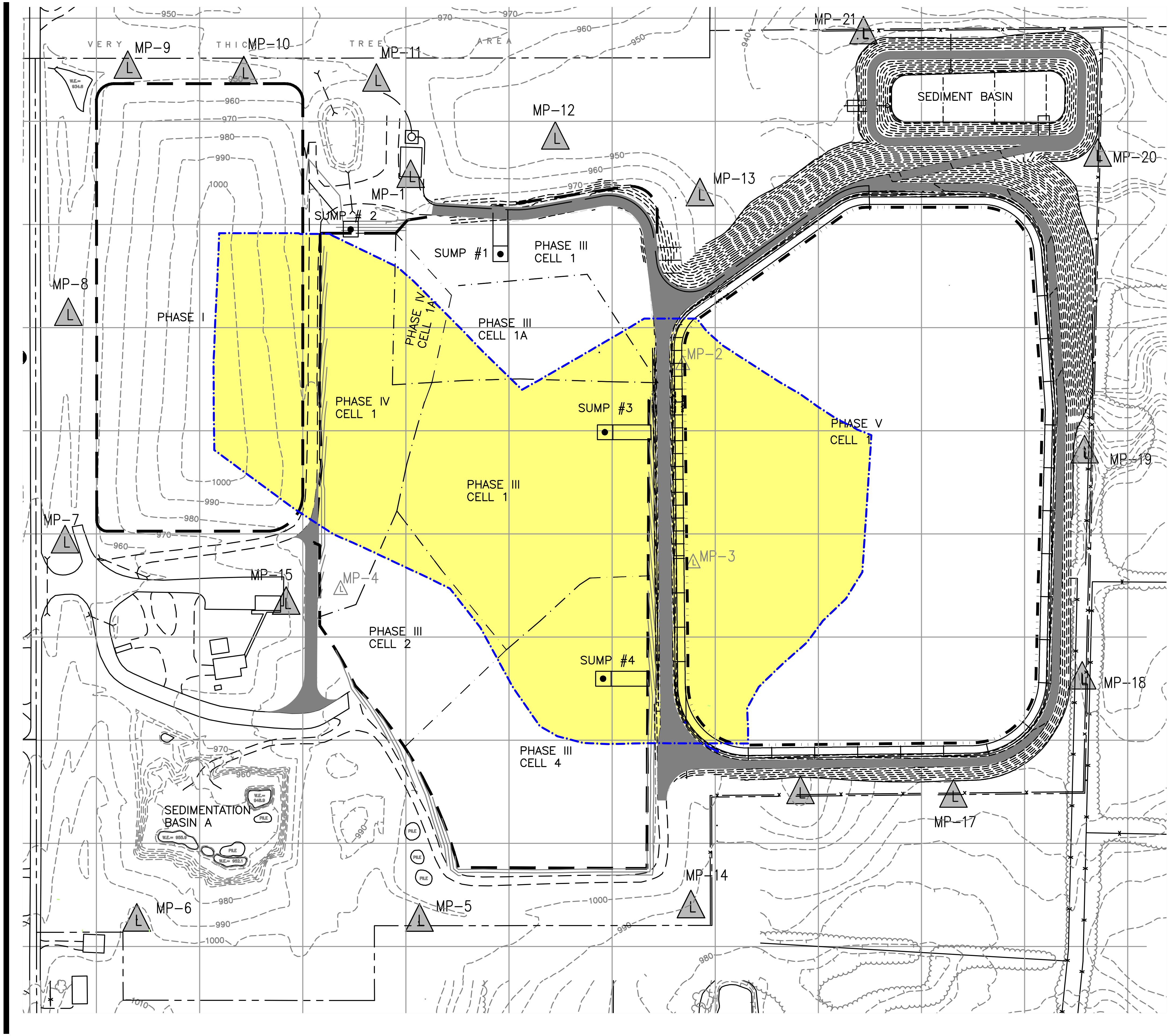
BASE MAP USGS 7.5–MINUTE QUADRANGLE
TOPOGRAPHIC MAPS:
JACKSON NORTH, MICH. 1970
GILLETTS LAKE, MICH. 1970

GRAPHIC SCALE

2000 0 2000

1" = 2000'

NTH PROJECT No.: 62–090103	CAD FILE NAME: 62090103–SM	NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services	SITE LOCATION MAP	PLATE: 1
DESIGNED BY: DLP	PLOT DATE: 12/23/2024			
DRAWN BY: CWS	DRAWING SCALE: AS SHOWN		MCGILL ROAD LANDFILL BLACKMAN AND LEONI TOWNSHIPS JACKSON COUNTY, MICHIGAN	
CHECKED BY: ACE	INCEPTION DATE: 04/19/07			



N

0 100' 200' 400'

SCALE

LEGEND:

EXISTING GAS MONITORING PROBE

ABANDONED GAS MONITORING PROBE

PROPERTY LINE

EXISTING SOLID WASTE BOUNDARY LINE (APPROX.)

FUTURE PHASE VI EXPANSION LIMIT

NOTES:

1. THE BASE MAP WAS PROVIDED BY McNEELY & LINCOLN ASSOCIATES.
2. THE LOCATIONS OF GAS MONITORING PROBES MP-8 THROUGH MP-15 ARE APPROXIMATED.

NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

NTH PROJECT No.: 62090103-OS
CAD FILE NAME: 0901030S - ATT A
DESIGNED BY: ACE
PLOT DATE: 12/20/2024
DRAWN BY: CWS
DRAWING SCALE: 1" = 200'
CHECKED BY: ACE
INCEPTION DATE: 06/12/09

GAS MONITORING PROBE LOCATION PLAN

MCGILL ROAD LANDFILL
JACKSON, MICHIGAN

PLATE:
2

J:\62\62090103\Reports\Env\OS\0901030S - Att A

APPENDIX A

Explosive Gas Control and Monitoring Regulations

Part 115 Administrative Rules Effective April 12, 1999

R 299.4433 Type II landfill operation; explosive gas control and monitoring.

Rule 433. (1) The owner and operator of a type II landfill shall ensure all of the following:

(a) That the concentration of methane gas generated by the facility is not more than 25% of the lower explosive limit for methane in facility structures, excluding gas control or recovery system components, and the leachate collection system.

(b) That the concentration of methane gas is not more than the lower explosive limit at or beyond the facility property boundary.

(c) That gases generated by the facility do not create a nuisance and are not otherwise in violation of part 55 of the act at the property boundary.

(2) The owner and operator of a type II landfill shall implement a routine methane monitoring program to ensure that the requirements of subrule (1) of this rule are met. The type and frequency of monitoring shall be based on all of the following factors:

(a) Soil conditions.

(b) The hydrogeologic conditions surrounding the facility.

(c) The hydraulic conditions surrounding the facility.

(d) The location of facility structures and property boundaries.

(3) The minimum frequency of methane monitoring shall be quarterly.

(4) If methane gas levels exceeding the limits specified in subrule (1) of this rule are detected from either an active or closed unit, the owner and operator shall do all of the following:

(a) Immediately take all necessary steps to ensure protection of human health and notify the director.

(b) Within 7 days of detection, place, in the operating record, the methane gas levels detected and a description of the steps taken to protect human health.

(c) 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 director that the plan has been implemented. The plan shall describe the nature and extent of the problem and the proposed remedy.

(5) The director may establish alternative schedules for demonstrating compliance under subrule (4) of this rule.

(6) An active gas management system shall be installed at a type II landfill if necessary under subrule (4) of this rule. An active gas management system shall do all of the following:

(a) Include a control system that includes 1 or both of the following:

(i) A system within the unit that is in compliance with subrule (7) of this rule.

(ii) A system outside the unit that is in compliance with subrule (8) of this rule.

(b) Include a collection system for transporting gas to a central point or points for process or disposal.

(c) Include provisions for collecting and draining gas condensate to the leachate collection and removal system.

(d) Prevent the migration of gas out of the unit.

(e) Operate until the waste is stabilized and no longer producing gas in quantities that are in violation of subrule (1) or (4) of this rule.

(7) An active gas control system that is installed within the perimeter of a solid waste disposal unit shall be designed and constructed to do the all of the following:

(a) Function for the active life of the disposal unit and the post-closure period.

(b) Operate safely in hazardous or explosive environments.

(c) Be resistant to corrosion by the constituents of landfill gas.

(d) Withstand all normal landfill conditions, including settlement.

(e) Provide for the collection and draining of gas condensate.

(f) Not adversely affect the integrity of any liner, leachate collection system, or final cover.

(g) Be airtight.

(8) An active gas control system that is located outside the perimeter of the solid waste disposal unit shall consist of either trenches or gas wells which effectively cut off the lateral migration of gas and which extend down to 1 of the following:

(a) A natural soil barrier that is in compliance with R 299.4912.

(b) The seasonal high water table.

(c) The elevation of the liner within the solid waste disposal unit.

(d) Other barriers approved by the director.

WAIS Document Retrieval[Code of Federal Regulations]
[Title 40, Volume 21]
[Revised as of July 1, 2001]
From the U.S. Government Printing Office via GPO Access
[CITE: 40CFR258.23]

[Page 398]

TITLE 40--PROTECTION OF ENVIRONMENT
PART 258--CRITERIA FOR MUNICIPAL SOLID WASTE LANDFILLS--Table of Contents
Subpart C--Operating Criteria

Sec. 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 deg. 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]

APPENDIX B

Monitoring Equipment – QED's GEM 5000

(Due to size, QED's Operating Manual complete with calibration procedures is filed and available on-line for reference.)

LANDTEC

QED

GEM5000 Gas Analyzer

Operating Manual

QED Environmental Systems, Inc.
2355 Bishop Circle West
Dexter, MI. 48130
Tel: (800) 624-2026
Fax :(734) 995-1170
Email: info@qedenv.com
Website: www.landtecna.com

APPENDIX C

Gas Monitoring Form – Explosive Gas Monitoring Results

McGill Road Landfill

Explosive Gas Monitoring Results

Date: ______________________

Weather Conditions:

Monitored by: ______________________

Temperature ______________

Wind strength/ direction ____

Ground Conditions ____

Monitoring Probes: Equipment calibrated : __________

MP-1	____________________	% LEL /	% CH_4	% O_2
MP-5	____________________	% LEL /	% CH_4	% O_2
MP-6	____________________	% LEL /	% CH_4	% O_2
MP-7	____________________	% LEL /	% CH_4	% O_2
MP-8	____________________	% LEL /	% CH_4	% O_2
MP-9	____________________	% LEL /	% CH_4	% O_2
MP-10	____________________	% LEL /	% CH_4	% O_2
MP-11	____________________	% LEL /	% CH_4	% O_2
MP-12	____________________	% LEL /	% CH_4	% O_2
MP-13	____________________	% LEL /	% CH_4	% O_2
MP-14	____________________	% LEL /	% CH_4	% O_2
MP-15	____________________	% LEL /	% CH_4	% O_2
MP-16	____________________	% LEL /	% CH_4	% O_2
MP-17	____________________	% LEL /	% CH_4	% O_2
MP-18	____________________	% LEL /	% CH_4	% O_2
MP-19	____________________	% LEL /	% CH_4	% O_2
MP-20	____________________	% LEL /	% CH_4	% O_2
MP-21	____________________	% LEL /	% CH_4	% O_2

Buildings:

Office	____________________	% LEL /	% CH_4
Maintenance	____________________	% LEL /	% CH_4
Scale House	____________________	% LEL /	% CH_4
Leachate Loading	____________________	% LEL /	% CH_4
Sump3	____________________	% LEL /	% CH_4
Sump4	____________________	% LEL /	% CH_4

CALIBRATION NOTES:

The GEM 5000 is calibrated per QED instructions (manual on file).

The continuous building monitors are calibrated by introducing known concentration of methane until response (audible/visual). The monitor's set screw is adjusted accordingly and adjustment is documented/filed.

APPENDIX D
Methane Material Safety Data Sheet

BOC GASES

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: METHANE

1. Chemical Product and Company Identification

BOC Gases,
Division of,
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974

TELEPHONE NUMBER: (908) 464-8100
24-HOUR EMERGENCY TELEPHONE NUMBER: CHEMTREC (800) 424-9300

BOC Gases
Division of
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3W6

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER: (905) 501-0802
EMERGENCY RESPONSE PLAN NO: 2-0101

PRODUCT NAME: METHANE
CHEMICAL NAME: CH4
COMMON NAMES/SYNONYMS: Methyl Hydride
TDG (Canada) CLASSIFICATION: 2.1
WHMIS CLASSIFICATION: A, B1

PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATES: 6/1/99

2. Composition, Information on Ingredients

EXPOSURE LIMITS[1]:

INGREDIENT	% VOLUME	PEL-OSHA[2]	TLV-ACGIH[3]	LD_{50} or LC_{50} Route/Species
Methane FORMULA: CH_4 CAS: 74-82-8 RTECS #: PA1490000	100	None Established	Simple Asphyxiant	Not Available

[1] Refer to individual state of provincial regulations, as applicable, for limits which may be more stringent than those listed here.
[2] As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)
[3] As stated in the ACGIH 1998-1999 Threshold Limit Values for Chemical Substances and Physical Agents.

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.

3. Hazards Identification

EMERGENCY OVERVIEW

Odorless, colorless flammable gas. Dangerous fire and explosion hazard. Avoid heat, sparks and flames. Simple Asphyxiant – This product does not contain oxygen and may cause asphyxia if released in a confined area. Maintain oxygen levels above 19.5%. Contents under pressure. Use and store below 125 °F.

PRODUCT NAME: METHANE

ROUTE OF ENTRY:

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
No	No	No	Yes	No

HEALTH EFFECTS:

Exposure Limits No	Irritant No	Sensitization No
Teratogen No	Reproductive Hazard No	Mutagen No
Synergistic Effects None reported		

Carcinogenicity: -- NTP: No IARC: No OSHA: No

EYE EFFECTS:
None anticipated.

SKIN EFFECTS:
None anticipated.

INGESTION EFFECTS:
None known. Ingestion is unlikely.

INHALATION EFFECTS:
Methane and nitrogen are simple asphyxiants. Exposure to high concentrations of this gas mixture may exclude an adequate supply of oxygen. Oxygen levels should be maintained at greater than 19.5% at normal atmospheric pressure.

Effects of oxygen deficiency resulting from simple asphyxiants may include: rapid breathing, diminished mental alertness, impaired muscular coordination, faulty judgement, depression of all sensations, emotional instability, and fatigue. As asphyxiation progresses, nausea, vomiting, prostration, and loss of consciousness may result, eventually leading to convulsions, coma, and death.

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known.

NFPA HAZARD CODES

Health: 2
Flammability: 4
Instability: 0

HMIS HAZARD CODES

Health: 0
Flammability: 4
Reactivity: 0

RATINGS SYSTEM

0 = No Hazard
1 = Slight Hazard
2 = Moderate Hazard
3 = Serious Hazard
4 = Severe Hazard

4. First Aid Measures

EYES:
None required.

SKIN:
None required.

INGESTION:
Not normally required.

INHALATION:
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO THIS PRODUCT. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive. Keep victim warm and quiet.

5. Fire Fighting Measures

Conditions of Flammability: Flammable gas			
Flash point: -306°F (-188°C)	Method: Closed cup		Autoignition Temperature: 1076°F (580°C)
LEL(%): 5		UEL(%): 15	
Hazardous combustion products: Carbon dioxide, Carbon monoxide			
Sensitivity to mechanical shock: None			
Sensitivity to static discharge: Not Available			

FIRE AND EXPLOSION HAZARDS:
Flammable gas. Cylinder may rupture violently from pressure when involved in a fire situation.

EXTINGUISHING MEDIA:
Carbon dioxide, dry chemical or water spray.

FIRE FIGHTING INSTRUCTIONS:
If possible, stop the flow of gas. Inerting the atmosphere to reduce oxygen levels may extinguish flame, allowing capping of leaking container. Do not attempt this unless specifically trained. Reduce the rate of flow and inject an inert gas, if possible, before completely stopping the flow to prevent flashback. Do not extinguish the fire until the supply is shut off as otherwise an explosive re-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. Direct 500 GPM water stream onto containers above liquid level with remote monitors. Limit the number of personnel in proximity of fire and evacuate surrounding areas in all directions.

Firefighters should wear respiratory protection (SCBA) and full turnout or Bunker gear. Continue to cool fire-exposed cylinders until well after flames are extinguished.

6. Accidental Release Measures

Immediately extinguish all ignition sources. No smoking, flames, sparks or flares in hazard area. Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

7. Handling and Storage

Electrical Classification:
Not Available

Earth ground and bond all lines and equipment associated with the system. All equipment should be non sparking or explosion-proof.

Methane is non-corrosive and may be used with any common structural material.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure regulator when connecting cylinder to lower pressure piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Post "NO SMOKING" signs in use or storage areas. There should be no sources of ignition in areas where this product is being used or stored. Outside or detached storage is preferred.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, P-14, and Safety Bulletin SB-2.

8. Exposure Controls, Personal Protection

ENGINEERING CONTROLS:
Hood with forced ventilation. Local exhaust to prevent dilution of oxygen levels below 19.5%. Mechanical in accordance with electrical codes.

EYE/FACE PROTECTION:
Safety goggles or glasses.

SKIN PROTECTION:
Plastic or rubber gloves. Protective gloves made of any suitable material.

RESPIRATORY PROTECTION:
Positive pressure air line with mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION:
Safety shoes.

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: Not Available	
Vapor density (Air = 1)	: Not Available	
Evaporation point	: Not Available	
Boiling point	: -285.7	°F
	: -161.5	°C
Freezing point	: -296.5	°F
	: -182.5	°C
pH	: Not Applicable	
Specific gravity	: 0.55	
Oil/water partition coefficient	: Not Available	
Solubility (H_20)	: Negligible	
Odor threshold	: Not Applicable	
Odor and appearance	: Odorless, colorless gas	

10. Stability and Reactivity

STABILITY:
Stable

INCOMPATIBLE MATERIALS:
Oxidizers

HAZARDOUS POLYMERIZATION:
Will not occur.

11. Toxicological Information

No data given in the Registry of Toxic Effects of Chemical Substances (RTECS) or Sax, Dangerous Properties of Industrial Materials, 7th ed.

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

12. Ecological Information

No data given.

PRODUCT NAME: METHANE

13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

14. Transport Information

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Methane, compressed	Methane, compressed
HAZARD CLASS:	2.1	2.1
IDENTIFICATION.NUMBER:	UN 1971	UN 1971
SHIPPING LABEL:	FLAMMABLE GAS	FLAMMABLE GAS

15. Regulatory Information

Methane is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III - HAZARD CLASSES:
Fire Hazard
Sudden Release of Pressure Hazard

16. Other Information

ACGIH	American Conference of Governmental Industrial Hygienists
DOT	Department of Transportation
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value
WHMIS	Workplace Hazardous Materials Information System

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

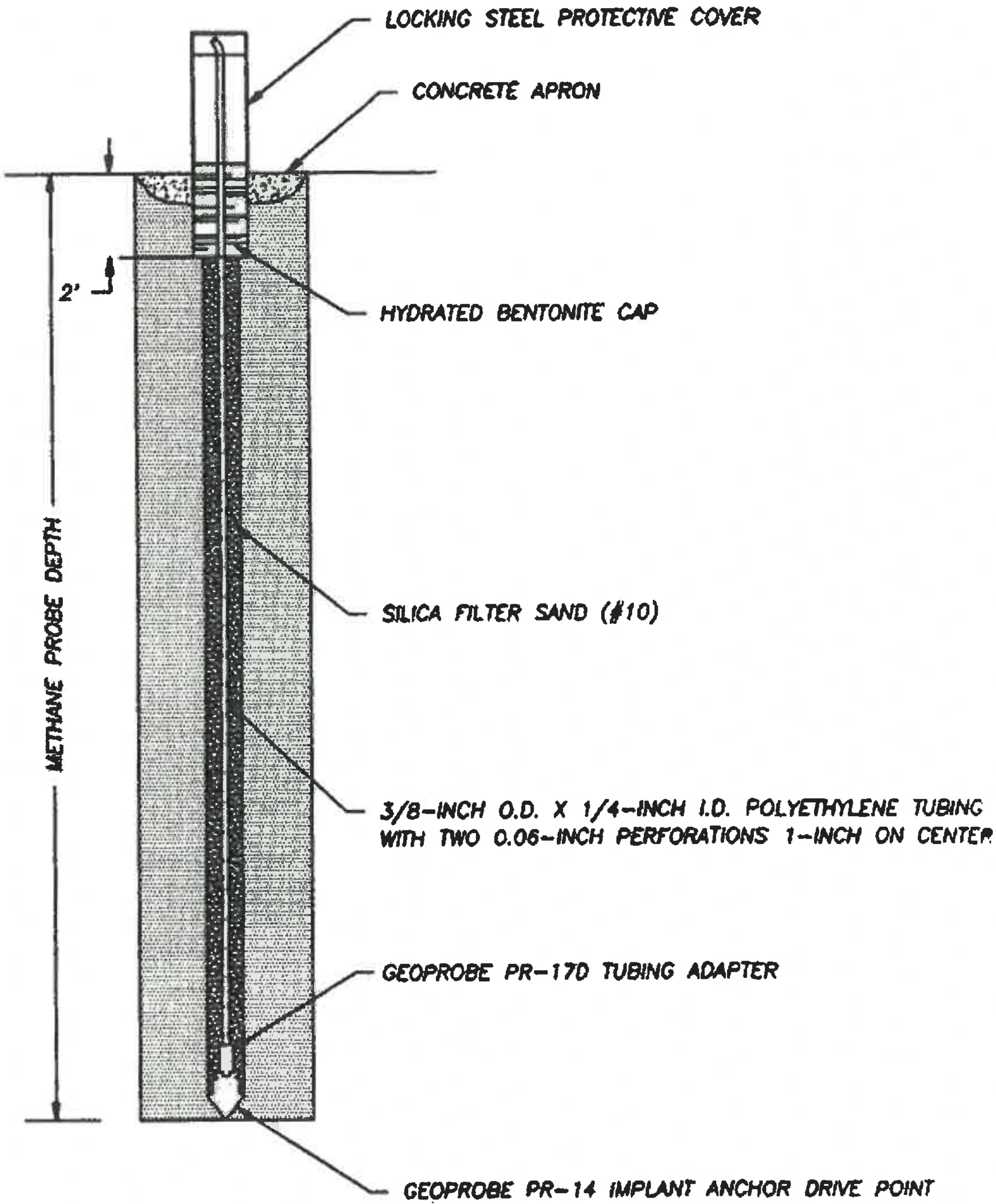
DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:
Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

APPENDIX E
Methane Monitoring Probe Installation

copy

METHANE MONITORING PROBE CONSTRUCTION DIAGRAM

PHILIP McGILL ROAD LANDFILL
3895 McGILL ROAD
JACKSON, MICHIGAN



METHANE PROBE DEPTHS
PROBE 1 – 39.0'
PROBE 2 – 10.5'
PROBE 3 – 26.5'
PROBE 4 – 20.0'

SUBSURFACE ALTERNATIVES, INC.

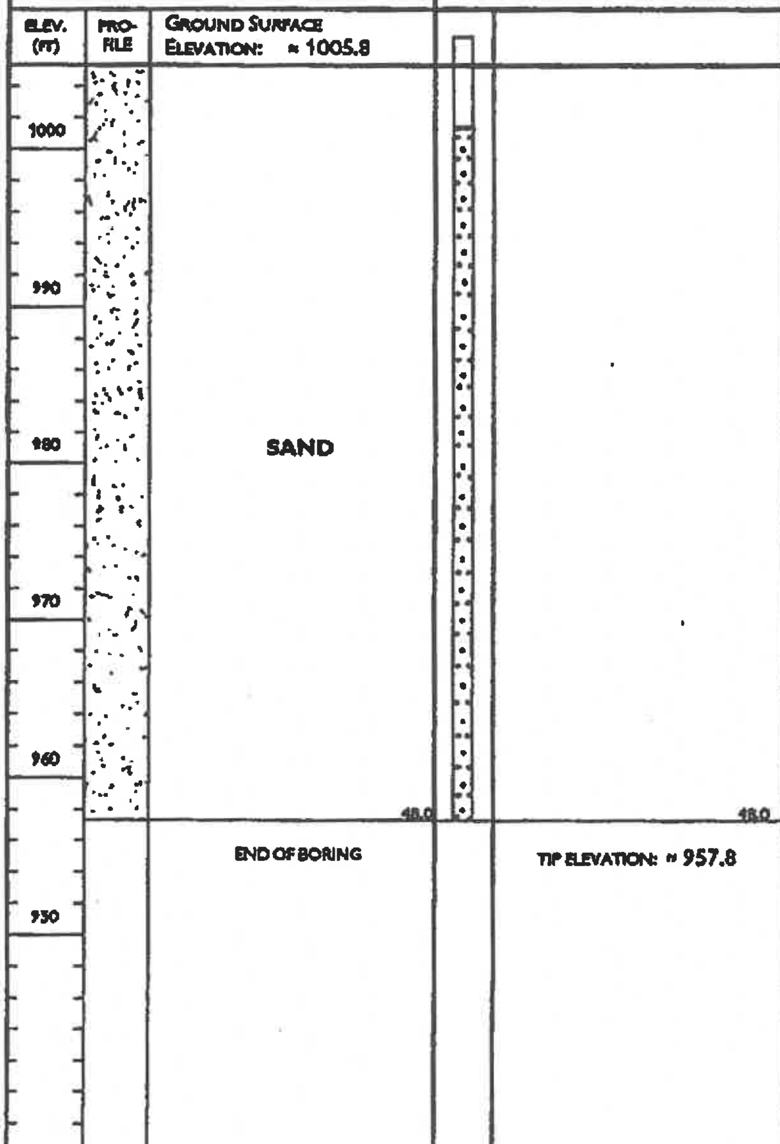
NTH CONSULTANTS, LTD.

METHANE MONITORING PROBE NO: MP-5

PROJECT NAME:	U.S.A. WASTE JACKSON LANDFILL	NTH PROJ. NO:	13-6773-51
PROJECT LOCATION:	McGILL ROAD, JACKSON, MICHIGAN	CHECKED BY:	MGG

LOG OF MONITORING PROBE

GENERALIZED SUBSURFACE PROFILE | INSTALLATION SCHEMATIC



METHANE DATA

DATE	METHANE READING	COMMENTS

NOTES:

[1] TUBING PERFORATED WITH 1/16" HOLES FROM 5.0' TO 48.0'.

[2] SOIL DESCRIPTIONS DERIVED FROM LOG OF MW-32/MW-33 BY EDI, GRAND HAVEN, MICHIGAN (03/11/94).

STARTED:	01/23/97	PROBE DIAMETER:	0.25"
COMPLETED:	01/23/97	PROBE LENGTH:	53.0'
INSPECTOR:	M. DUEWEKE	PROBE MESH:	43.0' PERFORATED
DRILLER:	T. PARSONS	PROBE MATERIAL:	HDPE
CONTRACTOR:	ALL TERRAIN SERVICES	PROBE COORDINATES:	N: 286647.00 E: 13123225.58
EQUIPMENT:	BOBCAT PROBER		
WELL TYPE:	METHANE MONITORING PROBE		

FIGURE NO.

NTH CONSULTANTS, LTD.

METHANE MONITORING PROBE NO. MP-6

PROJECT NAME:	U.S.A. WASTE JACKSON LANDFILL	NTH PROJ. NO:	13-6773-51
PROJECT LOCATION:	MCGILL ROAD, JACKSON, MICHIGAN	CHECKED BY:	MOG

LOG OF MONITORING PROBE

GENERALIZED SUBSURFACE PROFILE / INSTALLATION SCHEMATIC

GROUND SURFACE ELEVATION: ≈ 1008.1

ELEV. (FT)	DEPTH TO BOTTOM (FT)	PROFILE
1008.1–999.1	9.0	SAND
999.1–989.1	19.0	SILTY CLAY
989.1–982.1	26.0	SAND
982.1–970.1	38.0	SAND & GRAVEL

Elevation scale: 1000, 990, 980, 970, 960, 950, 940

END OF BORING

INSTALLATION SCHEMATIC: NON-SHRINKING CEMENT GROUT (to 1.0); 38.0

TIP ELEVATION: ≈ 970.1

METHANE DATA

DATE	METHANE READING	COMMENTS

NOTES:

[1] TUBING PERFORATED WITH 1/16" HOLES FROM 5.0' TO 38.0'.

[2] SOIL DESCRIPTIONS DERIVED FROM LOG OF MW-35 BY EDI, GRAND HAVEN, MICHIGAN (03/16/94).

STARTED:	01/09/97	PROBE DIAMETER:	0.25"
COMPLETED:	01/09/97	PROBE LENGTH:	41.0'
INSPECTOR:	M. DUEWEKE	PROBE MESH:	33.0' PERFORATED
DRILLER:	T. PARSONS	PROBE MATERIAL:	HDPE
CONTRACTOR:	ALL TERRAIN SERVICES	PROBE COORDINATES:	N: 286648.23 E: 13122677.97
EQUIPMENT:	BOBCAT PROBER		
WELL TYPE:	METHANE MONITORING PROBE		

FIGURE NO.

7.3

NTH CONSULTANTS, LTD.

METHANE MONITORING PROBE NO. MP-7

Project Name: U.S.A. WASTE JACKSON LANDFILL
Project Location: McGILL ROAD, JACKSON, MICHIGAN
NTH Proj. No: 13-6773-51
Checked By: [illegible]

LOG OF MONITORING PROBE

Generalized Subsurface Profile			Installation Schematic
Elev. (FT)	Pro-file	Ground Surface Elevation: ≈ 954.3	1.0
950		SAND	Non-Shrinking Cement Grout
940		14.0	14.0
		End of Boring	Tip Elevation: ≈ 940.3
930			
920			
910			
900			

METHANE DATA

Date	Methane Reading	Comments

NOTES:

[1] Tubing perforated with 1/16" holes from 5.0' to 14.0'.

[2] Soil descriptions derived from Log of MW-15 by EDI, Grand Haven, Michigan (07/09/92).

Started:	12/11/96
Completed:	12/11/96
Inspector:	M. Dueweke
Driller:	T. Parsons
Contractor:	All Terrain Services
Equipment:	Bobcat Prober
Well Type:	Methane Monitoring Probe

Probe Diameter:	0.25"
Probe Length:	17.0'
Probe Mesh:	9.0' Perforated
Probe Material:	HDPE
Probe Coordinates:	N: 287383.05 E: 13122538.66

FIGURE NO.

NTH Consultants, Ltd.
Infrastructure Engineering
and Environmental Services

38955 Hills Tech Drive
Farmington Hills, MI 48331-3432
248.553.6300
248.324.5179 Fax

Mr. Patrick J. Brennan
MDEQ – Waste Management Division
Jackson State Office Building
301 E. Louis Glick Highway
Jackson, Michigan 49201

August 28, 2001
NTH Project No. 13-6773-G01

RE: Report on Installation of Gas Monitoring Probes
McGill Road Landfill
Jackson, Michigan

Dear Mr. Brennan:

On behalf of McGill Road Landfill (MRL), NTH Consultants, Ltd., has prepared this report to document the installation of eight permanent gas monitoring probes at the MRL site in Jackson, Michigan. The purpose of this work was to upgrade the landfill gas monitoring system for MRL. These probes were installed in general accordance with the work plan dated June 26, 2001, which was submitted to and approved by the Michigan Department of Environmental Quality (MDEQ).

The work plan also included a number of additional activities designed to investigate the occurrence and possible sources of subsurface gas at the site and on the adjacent Jackson County Landfill No. 1 property. Several of these activities were performed concurrently with the gas probe installation. When the additional investigation is completed, a separate report will be submitted to MDEQ to present the results.

The following presents a summary of the field activities with respect to the installation of the permanent gas probes

On August 14 and 15, 2001, our drilling contractor, Mateco Drilling Company (Mateco), installed eight gas monitoring probes at MRL. The locations of the newly installed gas probes, designated MP-8 through MP-15, as well as existing gas monitoring locations, are shown on the attached Plate 1, Landfill Gas Monitoring Network. An NTH geologist observed the driller's field activities and noted the general soil conditions encountered and the construction details of each probe, including depth, materials used, and backfilling methods.

Each of the gas monitoring probes was installed using a Geoprobe®, Model DT-66, drill rig to a depth of approximately 2 feet above the estimated groundwater level. After Mateco completed the borehole to the target depth, the "knock out" plug was removed from the bottom the Geoprobe drill string, and a steam-cleaned probe assembly constructed of 1-inch diameter Schedule 40 PVC riser, fitted with a 0.010-inch slot PVC screen was inserted through the Geoprobe casing. The probe screens extend from the bottom depth of the borehole to approximately 5 feet below ground surface.

The boreholes were backfilled with sand to approximately 1 foot above the top of screen. Hydrated bentonite hole plug was used to seal the boreholes, and a locking protective cover was installed over each probe. Figure 1, Gas Probe Construction Diagram, shows a representative cross sectional view of the permanent gas probes. Upon completion of the new probes, surveyors with McNeely & Lincoln Associates, Inc., established the ground surface elevation and location coordinates for each new gas probe. Table 1, Gas Probe Construction Details, lists the ground surface and screen tip elevations, screen lengths, installation dates, and location coordinates for each gas probe at MRL.

The new gas probes will be included in the site's regularly scheduled landfill gas monitoring program. Should you have any questions or concerns regarding the information presented in this letter please contact our office at (248) 553-6300 or Paul Mazanec of Waste Management at (734) 326-8230.

Sincerely,

NTH Consultants, Ltd.

Scott T. Pratt /tt

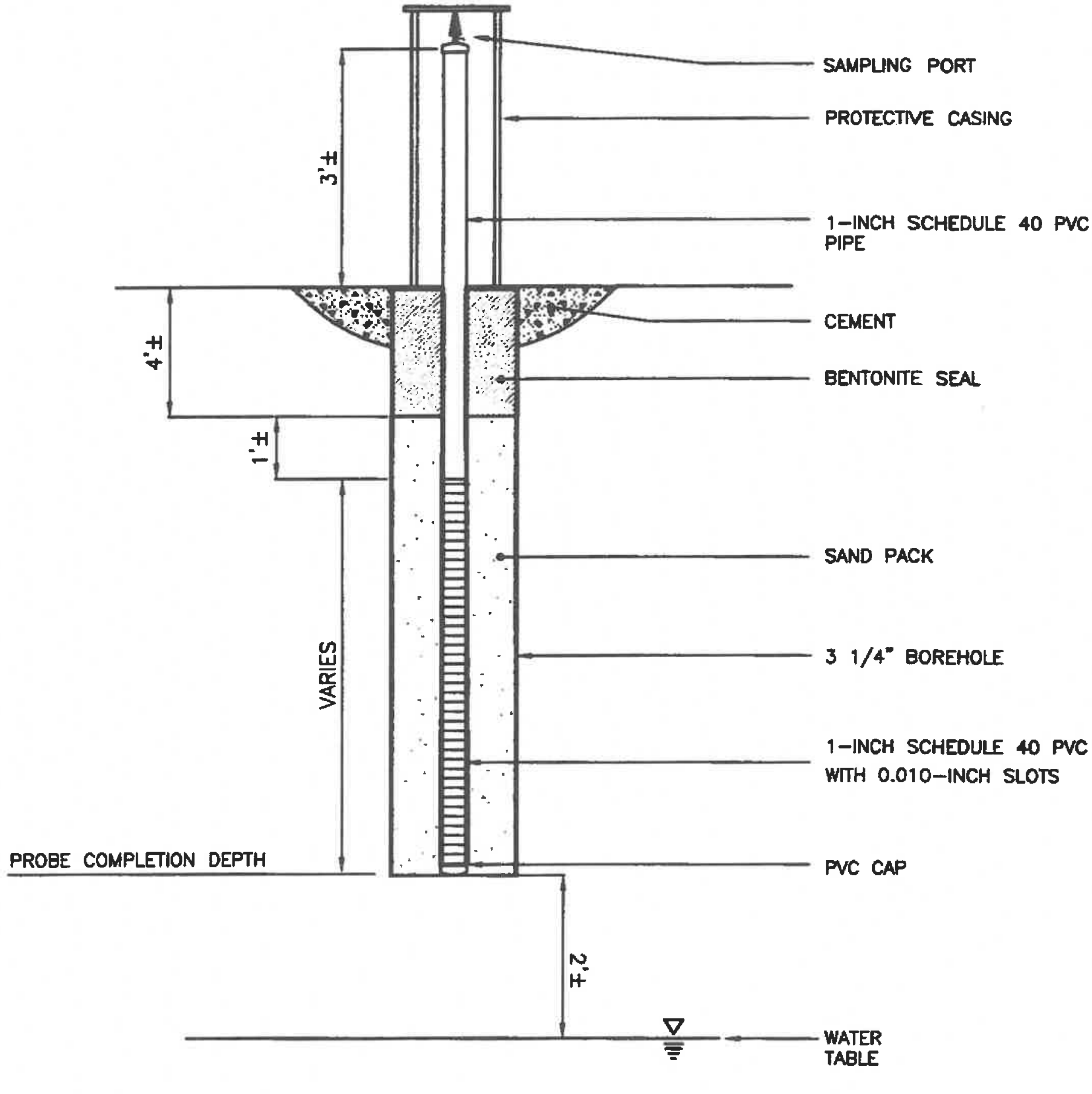
Scott T. Pratt
Senior Staff Geochemist

Alan Erickson, P.E.
Project Manager

STP/ACE/tt

attachments

cc: Paul Mazanec – WM (Operating Record)
Eric Wallis – WM



PROJECT NO. 13-6773-G01	LOCATION: McGILL ROAD LANDFILL JACKSON, MICHIGAN	TITLE: GAS PROBE CONSTRUCTION DIAGRAM	DATE: 8-27-01
SCALE: NOT TO SCALE			SHEET 1 OF 1
DRAWN BY: HK	NTH Consultants, Ltd. Professional Engineering & Environmental Services Farmington Hills · Detroit · Exton · Grand Rapids · Lansing		FIGURE NO: 1
CHECKED BY: ACE			

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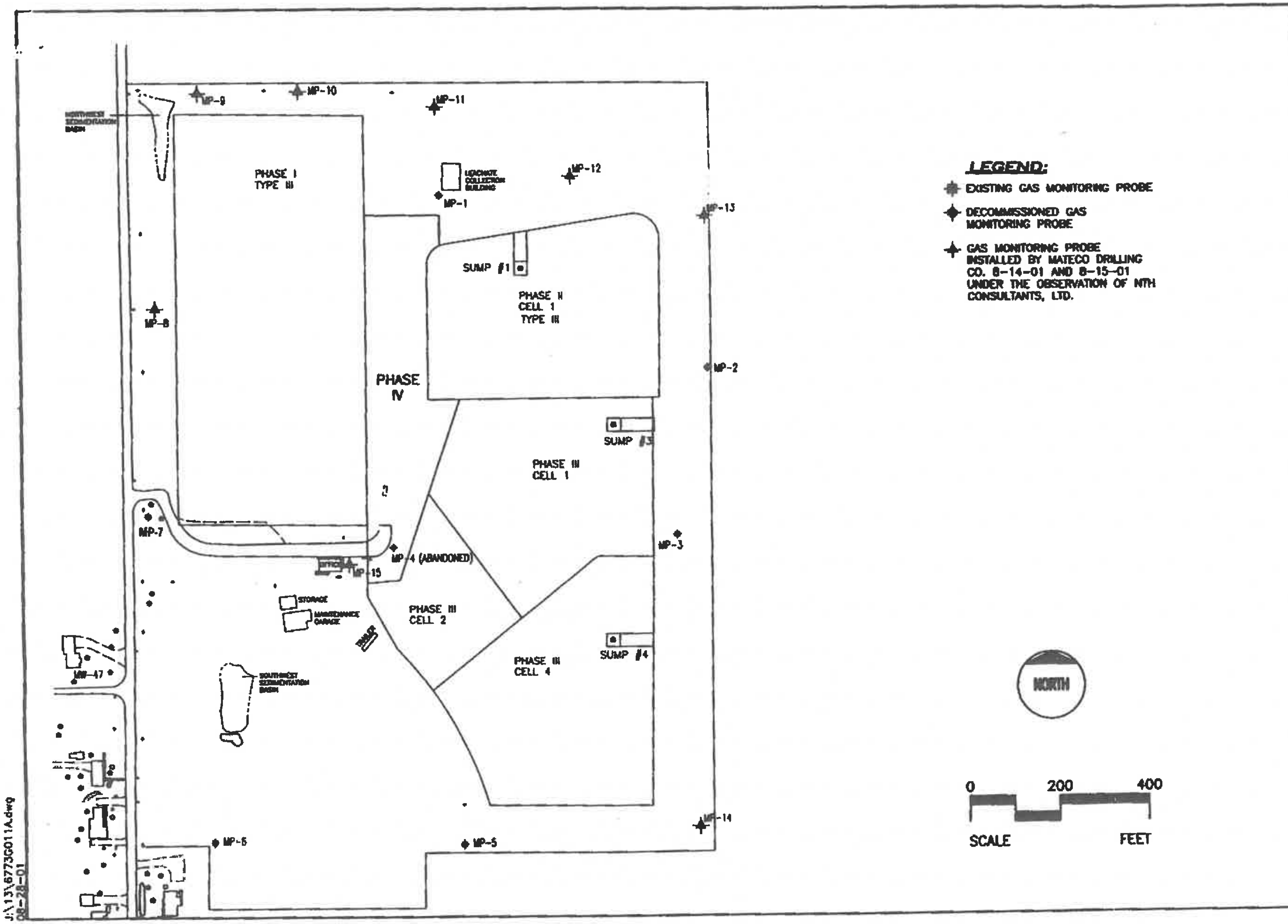
08-28-01



NTH Consultants, Ltd.

Professional Engineering & Environmental Services
Farmington Hills Detroit Exton Grand Rapids Lansing

PROJECT NO. 13-6773-G01
SCALE: 1"=200'
DRAWN BY: JD
CHECKED BY: ACE

LANDFILL GAS MONITORING NETWORK

McGILL ROAD LANDFILL
JACKSON, MICHIGAN

DATE: 8-27-01
SHEET 1 OF 1
PLATE NO: 1

METHANE MONITORING PROBE: MP-16

NTH CONSULTANTS, LTD.

Project Name: *McGILL ROAD LANDFILL*

Project Location: *JACKSON, MICHIGAN*

NTH Proj. No: *13-060122-W06*

Checked By: dMP

LOG OF MONITORING PROBE

Generalized Subsurface Profile — GROUND SURFACE ELEVATION: 997.8

Depth (ft)	Description
0.0 – 0.8	Topsoil: Silty Sand
0.8 – 44.4	Silty Sand
44.4	End of Boring

Installation Schematic — TOP OF WELL CASING ELEVATION: 999.4

Depth (ft)	Description
0.0 – 0.4	Concrete
0.4 – 4.4	Hydrated Bentonite Pellets
4.4 – 44.4	Filter Sand
44.4	Tip Elev: 953.4

ELEV. (ft): 990, 980, 970, 960, 950, 940, 930

METHANE DATA

Date	Methane Reading	Comments

NOTES

[1] Coordinates: E 3957.0, N 6899.1

[2] Survey data provided by McNeely & Lincoln Assoc., Inc. 04/04/07.

Started:	*12-19-06*
Completed:	*12-20-06*
Inspector:	*D. Anthony*
Contractor:	*Mateco Drilling Co.*
Driller:	*S. Middlebrook*
Equipment:	*CME-45C*
Well Type:	*Gas Monitoring*

Casing Diameter:	*1.0 in*
Casing Length:	*7.13 ft*
Casing Type:	*PVC*
Screen Diameter:	*1.0 in*
Screen Length:	*39.0 ft*
Screen Mesh:	*0.010 in*
Screen Type:	*PVC*

FIGURE NO. 16

METHANE MONITORING PROBE: MP-17

NTH CONSULTANTS, LTD.

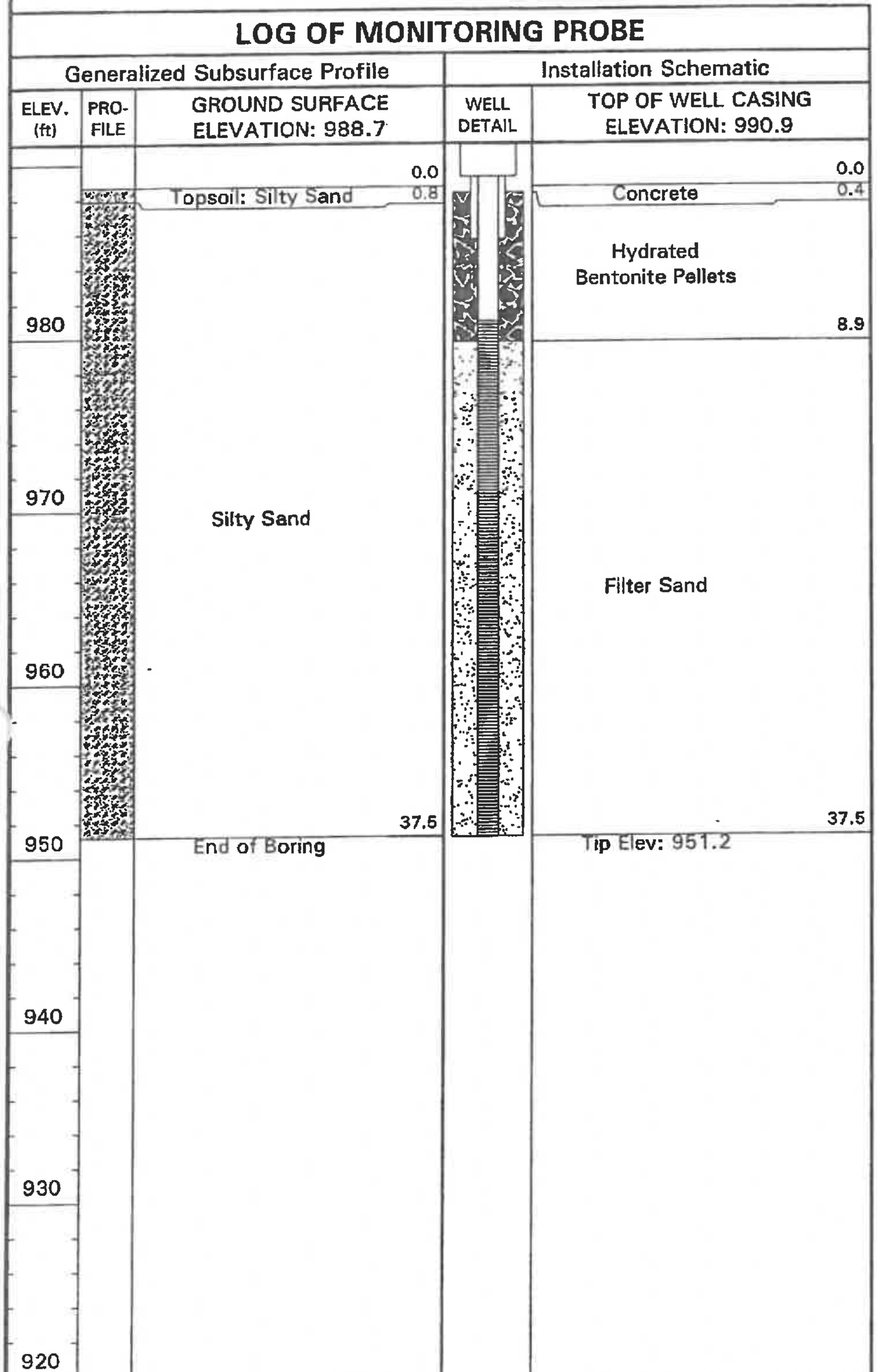
Project Name: *McGILL ROAD LANDFILL*

Project Location: *JACKSON, MICHIGAN*

NTH Proj. No: *13-060122-W06*

Checked By: dlp

LOG OF MONITORING PROBE



METHANE DATA

Date	Methane Reading	Comments

NOTES

[1] Coordinates: E 4231.9, N 6901.1
[2] Survey data provided by McNeely & Lincoln Assoc., Inc. 04/04/07.

Started:	*12-19-06*
Completed:	*12-19-06*
Inspector:	*D. Anthony*
Contractor:	*Mateco Drilling Co.*
Driller:	*S. Middlebrook*
Equipment:	*CME-45C*
Well Type:	*Gas Monitoring*

Casing Diameter:	*1.0 in*
Casing Length:	*9.93 ft*
Casing Type:	*PVC*
Screen Diameter:	*1.0 in*
Screen Length:	*30.0 ft*
Screen Mesh:	*0.010 in*
Screen Type:	*PVC*

FIGURE NO. 17

METHANE MONITORING PROBE: MP-18

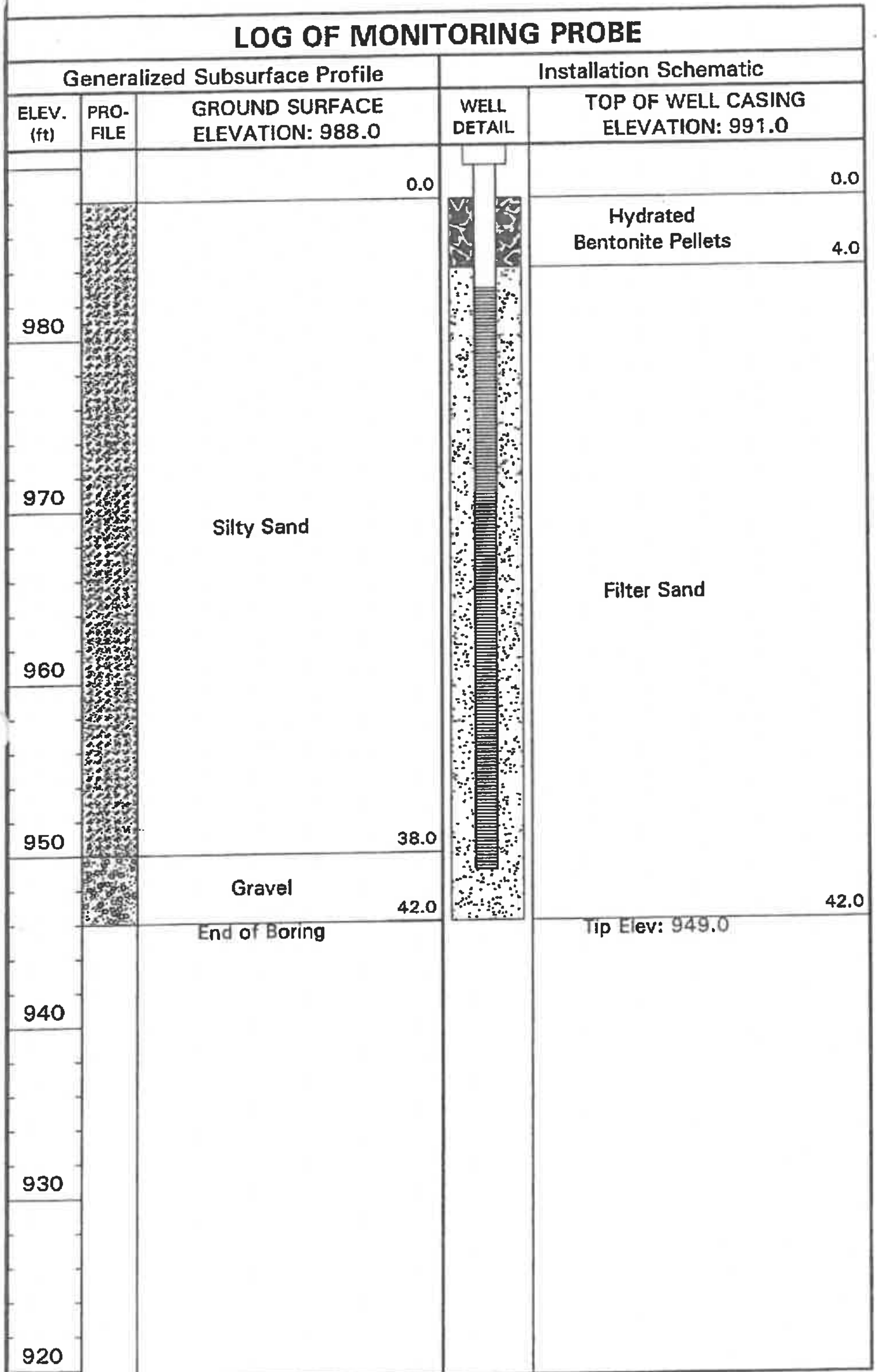
NTH CONSULTANTS, LTD.

Project Name: *McGILL ROAD LANDFILL*

Project Location: *JACKSON, MICHIGAN*

NTH Proj. No: *13-060122-W06*

Checked By: dlp



METHANE DATA

Date	Methane Reading	Comments

NOTES

[1] Coordinates: E 4511.0, N 7108.0
[2] Survey data provided by McNeely & Lincoln Assoc., Inc. 04/04/07.

Started:	*11-30-06*
Completed:	*11-30-06*
Inspector:	*M. McNamara*
Contractor:	*Mateco Drilling Co.*
Driller:	*S. Middlebrook*
Equipment:	*GeoProbe*
Well Type:	*Gas Monitoring*

Casing Diameter:	*1.0 in*
Casing Length:	*8.0 ft*
Casing Type:	*PVC*
Screen Diameter:	*1.0 in*
Screen Length:	*34.0 ft*
Screen Mesh:	*0.010 in*
Screen Type:	*PVC*

FIGURE NO. 18

METHANE MONITORING PROBE: MP-19

NTH CONSULTANTS, LTD.

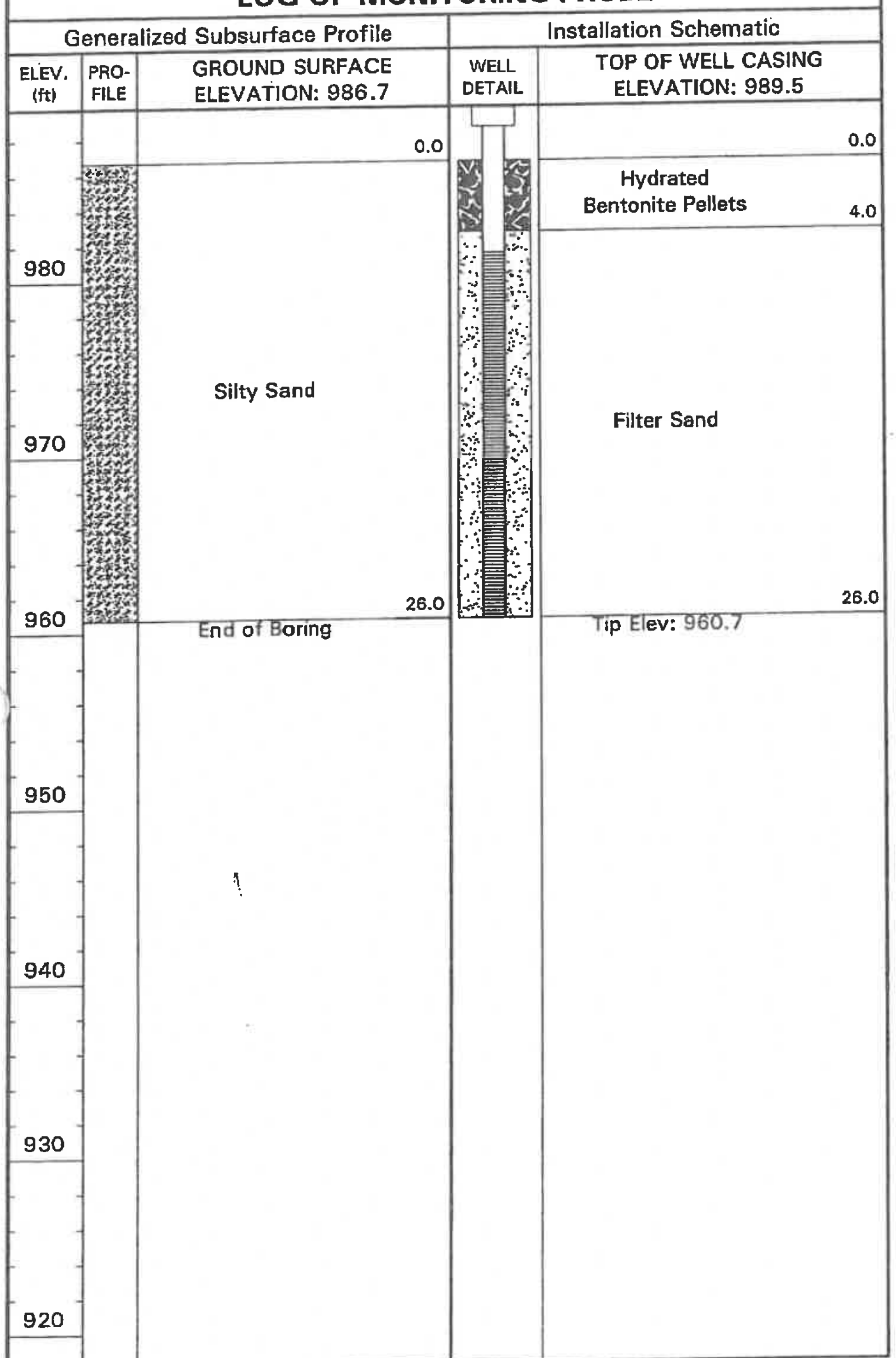
Project Name: *McGILL ROAD LANDFILL*

Project Location: *JACKSON, MICHIGAN*

NTH Proj. No: *13-060122-W06*

Checked By: dlp

LOG OF MONITORING PROBE



METHANE DATA

Date	Methane Reading	Comments

NOTES

[1] Coordinates: E 4519.3, N 7530.5
[2] Survey data provided by McNeely & Lincoln Assoc., Inc. 04/04/07.

Started:	*11-30-06*
Completed:	*11-30-06*
Inspector:	*M. McNamara*
Contractor:	*Mateco Drilling Co.*
Driller:	*S. Middlebrook*
Equipment:	*GeoProbe*
Well Type:	*Gas Monitoring*

Casing Diameter:	*1.0 in*
Casing Length:	*8.0 ft*
Casing Type:	*PVC*
Screen Diameter:	*1.0 in*
Screen Length:	*21.0 ft*
Screen Mesh:	*0.010 in*
Screen Type:	*PVC*

FIGURE NO. 19

METHANE MONITORING PROBE: MP-20

NTH CONSULTANTS, LTD.

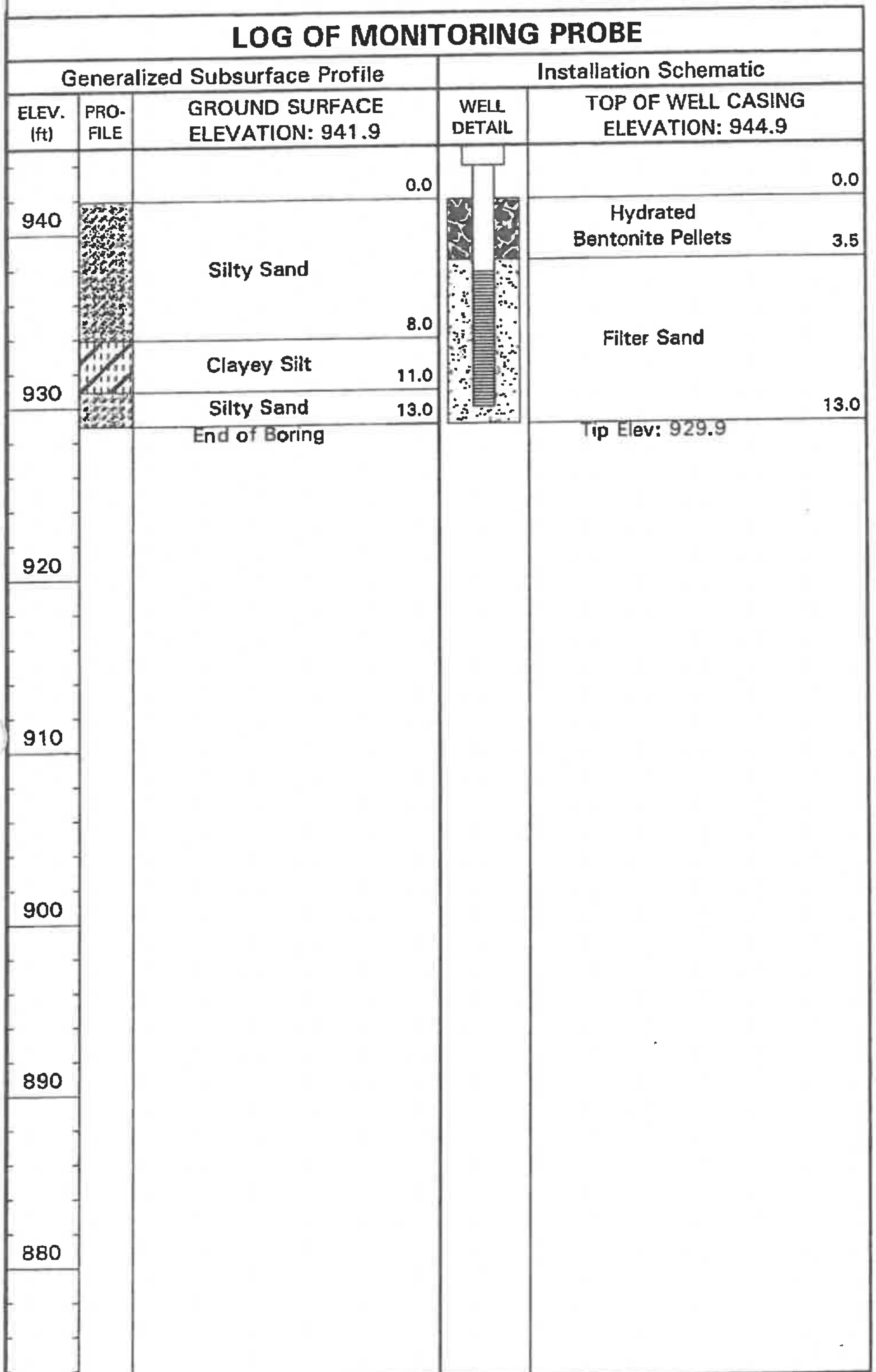
Project Name: *McGILL ROAD LANDFILL*

Project Location: *JACKSON, MICHIGAN*

NTH Proj. No: *13-060122-W06*

Checked By: *dWP*

LOG OF MONITORING PROBE



METHANE DATA

Date	Methane Reading	Comments

NOTES

[1] Coordinates: E 4535.4, N 8133.7

[2] Survey data provided by McNeely & Lincoln Assoc., Inc. 04/04/07.

Started:	*11-29-06*
Completed:	*11-29-06*
Inspector:	*M. McNamara*
Contractor:	*Mateco Drilling Co.*
Driller:	*S. Middlebrook*
Equipment:	*GeoProbe*
Well Type:	*Gas Monitoring*

Casing Diameter:	*1.0 in*
Casing Length:	*7.0 ft*
Casing Type:	*PVC*
Screen Diameter:	*1.0 in*
Screen Length:	*8.0 ft*
Screen Mesh:	*0.010 in*
Screen Type:	*PVC*

FIGURE NO. 20

METHANE MONITORING PROBE: MP-21

NTH CONSULTANTS, LTD.

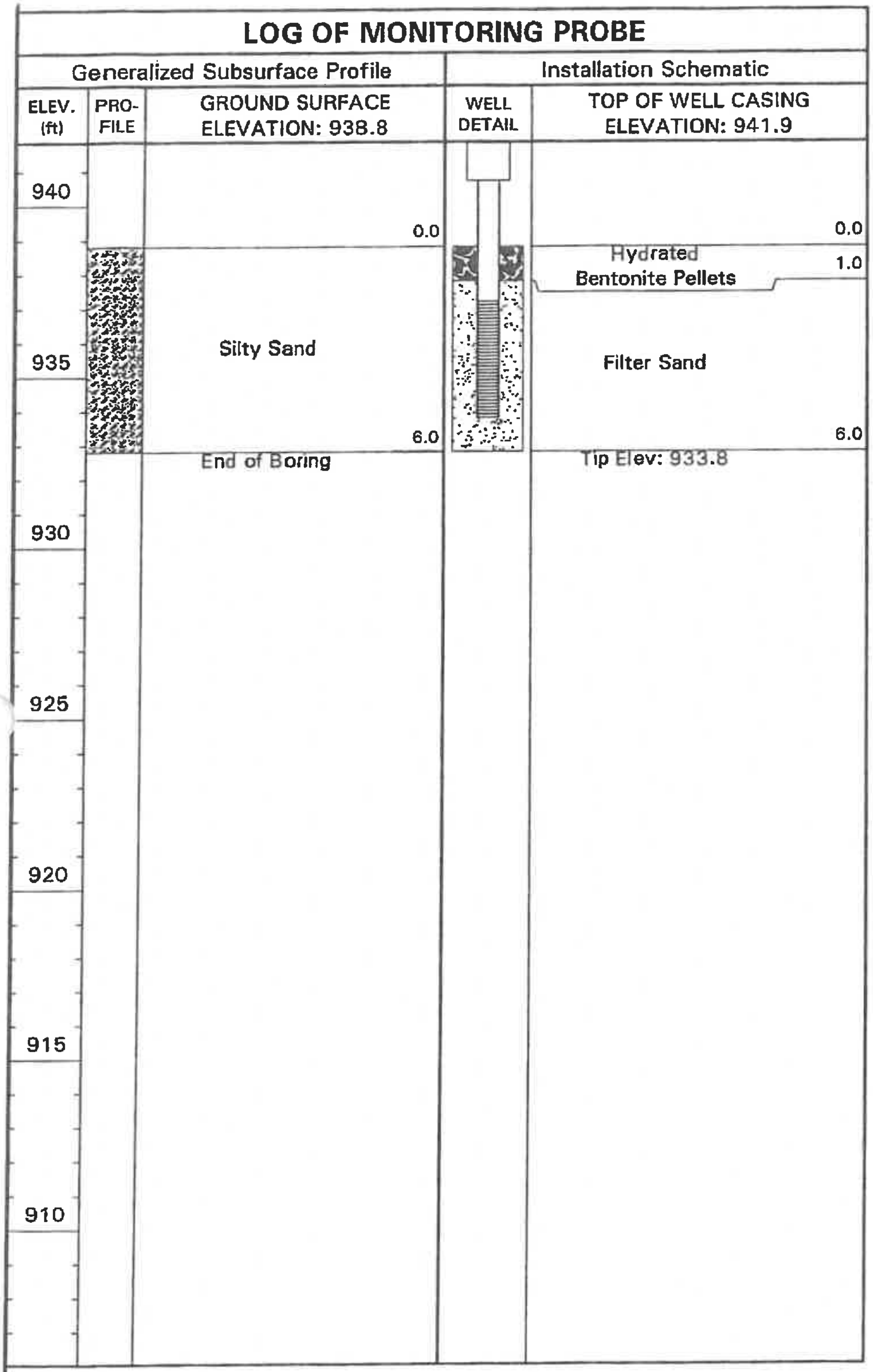
Project Name: *McGILL ROAD LANDFILL*

Project Location: *JACKSON, MICHIGAN*

NTH Proj. No: *13-060122-W06*

Checked By: dlp

LOG OF MONITORING PROBE



METHANE DATA

Date	Methane Reading	Comments

NOTES

[1] Coordinates: E 4094.3, N 8369.5
[2] Survey data provided by McNeely & Lincoln Assoc., Inc. 04/04/07.

Started:	*11-29-06*
Completed:	*11-29-06*
Inspector:	*M. McNamara*
Contractor:	*Mateco Drilling Co.*
Driller:	*S. Middlebrook*
Equipment:	*GeoProbe*
Well Type:	*Gas Monitoring*

Casing Diameter:	*1.0 in*
Casing Length:	*4.5 ft*
Casing Type:	*PVC*
Screen Diameter:	*1.0 in*
Screen Length:	*3.5 ft*
Screen Mesh:	*0.010 in*
Screen Type:	*PVC*

FIGURE NO. 21

TABLE 1
GAS MONITORING PROBE CONSTRUCTION DETAILS
McGill Road Landfill
Jackson, Michigan

PROBE DESIGNATION	GROUND SURFACE ELEVATION (FEET)	SCREEN TIP ELEVATION (FEET)	SCREEN LENGTH (FEET)	PROBE CASING / SCREEN MATERIALS	DATE INSTALLED
MP-1	968.2	929.2	36	PVC/Polyethylene tubing	9/15/95
MP-2 (Note 2)	~~964.2~~	~~951 .7~~	~~5~~	~~PVC/Polyethylene tubing~~	~~9115/95~~
MP-3 (Note 2)	~~998.1~~	~~971.6~~	~~21.5~~	~~PVC/Polyethylene tubing~~	~~9/15/95~~
MP-4 (Note 3)	~~974.8~~	~~954 .8~~	~~15~~	~~PVC/Polyethylene tubing~~	~~9/15/9 5~~
MP-5	1005.8	957.8	43	PVC/PVC	1/23/97
MP-6	1008.1	970.1	33	PVC/PVC	1/9/97
MP-7	954 .3	940 .3	9	PVC/PVC	12/11/96
MP-8	946 .0	936.0	5	PVC/PVC	8/15/01
MP-9	9434	930.4	8	PVC/PVC	8/14/01
MP-10	948.1	931.1	10	PVC/PVC	8/15/01
MP-I I	966.9	932.9	30	PVC/PVC	8/15/01
MP-12	949 .7	940.7	5	PVC/PVC	8/14/01
MP-13	956.8	941.8	10	PVC/PVC	8/14/01
MP-14	988.9	931.9	30	PVC/PVC	8/15/01
MP-15	970.3	952.3	13	PVC/PVC	8/15/01
MP-16	997.8	953.4	39	PVC/PVC	9/20/06
MP-17	988.7	951.2	30	PVC/PVC	9/19/06
MP-18	988.0	951.0	34	PVC/PVC	11/30/06
MP-19	986.7	960.7	21	PVC/PVC	11/30/06
MP-20	941.9	931.0	8	PVC/PVC	11/29/06
MP-21	938.8	935.0	4	PVC/PVC	11/29/06

NOTES:

1 . Probe construction details and survey data for MP- I through MP-4 taken from site operating record.
2. MP-2 & 3 were removed and abandoned due to its location within the footprint of Phase V.
3. MP-4 was removed and abandoned on 5/30/0 I due to its location within the footprint of Phase IV/Cell I.