November 23, 2021
Project Number: 210166-05

Ministry of the Environment, Conservation and Parks (MECP)
Director, Client Services and Permissions Branch
135 St. Clair Avenue West, 1st Floor
Toronto, ON M4V 1P5

Re: Amendment to Environmental Compliance Approval No. A371203

To whom it may concern,

Please find attached an Environmental Compliance Approval (ECA) application and supporting documentation for an amendment to ECA No. A371203 dated March 19, 2021 and issued to Waste Management of Canada Corporation (WM) for the Richmond Landfill site (the Site) located in the Town of Greater Napanee, ON. This package has been prepared in consultation with WM and is being provided on their behalf.

This application includes the following documentation:

- Figure 1 – Properties Included in the Proposed (CAZ)
- Attachment A – ECA Application Form
- Attachment B – MECP Confirmation of Delineation
- Attachment C – Proof of Legal Name
- Attachment D – Copy of Notification Letter and Distribution List
- Attachment E – Proposed Post-Closure Environmental Monitoring Plan (BluMetric, 2021)

On December 24, 2015, the Environmental Review Tribunal issued a decision regarding ECA No. A371203 including a requirement to demonstrate delineation of leachate-impacted groundwater at the Site, and off-Site. On August 24, 2021, MECP Kingston District Manager Trevor Dagilis confirmed that the extent of leachate-impacted groundwater related to the Site has been delineated (see Attachment B). In accordance with Condition 8.5(e) of ECA No. A371203, WM is submitting this application for approval to amend the ECA to address non-compliance with Condition 8.8 and Guideline B-7, including incorporation of a contaminant attenuation zone (CAZ, see Figure 1) into the approval and a proposed updated environmental monitoring plan (EMP) (see Attachment E).

Tel. 613-531-2725
Fax. 613-531-1852

BluMetric Environmental Inc.
The Tower, The Woolen Mill, 4 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7

www.blumetric.ca

WM is requesting changes to the following Conditions as listed below:

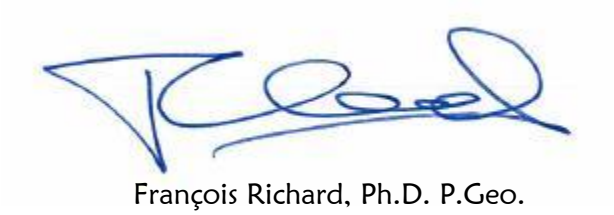
ECA Section and Condition	Change Requested and Rationale
4.0 Site Operations; Conditions 4.8 (a) and (b) (Phytoremediation System)	Propose changes, as required by Condition 4.8 (3), to include monitoring locations suitable for determining groundwater levels and quality around the phytoremediation system in the northwest corner of the Site based on the proposed post-closure EMP: ▪ 4.8 (1) a. Shallow Zone - M27, M66-2, M67-2, M86, M101, M102, M103 and M104 ▪ 4.8 (1) b. Intermediate Bedrock Zone - M5-3, M6-3, M46-2, M72, M74, M75 and M95-1 ▪ 4.8 (2) a. Shallow Zone - M67-2, M86, M101 and M103 ▪ 4.8 (2) b. Intermediate Bedrock Zone - M5-3, M6-3, M74, M75 and OW1
8.0 Monitoring; Condition 8.5 (a) proposed Environmental Monitoring Plan (EMP)	Propose changes to Condition to correspond to proposed post-closure EMP submitted as part of this application (see Attachment E)
8.0 Monitoring; Condition 8.5 (b)	Propose change to refer to proposed post-closure EMP (see Attachment E)
8.0 Monitoring; Condition 8.5 (c)	Propose removal of Condition – plume has been delineated (see Attachment B)
8.0 Monitoring; Condition 8.5 (d)	Propose removal of Condition – satisfying this condition with this ECA amendment application
8.0 Monitoring; Condition 8.5 (e)	Propose removal of Condition – satisfying this condition with this ECA amendment application
8.0 Monitoring; Condition 8.6	Propose removal of Condition – this study has been completed
8.0 Monitoring; Condition 8.10	Propose change to refer to established CAZ as proposed in current application (see Figure 1)
8.0 Monitoring; Conditions 8.11 & 8.12	Propose removal of Conditions. Monitoring results will reported in annual reports
8.0 Monitoring; Conditions 8.13	Propose change to Condition – remove 1264, 1252, 1250, 1206 and 1144 Beechwood Road as these residences have been demolished or, in the case of the residence located at 1144 Beechwood Road, or scheduled for demolition in December 2021)
14.0 Semi Annual and Annual Reporting; Condition 14.1	- Propose change to Annual Reporting with submission by February 15 (when annual sampling occurs in the fall) or August 15 (when sampling occurs in the spring) of each year - Propose change to Condition 14.1 a. iv – an evaluation of leachate quality within the landfill

ECA Section and Condition	Change Requested and Rationale
	- Propose change to Condition 14.1 a. vi. – maps or figures showing groundwater impact delineation based on 1,4-dioxane RUL exceedances in the shallow and intermediate aquifers - Propose addition of Condition 14.1 a. x. – trend analysis for indicator parameters in surface water (as requested by MECP surface water reviewer). - Propose change to Conditions 14.1. d. and e. – replace references to semi-annual report with Annual Monitoring Report

We trust that the information provided herein is complete and contains sufficient detail. Please contact the undersigned should you have any concerns or questions.

Respectfully submitted,
BluMetric Environmental Inc.

Madeleine Corriveau, M.Sc., P.Geo.
Senior Environmental Geoscientist
mcorriveau@blumetric.ca
(613) 328-4518



François Richard, Ph.D. P.Geo.
Senior Hydrogeologist
frichard@blumetric.ca
(613) 558-5936

FIGURES

LEGEND

- WM Owned Property
- Proposed Contaminant Attenuation Zone
- Lot Parcels

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

DO NOT SCALE DRAWING.
THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.

N, W, E, S

0 100 200 Metres

CLIENT

WM WASTE MANAGEMENT

PROJECT

Waste Management Richmond Landfill - ECA Amendment Application

TITLE

Properties Included in the Proposed CAZ

BluMetric™ Environmental
4 Cataraqui Street
Kingston ON K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
210166-05	November, 22, 2021

DRAWN	CHECKED	FIG NO.	REV
GM	FR	01	0

N:\GIS_PROJECTS\PROJECTS\WM\Richmond\210166\MXD\2021-11-22\210166-Fig01_Properties.mxd

ATTACHMENT A

ECA Application Form

Ontario

Ministry of the Environment and Climate Change

Environmental Compliance Approval Application

Table of Contents

Ontario

Ministry of the Environment and Climate Change

Environmental Compliance Approval Application

General Information and Instructions

General Information

Information requested in this form is collected under the authority of the *Environmental Protection Act* (EPA), *Ontario Water Resources Act* (OWRA) and Environmental Bill of Rights (EBR), and will be used to evaluate applications for Environmental Compliance Approvals (ECAs) issued under Part II.1 of the EPA. This application form should not be used for mobile PCB destruction facilities.

For all questions related to preparing or submitting this form or about the Ministry's collection of information related to applying for an ECA, contact:

Client Services and Permissions Branch
135 St. Clair Ave. West, 1st Floor
Toronto Ontario M4V 1P5
Telephone outside Toronto 1-800-461-6290 or in Toronto 416-314-8001.

Instructions

1. Applicants are responsible for ensuring that they complete the most recent application form. Application forms and information about the required supporting documentation and technical requirements are available from the Client Services and Permissions Branch (the address and phone number are provided in the General Information on this page). As well, you can get this information from your local District Office of the Ministry of the Environment and Climate Change, and online at: https://www.ontario.ca/page/environmental-approvals
2. A complete application consists of:
   - a completed and signed application form;
   - all required supporting documents and technical requirements identified in:
     i. this form,
     ii. Ministry guidance,
     iii. the Applications for Environmental Compliance Approvals regulation, and
   - payment of the application fee (in Canadian funds) by certified cheque or money order made payable to the Minister of Finance, or credit card payment (for payments up to $10,000). For Transfer of Review, make the cheque or money order payable to the appropriate municipality. T**he Ministry may return or refuse incomplete applications to the applicant**. The Director may require additional information of any application initially accepted as complete.
3. Submit the complete application as follows:
   - One (1) paper copy (unless the application is a Transfer of Review), one (1) electronic copy and the fee to the Director, Client Services and Permissions Branch at the address provided in the General Information on this page.
   - If the application is a Transfer of Review, the applicant must submit two (2) copies of the completed application and the fee to the designated municipal authority.
4. The applicant must also send a copy of the application without the fee to the local Ministry District Office that has jurisdiction over the area where the facilities are located. DO NOT send payment to the District Office.
   - To locate the appropriate local Ministry District Office, visit the Ministry of the Environment and Climate Change website at: http://www.ontario.ca/environment-and-energy/ministry-environment-and-climate-change-regional-and-district-offices
5. For Waste Disposal Sites the applicant must also send a copy of the application without the fee to the Clerk's office of the local municipality (both upper and lower tier) in which the facility/proposed facility is located unless the application is for a revocation or an amendment that is environmentally insignificant or the applicant is a municipality. DO NOT send any payment information to the municipality.

Information collected by the Ministry of the Environment and Climate Change is subject to the *Freedom of Information and Protection of Privacy Act (FIPPA)*. If the applicant is of the view that any part of the application is confidential on the grounds that such information constitutes a trade secret or scientific, technical, commercial, financial or labour relations information, please make this known now. Otherwise, the Ministry may make the information available to the public without further notice to the applicant.

It is an offence under the EPA and OWRA to provide false or misleading information in this application and/or accompanying documents.

Complete the sections as shown below.

- Section 1: Applicant Information
- Section 2: Project Information
- Section 3: Regulatory Requirements
- Section 4: Site Information
- Section 5: Facility Information
- Section 6: Supporting Documentation
- Section 7: Payment Information
- Section 8: Authorization

Fields marked with an asterisk (*) are mandatory.

1. Applicant Information

1.1 Applicant Information

Applicant Type *

☑ Corporation ☐ Individual ☐ Federal Government ☐ Municipal Government

☐ Partnership ☐ Provincial Government ☐ Sole Proprietor

☐ Other (specify)

Applicant Name (Legal name of individual or organization as evidenced by legal documents) *

Waste Management of Canada Corporation

☑ Select if Business Name same as Applicant Name

Business Name *

Waste Management of Canada Corporation

Business Number *	Business Website Address
876294844	https://www.wm.com/ca/en

Primary North American Industry Classification System (NAICS) Code *

005621

Other NAICS Code

Separate list attached?

☐ Yes ☐ No

Business Activity Description

✓ Completion Status (1.1 Applicant Information)

1.2 Applicant Physical Address

Address Type? *

☑ Civic Address ☐ Survey Address

Civic Address

Unit Number	Street Number *	Street Name *
	1271	Beechwood Road

Survey Address

Enter Lot and Concession or Part and Reference Plan

Lot	Concession	Part	Reference Plan

Municipality/Unorganized Township *	County/District
Napanee	

Province/State *	Country *	Postal/Zip Code *
ON	Canada	K7R 3L1

Telephone Number *	Fax Number	Mobile Number	Email Address *
613-388-1057 ext.	613 388-2785		wmcdonou@wm.com

Geo Reference

Description of location	Map Datum	Zone	Accuracy Estimate	Geo-Referencing Method	UTM Easting	UTM Northing
Southwest corner of property	NAD83	18	10 m	Google Earth	335,530.00	4,901,390.00
Physical location of front door or main entrance	NAD83	18	10 m	Google Earth	335,357.00	4,902,582.00

✓ Completion Status (1.2 Applicant Physical Address)

1.3 Applicant Mailing Address

☑ Select if same as Physical Address

Unit Number	Street Number *	Street Name *
	1271	Beechwood Road

Delivery Designator	Delivery Identifier	Postal Station

Municipality/Unorganized Township *	County/District
Napanee	

Province/State *	Country *	Postal/Zip Code *
ON	Canada	K7R 3L1

Telephone Number *	Fax Number	Mobile Number	Email Address *
613-388-1057 ext.			wmcdonou@wm.com

✓ Completion Status (1.3 Applicant Mailing Address)

2. Project Information

2.1 Project Name and Description

Project Name *

WM Richmond Landfill - Application to Amend ECA No. A371203

Project Description Executive Summary *

The purpose of this amendment is to: establish a Contaminant Attenuation Zone (CAZ) for the WM Richmond Landfill (the Site); and, update the environmental monitoring plan (EMP) for the site.

Supplemental Application Information (select information button for required information for this field) *

On December 24, 2015, the Environmental Review Tribunal issued a decision regarding ECA No. A371203 including a requirement to demonstrate delineation of leachate-impacted groundwater at the Site, and off-Site. On August 24, 2021, MECP Kingston District Manager Trevor Dagilis confirmed that the extent of leachate-impacted groundwater related to the Site has been delineated (Attachment B). In accordance with Condition 8.5 of ECA No. A371203, WM is submitting this application for approval to amend the ECA to address non-compliance with Condition 8.8 and Guideline B-7, including incorporation of a contaminant attenuation zone (CAZ) into the approval (Attachment E), and a proposed updated environmental monitoring plan (EMP) (Attachment F).

Conditions to be removed or revised are as follows:

- Proposed for removal: Conditions 8.5 (c), (d) and (e); Conditions 8.6, 8.11 and 8.12.
- Proposed for revision: Condition 4.8; Condition 8.5 (a) and (b); Condition 8.10; Condition 8.13; Condition 14.1.

✓ Completion Status (2.1 Project Name and Description)

2.2 Application Type

Type *

- ☐ New ECA
- ☑ Amendment to existing ECA
- ☐ Revocation of existing ECA
- ☐ Administrative amendment to existing ECA
- ☐ Application for renewal of limited operational flexibility
- ☐ Consolidation of existing ECAs

Is this application for the addition of a new project type to the site or a new municipal waste category/class code to the waste management systems or a new sewage facility type? *

☐ Yes ☑ No

Is this application for Transfer of Review? *

☐ Yes ☑ No

✓ Completion Status (2.2 Application Type)

2.3 Project Type

Project Type (Select all that apply) *	Limited Operational Flexibility?	Pilot Project?
☐ Air - Stationary	☐	☐
☐ Air - Mobile	☐	☐
☐ Noise	☐	☐
☐ Vibration	☐	☐
☑ Waste Disposal Site - Landfill site	N/A	☐
☐ Waste Disposal Site - Transfer site	☐	☐
☐ Waste Disposal Site - Processing site	☐	☐
☐ Waste Disposal Site - Composting site	N/A	☐
☐ Waste Disposal Site - Thermal Treatment site	N/A	☐
☐ Sewage - Industrial	☐	☐
☐ Sewage - Municipal	☐	☐
☐ Sewage - Private	☐	☐
☐ Waste Management System – General Waste Management System	N/A	☐
☐ Waste Management System - Hauled Sewage (Septage)	N/A	☐
☐ Waste Management System – Soil Conditioner for transport to a site for Application on Land	N/A	☐
☐ Waste Management System - Mobile Waste Processing	N/A	☐
☐ Cleanup of contaminated sites - Mobile	N/A	☐
☐ Cleanup of contaminated sites - Site specific	N/A	☐

✓ Completion Status (2.3 Project Type)

2.4 Approval Information

Application initiated by *

☑ Applicant
☐ S. 20.18 Order (attach copy)
☐ Condition of existing approval
☐ Provincial Officer Order (attach copy)
☐ Inspection Report (attach copy)
☐ Other (specify) _____

Current Environmental Compliance Approvals that may be changed or amended by this application: ☐ N/A

Environmental Compliance Approval Number *	Date of Issuance (yyyy/mm/dd) *
A371203 (Amended)	2021/03/19

Separate list attached?

☐ Yes ☑ No

Proposed Environmental Compliance Approvals related to this project: ☑ N/A

Project Type	Ministry Reference Number (if applicable)	Have Submitted	Have not Submitted
		☐	☐

Separate list attached?

☐ Yes ☑ No

✓ Completion Status (2.4 Approval Information)

2.5 Other Approval/Permits for Facility ☐ N/A

List all other instruments (approvals or permits) issued by the Ministry of the Environment and Climate Change or applied for under the *Environmental Protection Act*, *Environmental Assessment Act*, *Ontario Water Resources Act* and *Safe Drinking Water Act, 2002* and any Environmental Activity and Sector Registrations that are relevant to this application.

Instrument Type	Instrument Number/ Application Reference Number	Approval or Application Date (yyyy/mm/dd)
Environmental Compliance Approval	1688-8HZNJG (Amended)	2012/01/10

Separate list attached?

☐ Yes ☑ No

List all other instruments (approvals or permits) issued by an agency, municipality or another ministry that are relevant to this application.

Issuing Agency	Approval or Permit Name	Approval or Permit Number	Issued Date (yyyy/mm/dd)

Separate list attached?

☐ Yes ☑ No

✓ Completion Status (2.5 Other Approval/Permits for Facility)

2.6 Technical Contacts

Technical Contact 1

Area of Responsibility (Select all that apply) *

☐ Air ☐ Noise/Vibration ☐ Sewage ☑ Waste

Name of Technical Contact

Last Name *	First Name *
Richard	Francois

Company *

BluMetric Environmental Inc.

Address Information

☐ Select if same as Applicant Mailing Address

Civic Address

Unit Number	Street Number *	Street Name *
Tower	4	Cataraqui Street

Delivery Designator	Delivery Identifier	Postal Station

Municipality/Unorganized Township *	County/District
Kingston	

Province/State *	Country *	Postal/Zip Code *
ON	Canada	K7K 1Z7

Telephone Number *	Fax Number	Mobile Number	Email Address *
613-558-5936 ext.		613-558-5936	frichard@blumetric.ca

✓ Completion Status (2.6 Technical Contacts)

3. Regulatory Requirements

3.1 Environmental Bill of Rights (EBR) Requirements

Is this a proposal for a prescribed instrument under the EBR? *

☑ Yes ☐ No

If yes, is this proposal exempted from the EBR requirements? *

☐ Yes ☑ No

If yes, please check one of the following (Please provide supporting information.)

☐ This proposal has been considered in a substantially equivalent process of public participation. (EBR, 1993, s.30.)

Was the public participation process carried out in fulfillment of the requirements related to an approval under the *Planning Act*?

☐ Yes ☐ No

If yes, was the *Planning Act* approval related to a plan of subdivision?

☐ Yes ☐ No

☐ This proposal is for an emergency situation. (EBR, 1993, s. 29.)

☐ This proposal is for an amendment to or revocation of an existing Environmental Compliance Approval that is not environmentally significant. (EBR, 1993, s. 22 (3).)

☐ This proposal has been subject to or exempted from EAA Requirements or considered in a decision of a tribunal. (EBR, 1993, s. 32.)

✓ Completion Status (3.1 Environmental Bill of Rights (EBR) Requirements)

3.2 *Environmental Assessment Act* (EAA) Requirements

Is the proposed undertaking subject to the requirements of the EAA? *

☐ Yes ☑ No

If yes, please select one of the following:

☐ The proposed undertaking has fulfilled the requirements of the EAA through the completion of a Class EA process

Name of Class EA _____

Schedule/Group/Category (if applicable) _____

If applicable, please submit a copy of the proof of completion (for example, Notice of Completion).

Was the undertaking subject of a Part II Order request(s)?

☐ Yes ☐ No

If yes, please submit a copy of the Director's or Minister's decision letter.

☐ The proposed undertaking has fulfilled all of the requirements for the EAA through:

Select all that apply:

☐ completion of an Environmental Screening Process pursuant to O. Reg. 101/07 of the EAA

☐ completion of an Environmental Screening Process pursuant to O. Reg. 116/01 of the EAA

Was the undertaking subject of an elevation request(s)?

☐ Yes ☐ No

If yes, please submit a copy of the Director's decision letter. If an appeal was made to the Director's decision, please also submit a copy of the Minister's decision letter.

☐ completion of an Environmental Screening Process pursuant to O. Reg. 231/08 of the EAA

Was the undertaking subject of an objection(s)?

☐ Yes ☐ No

If yes, please submit a copy of the Minister's decision letter.

☐ The proposed undertaking has fulfilled the requirements of the EAA through the completion of an individual Environmental Assessment.

Please submit a copy of the signed Notice of Approval.

Was the undertaking exempted from the requirements of the EAA? *

☐ Yes ☑ No

The proposed undertaking has fulfilled the requirements of the EAA through an exemption provided under:

Select one of the following

☐ Section _____ of Ontario Regulation No. _____ or

☐ Declaration/Exemption Order Number _____

If Regulation, Declaration Order or Exemption Order does not refer directly to this undertaking, please provide supporting documentation to explain why it applies to this facility

✓ Completion Status (3.2 *Environmental Assessment Act* (EAA) Requirements)

3.3 Consultation/Notification

Indigenous Consultation:

Is the proposed project/activity on Crown land or does/would it alter access to Crown land? *	☐ Yes ☑ No
Is the proposed project/activity in an open or forested area where hunting, trapping or plant gathering could occur? *	☐ Yes ☑ No
Does the proposed project/activity involve the clearing of forested land? *	☐ Yes ☑ No
Could the proposed project/activity impact a water body (e.g., direct discharge) or alter access to a water body? *	☐ Yes ☑ No
Could the proposed project/activity impact cultural heritage or archaeological resources, or access to them? *	☐ Yes ☑ No
Is the proposed project/activity adjacent or close to a First Nation Reserve? *	☑ Yes ☐ No
Is the applicant aware of any concerns from Indigenous communities about this proposed project/activity? *	☑ Yes ☐ No
Were there conditions placed, or direction provided, in another (or previous) permit or approval for consultation in relation to this project/activity? *	☑ Yes ☐ No
Based on the online Guide to Applying for an Environmental Compliance Approval, or direction provided by the ministry or another agency, are Indigenous consultation activities likely required as part of this application process? *	☑ Yes ☐ No

If Yes to the question above, please describe the consultation/notification activities undertaken for this application or as part of another process (e.g., EAA) in relation to the proposed project/activity, including a summary of the notification/ consultation, First Nation and Métis communities contacted, key issues raised and how they were addressed, any changes to the project as a result of these activities, and any planned consultation/notification activities in the future. *

Consultation in relation to ERT Appeal Case No. 12-033

Please attach supporting documents (e.g., record of consultation, delegation letter and/or direction provided by the Crown, materials provided to communities, meeting notes and agendas, correspondence with communities as appropriate).

If the applicant has determined that consultation with First Nation and Métis communities is not likely required for the proposed project/activity, please provide a rationale why:

Other Consultation/Notification:

Has the applicant had a ministry pre-application consultation in relation to the proposed project? *

☑ Yes ☐ No

If this application is for a waste disposal site, have the neighbour notification requirements been completed? *

☑ Yes ☐ No

If yes, please attach a Public Consultation/Notification Report that includes the notice and list of recipients.

If no, please select the reason for not undertaking neighbour notification:

☐ Application is for an administrative amendment

☐ The proposal was subject to public consultation through an Environmental Assessment process

☐ other , please explain

Are there any other consultation/notification activities that have been undertaken to fulfill requirements by other legislation or through voluntary efforts? *

☑ Yes ☐ No

If yes, please: *

1. describe the consultation/notification activities below; and
2. attach documents describing each of these consultation\notification activities, any changes to the project as a result of these activities and any planned consultation/notification activities in the future.

Consultation with stakeholders (CCCTE, MBQ, PLC) in relation to ERT Appeal Case No. 12-033

✓ Completion Status (3.3 Consultation/Notification)

4. Site Information

4.1 Site Address or Storage Location

Will the vehicles or equipment be stored at more than one location?

☐ Yes ☐ No

(If yes, please enter all vehicle or equipment storage locations below and attach separate list, as necessary.)

☐ Select if same as Applicant Physical Address

Address Type? *

☑ Civic Address ☐ Survey Address

Primary Civic Address

Unit Number	Street Number *	Street Name *
	1264	Beechwood Road

Additional Civic Addresses

Unit Number	Street Number	Street Name
	1252	Beechwood Road
	1250	Beechwood Road
	1206	Beechwood Road
	1144	Beechwood Road

Separate list attached?

☐ Yes ☑ No

Primary Survey Address

Enter Lot and Concession or Part and Reference Plan

Lot	Concession	Part	Reference Plan

Additional Survey Address

Enter Lot and Concession or Part and Reference Plan

Lot	Concession	Part	Reference Plan

Separate list attached?

☐ Yes ☐ No

Municipality/Unorganized Township *	County/District	
Napanee		
Province/State *	**Country ***	**Postal/Zip Code ***
ON	Canada	K7R3L1

Non-address Information (includes any additional information to clarify the physical location)

Geo Reference (required)

☐ Select if same as Applicant Physical Geo Reference

Description of location	Map Datum *	Zone *	Accuracy Estimate *	Geo-Referencing Method *	UTM Easting *	UTM Northing *
Southwest corner of property	NAD83	18	10 m	GoogleEarth	335,530.00	4,901,390.00
Physical location of front door or main entrance	NAD83	18	10 m	GoogleEarth	335,357.00	4,902,582.00

✓ Completion Status (4.1 Site Address or Storage Location)

4.2 Site or Storage Location Information

Site Name *

WM Richmond Landfill

Days and Hours of Operation *	Ministry of the Environment and Climate Change District Office *
Site is closed	Kingston District Office

Is the site (property) that is the subject of this application owned by the applicant? *

☑ Yes ☐ No

If no, please include the owner's name, address and a signed document indicating that the applicant has the authority to install and operate the proposed activity, or store vehicles or equipment on the land.

Is the applicant the operating authority of the site that is the subject of this application? *

☑ Yes ☐ No

If no, please include the operating authority name, address and phone number.

Is the site located in an area of development control as defined by the *Niagara Escarpment Planning and Development Act* (NEPDA)? *

☐ Yes ☑ No

If yes, please attach a copy of the NEPDA permit for proposed activity.

Is the site within an area covered by the Oak Ridges Moraine Conservation Plan? *

☐ Yes ☑ No

If yes, please attach proof of municipal planning approval for the proposed activity/work (for example, zoning by-law, letter from municipality, etc.).

✓ Completion Status (4.2 Site or Storage Location Information)

4.3 Site Zoning and Classification ☐ N/A

Current Land Use *	Official Plan Designation *	Current Zoning (Please attach zoning map, if available.) *
Agricultural; Rural	Rural	Rural (RU), Rural Industrial (M3-2) & Extractive (M4)

Adjacent Land Use (select all that apply) *

☐ Industrial ☑ Agricultural ☐ Commercial ☐ Recreational ☑ Residential

☑ Other (specify) * General rural, wooded

Adjacent Land Zoning *

Rural (RU)

Does the current zoning permit the proposed activity? *

☑ Yes ☐ No

Does the applicant have correspondence from the municipality to confirm that the current zoning of the property permits the proposed use? *

☐ Yes ☑ No If yes, please attach correspondence from the municipality.

Does the official plan designation support the proposed activity? *

☑ Yes ☐ No ☐ N/A

✓ Completion Status (4.3 Site Zoning and Classification)

4.4 Point of Entry into Ontario ☐ N/A

(for waste management system vehicles that are stored at an address outside of Ontario)

City in closest proximity to the point of entry

Description of Point of Entry

✓ Completion Status (4.4 Point of Entry into Ontario)

4.5 Source Protection/Drinking Water Threats (sewage or waste disposal site applications only) ☐ N/A

Check the source protection area(s) where the activity is/will be located *

☐ Ausable Bayfield	☐ Cataraqui Region	☐ Catfish Creek
☐ Central Lake Ontario	☐ Credit Valley	☐ Crowe Valley
☐ Essex	☐ Ganaraska	☐ Grand River
☐ Grey Sauble	☐ Halton	☐ Hamilton
☐ Kawartha-Haliburton	☐ Kettle Creek	☐ Long Point
☐ Lakehead	☐ Lake Simcoe and Couchiching/Black River	☐ Lower Trent
☐ Lower Thames Valley	☐ Maitland Valley	☐ Mattagami
☐ Mississippi Valley	☐ Niagara	☐ North Bay Mattawa
☐ Northern Bruce Peninsula	☐ Nottawasaga Valley	☐ Rideau Valley
☐ Raisin Region	☐ South Nation	☐ Saugeen Valley
☐ Sault Ste. Marie	☐ Severn Sound	☐ Sudbury
☐ St. Clair Region	☐ Toronto and Region	☐ Otonabee-Peterborough
☐ Outside a source protection area	☑ Quinte	☐ Upper Thames River

Is the proposed activity located or planned to be located in a vulnerable area identified in a local assessment report source protection plan under the *Clean Water Act, 2006*? *

☐ Yes ☑ No

If yes, what is/are the vulnerable area(s)/zone(s)?

☐ Wellhead Protection Areas ☐ Surface Water Intake Protection Zones ☐ Highly Vulnerable Aquifers

☐ Significant Groundwater Recharge Areas

Is the activity being applied for identified as a significant drinking water threat in the assessment report for the local source protection area? *

☐ Yes ☑ No

✓ Completion Status (4.5 Source Protection/Drinking Water Threats)

4.6 Receiver of Effluent Discharge (sewage applications only) ☐ N/A

Intermediate Receiver Name

Watershed Name

Type of Receiver

☐ Surface Water ☐ Groundwater ☐ Other (specify) _____

Has the facility received local Conservation Authority clearance? (for stormwater management facility discharging to the natural environment)

☐ Yes ☐ No

If yes, please include a copy of the Conservation Authority clearance.

Final Receivers ☐ N/A

Will the proposed activity discharge sewage to any of the following critical receivers?

☐ Lake Simcoe ☐ Rideau River ☐ Detroit River

☐ Great Lakes ☐ Rouge River ☐ Bay of Quinte

☐ Other (specify) _____

Is the receiver a Policy 2 receiver?

☐ Yes ☐ No

Does the applicant have a Policy 2 deviation approval from the directors?

☐ Yes ☐ No

If yes, please attach a copy of the Director's approval.

✓ Completion Status (4.6 Receiver of Effluent Discharge)

5. Facility Information

5.1 Air Note** - If the application does not have air emissions please proceed to Section 5.2 Information

5.1.1 Summary of Equipment that Discharges Contaminants to the Air

Select Type of Equipment	Number of Pieces of Equipment
☐ Combustion equipment that uses natural gas, propane, no. 2 oil, landfill gas or sewage treatment gas for fuel for the purpose of providing comfort heating or emergency power, producing hot water or steam, or heating material in a system that does not discharge to the atmosphere (Total Heat input of all units: ≤ 50,000,000 kJ/hr)	N/A
☐ Storage tanks	N/A
☐ Welding operations that use a maximum of 10 kilograms of welding rod per hour	N/A
☐ Combustion equipment that uses waste-derived fuel for the purpose of providing comfort heating, burning ≤ 15 litres per hour	
☐ Heat cleaning ovens used for parts cleaning and associated parts washers or degreasing equipment, other than solvent degreasing equipment	
☐ Cooling towers	
☐ Equipment used to control emissions of contaminants, other than a fume incinerator	
☐ Laboratory fume hoods	
☐ Paint spray booths and associated equipment that have a design capacity of up to 8 litres per hour of paint	
☐ Grain dryers	
☐ Any other equipment not listed above with a flow rate of less than or equal to 1.5 m^3/second	
☐ Any other equipment not listed above with a flow rate of greater than 1.5 m^3/second	
☐ Equipment that is subject to an Environmental Compliance Approval, and from which there is no proposed increase in the discharge of any contaminant that was previously reviewed by the Director.	N/A

✓ Completion Status (5.1.1 Summary of Equipment that Discharges Contaminants to the Air)

5.1.2 Emission Summary and Dispersion Modelling (ESDM) Report

Is the review of an existing, approved ESDM required as part of this proposed application?

☐ Yes ☐ No

If yes, identify the number of emission sources described in the existing ESDM Report that emit contaminants in common with the sources forming the subject of the application (if none, enter zero).

Have all of these emission sources been described in an ESDM Report that was previously reviewed as part of an application for an existing Environmental Compliance Approval?

☐ Yes ☐ No

✓ Completion Status (5.1.2 ESDM Report)

5.1.3 O. Reg. 419/05 Requirements

Which of the following sections of O. Reg. 419/05 applies to the facility?

☐ s.19 (Schedule 2)

☐ s. 20 (Schedule 3)

☐ Does not apply. Please indicate reason _____

Has an instrument under O. Reg. 419/05 been issued?

☐ Yes ☐ No

If yes, what type(s) of instruments (including any notices, orders or approvals) has (have) been issued? (select all that apply)

☐ ss. 4(2) Adjacent Properties

☐ ss. 7(1) Specified Dispersion Models

☐ ss. 8(2) Negligible Sources

☐ ss. 10(2) Operating Conditions

☐ ss. 11(2) Refined Emission Rates

☐ ss. 13.1 Value of Dispersion Modeling Parameters

☐ ss. 13(1) Meteorological Data

☐ ss. 14(6) Area of Modelling Coverage

☐ ss. 20(4) Speed-up Request

☐ ss. 20(5) Speed-up Order

☐ s. 35 Site-specific Standard

☐ ss. 35(14) Site-specific Standard Order

☐ ss. 39(3) Technical Standard Registration (Industry Standard)

☐ ss. 39(4) Technical Standard Registration (Equipment Standard)

☐ Other (list all that have been issued) _____

Is an instrument under O. Reg. 419/05 being requested as part of this application?

☐ Yes ☐ No

If yes, what type(s) of notice, order or approval is (are) being requested?

☐ ss. 7(1) Specified Dispersion Models

☐ ss. 8(2) Negligible Sources

☐ ss. 10(2) Operating Conditions

☐ ss. 11(2) Refined Emission Rates

☐ ss. 13(1) Meteorological Data

☐ ss. 14(6) Area of Modelling Coverage

☐ ss. 20(4) Speed-up Request

☐ s. 32 Request for a Site-specific Standard Order

☐ ss. 39(1)(a) Application for Technical Standard Registration (Industry Standard)

☐ ss. 39(1)(b) Application for Technical Standard Registration (Equipment Standard)

☐ Other (list all that have been issued) _____

Please attach the form(s) requesting the notice(s) and/or order(s) and any additional supporting information.

Has an s. 30 Upper Risk Threshold (Schedule 6) been exceeded?

☐ Yes ☐ No

If yes, please include additional supporting information.

Is the facility located in a multi-tenant building?

☐ Yes ☐ No

If yes, additional information may be requested.

Are all of the contaminants to which the application relates represented in the Ministry of the Environment and Climate Change publication titled "Summary of Standards and Guidelines to support Ontario Regulation 419: Air Pollution- Local Air Quality' or have they been screened out based on the publication titled " Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution - Local Air Quality"?

☐ Yes ☐ No

(If no, please attach Supporting Information for a Maximum Ground Level Concentration Acceptability Request for Compounds with no Ministry POI Limit - Supplement to Application for Approval, EPA S. 9).

✓ Completion Status (5.1.3 O. Reg. 419/05 Requirements)

✓ Completion Status (5.1 Air)

5.2 Noise Note** - If the application does not have noise emissions please proceed to Section 5.3

5.2.1 Noise Assessment Information

Has an Acoustic Assessment Report (AAR) been completed in relation to the proposed project/activity?

☐ Yes ☐ No

If yes, please attach the Acoustic Assessment Report

Does the AAR show that applicable limits are met?

☐ Yes ☐ No

If no, please attach the Acoustic Assessment Report including the Noise Abatement Action Plan

If no, is the application eligible for Primary or Secondary Noise Screening?

☐ Yes ☐ No

Note that if the proposed activity is not eligible for either of the screenings, an AAR must be submitted.

If yes, is the proposed activity eligible for the Primary Noise Screening?

☐ Yes ☐ No

If yes, is the actual separation distance between the facility and the nearest noise sensitive point of reception (POR) greater than the minimum required separation distance calculated from the Primary Noise Screening?

☐ Yes ☐ No

If yes, please attach the Primary Noise Screening form and supporting documentation.
Note that if the Primary Noise Screening is not successful then the applicant may attempt to proceed with the Secondary Noise Screening.

If no, does the Secondary Noise Screening Form show that the applicable sound level limits are met?

☐ Yes ☐ No

If yes, please attach the Secondary Noise Screening Form and supporting documentation.
Note that if meeting the applicable sound level limits cannot be demonstrated, then an AAR must be submitted.

✓ Completion Status (5.2.1 Noise Assessment)

5.2.2 Equipment Subject to Noise Review

Description	Number of Pieces of Equipment
☐ Arc Furnaces	
☐ Asphalt Plants	
☐ Blow-down Devices	
☐ Co-Generation Facilities	
☐ Crushing Operations	
☐ Flares	
☐ Gas Turbines	
☐ Pressure Blowers or Large Induced Draft Fans (flow rate > 47 m^3/second or static pressure > 1.25 kilopascals)	
☐ Any other equipment not listed above that has not previously been reviewed by the Director in connection with an application for an Environmental Compliance Approval with respect to the facility	
☐ Any other equipment not listed above that is identical to equipment for which a noise assessment was previously reviewed by the Director in connection with an application for an Environmental Compliance Approval with respect to the facility	

✓ Completion Status (5.2.2 Equipment Subject to Noise Review)

✓ Completion Status (5.2 Noise)

5.3 Sewage Works Information

Note** - If the application does not contain Sewage Works please proceed to Section 5.4

5.3.1 Facility Type - Sewage Works

Select the type of facility that is the subject of the application (select all that apply).

☐ Sewage Treatment Plant (STP) ☐ Stormwater Management Facility

For the following, the applicant must complete and attach the relevant sections of the pipe data form:

☐ Storm Sewers ☐ Ditches ☐ Combined Sewers

☐ Force mains ☐ Sanitary Sewers ☐ Pumping Station

Sewage Treatment Plant Details

☐ Primary ☐ Secondary ☐ Tertiary

☐ Receives septage ☐ Constructed/Engineered Wetlands ☐ On-site system

☐ Lagoons (check all that apply below)

☐ Septage ☐ Municipal ☐ Other (specify) _____

Facility Type

☐ Municipal or private facility

Category: ☐ New ☐ 1 ☐ 2 ☐ 3 ☐ 4

Please indicate the maximum design capacity of the municipal or private sewage treatment plant:

☐ ≤ 4,500 m^3/day ☐ > 4,500 m^3/day

☐ Facility for the treatment of leachate

Category: ☐ New ☐ 1 ☐ 2 ☐ 3 ☐ 4

☐ Facility for the treatment of industrial process wastewater

Category: ☐ New ☐ 1 ☐ 2 ☐ 3 ☐ 4

☐ Facility for the disposal of non-contact cooling water

☐ Subsurface disposal

Please indicate the design capacity of the subsurface disposal:

☐ ≤ 15m^3/day ☐ > 15 m^3/day and < 50 m^3/day ☐ > 50 m^3/day

Stormwater Management Facility Details

Category: ☐ New ☐ 1 ☐ 2 ☐ 3 ☐ 4

Pond Type

☐ Wet Pond ☐ Dry Pond ☐ Other (specify) _____

What is the drainage area (in hectares) associated with the proposed activity? _____

Does the applicant own all, or part of the drainage area?

☐ Applicant owns all of the drainage area

☐ Applicant owns part of the drainage area

☐ Applicant does not own the drainage area

For the drainage area land that the applicant does not own, does the applicant have an agreement with the owner(s) of the drainage area?

☐ Yes ☐ No

What is the predominant type of land use in the drainage area?

☐ Rural or Agricultural ☐ Commercial or Industrial ☐ Residential

Is a Hydrogeological Assessment required?

☐ Yes ☐ No

(If yes, please attach the hydrogeological assessment.)

Is a review of effluent criteria assessment for stormwater management, cooling water or soil remediation facilities required?

☐ Yes ☐ No

(If yes, please attach the final effluent criteria accepted by the Regional Office of the Ministry.)

Is a review of effluent criteria assessment for municipal or private sewage, industrial process wastewater or leachate treatment plant required?

☐ Yes ☐ No

(If yes, please attach the final effluent criteria accepted by the Regional Office of the Ministry.)

Note: The Hydrogeological Assessment, effluent criteria, and surface water assessment must be discussed and prepared with the Ministry's regional technical support section during a pre-application meeting(s) and consultation(s) with the Ministry. A proof of concurrence from technical support must be included as part of the ECA application package.

✓ Completion Status (5.3.1 Facility Type - Sewage Works)

5.3.2 Servicing

The works will provide sewage servicing for (select all that apply):

☐ Residential

Residential Type

☐ Subdivision ☐ Condominium ☐ Institutional

☐ Other (specify) _____

Is there a Municipal Responsibility Agreement in place?

☐ Yes ☐ No ☐ N/A

(If yes, please attach a copy of the Municipal Responsibility Agreement.)

☐ Commercial

Commercial Type

☐ Hotel, Motel, Inn ☐ Campground, Park ☐ Rental Cabins

☐ Resort ☐ Shopping Malls ☐ Restaurant

☐ Highway Service Station/Gas Bars ☐ Other (specify) _____

☐ Industrial

Describe _____

✓ Completion Status (5.3.2 Servicing)

5.3.3 Sewage Servicing for Waste Disposal/Landfill Sites

Does/Will the sewage treatment facility receive waste disposal/landfill site leachate?

☐ Yes ☐ No

If yes, please identify the site(s) below.

Name of Site Contributing Leachate	Environmental Compliance Approval Number	Volume of Leachate (m^3)
1.		

✓ Completion Status (5.3.3 Sewage Servicing for Waste Disposal/Landfill Sites)

✓ Completion Status (5.3 Sewage Works)

5.4 Waste Disposal Site

Note** - If the application is not for a waste disposal or processing site please proceed to Section 5.5

5.4.1 Facility Description - Waste Disposal Site (information on the nature of the proposed business or activity at this site)

Service Area *	Total Area of Site (hectares) *
Contaminant Attenuation Zone - will not be accepting waste	360.4

Monitoring (select all that apply) *

☑ Groundwater ☑ Surface Water ☐ Landfill Gas

☐ Leachate ☐ None

☐ Other (specify) _____

Type(s) of waste to be accepted at this site (select all that apply) *

Subject: Non-subject:

☐ Hazardous Waste ☐ Municipal (non-hazardous)

☐ Liquid Industrial Waste ☐ Other Liquid Waste

Municipal waste categories to be accepted at this site (select all that apply)

☐ All Categories ☐ Contaminated Soil ☐ Domestic Sources

☐ IC & I Sources ☐ Source Separated Organics ☐ Tires

☐ Leaf and Yard Waste ☐ Wood Waste ☐ Blue Box Materials

☐ Other (specify) _____

Other liquid waste categories to be accepted at this site (select all that apply)

☐ Processed Organics ☐ Hauled Sewage

☐ Waste from Food Processing/Preparation Operations ☐ Other (specify) _____

Hazardous Waste / Liquid Industrial Waste

Class Code	Class Code	Class Code	Class Code	Class Code

✗ Completion Status (5.4.1 Facility Description - Waste Disposal Site)

5.4.2 Waste Transfer/Processing/Composting - Complete this information if waste transfer and/or processing and/or composting take(s) place at this facility

Waste Type to be Transferred or Processed

☐ Hazardous waste or liquid industrial waste

Design Capacity

☐ ≤ 100 tonnes per day ☐ > 100 tonnes per day

☐ Waste other than hazardous waste and liquid industrial waste

Design Capacity

☐ ≤ 100 tonnes per day ☐ > 100 tonnes per day

Change to Operations

☐ No Change Proposed

☐ Change does not require fundamental design review

☐ Change requires fundamental design review

Liquid Waste

Maximum Storage Capacity (m^3)

Hazardous	Liquid Industrial	Other Liquid Waste

Maximum Residual for Final Disposal (m^3)

Hazardous		Liquid Industrial Waste		Other Liquid Waste	
Daily	Annually	Daily	Annually	Daily	Annually

Solid Waste

Maximum Storage Capacity (tonnes)

Hazardous	Non-Hazardous

Maximum Residual for Final Disposal (tonnes)

Hazardous		Non-hazardous	
Daily	Annually	Daily	Annually

Maximum Amount of Waste to be Received Daily

Liquid (m^3)			Solid (tonnes)	
Hazardous	Liquid Industrial	Other Liquid Waste	Hazardous	Non-hazardous

✓ Completion Status (5.4.2 Waste Transfer/Processing/Composting)

5.4.3 Thermal Treatment Facility - Complete this information if thermal treatment takes place at this facility

Waste Type for Thermal Treatment

☐ Hazardous waste or liquid industrial waste

Design Capacity

☐ ≤ 100 tonnes per day ☐ > 100 tonnes per day

☐ Waste other than hazardous waste and liquid industrial waste

Design Capacity

☐ ≤ 100 tonnes per day ☐ > 100 tonnes per day

Change to Operations

☐ No Change Proposed

☐ Change does not require fundamental design review

☐ Change requires fundamental design review

Liquid Waste

Maximum Storage Capacity (m^3)

Hazardous	Liquid Industrial	Other Liquid Waste

Maximum Residual for Final Disposal (m^3)

Hazardous		Liquid Industrial Waste		Other Liquid Waste	
Daily	Annually	Daily	Annually	Daily	Annually

Solid Waste

Maximum Storage Capacity (tonnes)

Hazardous	Non-Hazardous

Maximum Residual for Final Disposal (tonnes)

Hazardous		Non-hazardous	
Daily	Annually	Daily	Annually

Maximum Amount of Waste to be Received Daily

Liquid (m^3)			Solid (tonnes)	
Hazardous	Liquid Industrial	Other Liquid Waste	Hazardous	Non-hazardous

Maximum Daily Feed Rate (tonnes/m^3)

Hazardous Waste (tonnes)	Non-hazardous Waste (tonnes)	Liquid Industrial Waste (m^3)	Other Liquid Waste (m^3)

✓ Completion Status (5.4.3 Thermal Treatment Facility)

5.4.4 Landfill Site - Complete this information if this facility operates as a landfill site

Waste Types to be accepted at the Landfill *

☐ Hazardous waste or liquid industrial waste

Design Capacity

☐ ≤ 40,000 m^3 ☐ > 40,000 m^3 ≤ 3 million m^3 ☐ > 3 million m^3

☐ Waste is only uncontaminated tree stumps, leaves, branches, concrete and rocks

Design Capacity

☐ ≤ 40,000 m^3 ☐ > 40,000 m^3 ≤ 3 million m^3 ☐ > 3 million m^3

☐ Waste other than hazardous waste and liquid industrial waste, other than uncontaminated tree stumps, leaves, branches, concrete and rocks.

Design Capacity

☐ ≤ 40,000 m^3 ☐ > 40,000 m^3 ≤ 3 million m^3 ☐ > 3 million m^3

Change to Operations *

☐ No Change Proposed

☑ Change does not require fundamental design review or hydrogeological assessment

☐ Change requires fundamental design review or hydrogeological assessment

Note: The Hydrogeological Assessment, effluent criteria, and surface water assessment must be discussed and prepared with the Ministry's regional technical support section during a pre-application meeting(s) and consultation(s) with the Ministry. A proof of concurrence from technical support must be included as part of the ECA application package.

Maximum Landfilling Capacity (m^3)

Hazardous Waste	Non-hazardous Waste	Liquid Industrial Waste	Other Liquid Waste

Maximum Amount of Waste to be Received

Hazardous Waste (tonnes)		Non-hazardous Waste (tonnes)		Liquid Industrial Waste (m^3)		Other Liquid Waste (m^3)	
Daily	Annually	Daily	Annually	Daily	Annually	Daily	Annually

Landfill Information

Area to be Landfilled (hectares) *	Total Site Area including Buffer Area (hectares) *
16.2	555.9
Estimated Date of Closure (yyyy/mm/dd) *	Population Served
2011/06/30	

Control Types (select all that apply) *

☑ Leachate Collected and Treated Off-site ☐ Leachate Collected and Treated On-site

☐ Landfill Gas Collected and Flared ☐ Landfill Gas Collected for Energy Generation

☐ Other (specify) _____

✗ Completion Status (5.4.4 Landfill Site)

✗ Completion Status (5.4 Waste Disposal Site)

5.5 Waste Management Systems (Except Mobile Waste Processing)

Note**- If the application is not for a waste management system please proceed to Section 5.7.

5.5.1 Fleet List (all vehicles and equipment to be used in the operation of the Waste Management System)

Year	Make	Model	Vehicle Identification Number (VIN)	License Plate Number	Province/State

Separate list attached?

☐ Yes ☐ No

✓ Completion Status (5.5.1 Fleet List)

5.5.2 Vehicle Information

Are all the vehicles to be used owned by the applicant?

☐ Yes ☐ No

If no, please include additional information about ownership arrangements for each vehicle not owned by the applicant.

Has a minimum of $1,000,000.00 liability insurance been obtained for all vehicles for which it is required?

☐ Yes ☐ No

Describe any additional insurances that are held (for example, environmental impairment liability insurance).

✓ Completion Status (5.5.2 Vehicle Information)

5.5.3 General Waste Management System

Type(s) of Waste to be Transported by the General Waste Management System (select all that apply)

Subject:

☐ Hazardous Waste

☐ Liquid Industrial Waste

Non-subject:

☐ Municipal (non-hazardous)

☐ Other Liquid Waste

Non-subject Categories to be Transported by the General Waste Management System (select all that apply)

☐ Blue Box Materials

☐ Commercial

☐ Leaf/Yard Waste

☐ Spill Cleanup Material

☐ Tires

☐ Waste Wash Water

☐ Waste from Food Processing/ Preparation Operations

☐ Processed Organics (not for land application)

☐ Domestic Sources

☐ Non-Hazardous Solid Industrial

☐ Wood Waste

☐ Contaminated Soil

☐ Asbestos Waste in Bulk

☐ Grease Trap Waste

☐ Dewatered Catch Basin Clean-out Material

☐ Other (specify) _____

Subject Waste Categories to be Transported by the General Waste Management System

Hazardous Waste / Liquid Industrial Waste

Class Code	Class Code	Class Code	Class Code	Class Code

Separate list attached?

☐ Yes ☐ No

☐ All drivers are/will be trained in accordance with O. Reg. 347 and all pertinent environmental legislation.

☐ Each vehicle used to transport a specific subject waste class is suitable for that waste transportation in order to protect the health and safety of the public and the natural environment.

Note: For transporters of pathological waste and PCBs (waste classes 243 and 312) Operations Manual and Driver Training Manual must also be attached and Financial Assurance must be provided.

General Waste Management System - Disposal Site Information

What is the Final Destination of Waste to be Transported by the General Waste Management System? (select all that apply)

☐ A disposal site in Ontario approved by the Ministry of the Environment and Climate Change

☐ Disposal sites outside of Ontario approved by another regulatory agency

List the destination province(s)/state(s)

Province/State	Province/State	Province/State	Province/State

✓ Completion Status (5.5.3 General Waste Management System)

5.5.4 Soil Conditioner Waste Management System (includes non-agricultural source material (NASM) that is waste and processed organic waste (biosolids) destined for land application only)

Has the applicant received recommendation from Biosolids Utilization Committee (BUC) for land application of processed organic waste (biosolids) or NASM?

☐ Yes If yes, please provide a copy of the BUC recommendation.

☐ No If no, please clarify _____

Spreading equipment (land application only)

Equipment Type	Make and Model	Description

Separate list attached?

☐ Yes ☐ No

Method of system operation (land application only)

Estimated quantity to be handled on an annual basis (cubic metres/litres/tonnes)

Please describe the loading procedures:

Please describe the spreading methods:

Please describe the storage facilities (tanks, lagoons, etc.):

Soil Conditioner Waste Management System - Land Application Sites

What is the final destination of waste to be transported by the soil conditioner waste management system? (must include for land application only)

☐ Non-agricultural land ☐ Agricultural land ☐ Both agricultural and non-agricultural land

✓ Completion Status (5.5.4 Soil Conditioner Waste Management System)

5.5.5 Hauled Sewage (Septage) Waste Management System

Type(s) of hauled sewage (septage) to be transported

☐ Portable toilet waste ☐ Septic tank waste ☐ Holding tank waste

☐ Other (specify) _____

Spreading equipment (land application only)

Equipment Type	Make and Model	Description

Separate list attached?

☐ Yes ☐ No

Does this system include in-transit storage?

☐ Yes ☐ No

If yes:

a) What is the duration of storage? Please specify (Maximum period of in-transit storage should not exceed more than two weeks):

b) Is the storage tank a prefabricated tank with the capacity < 100,000 L, designed and constructed in accordance with a Class 5 Sewage System under the Ontario Building Code or CAN/CSA B66-05?

☐ Yes ☐ No If no, please provide a copy of the design of the storage tank signed and dated by a professional engineer.

Does this system include in-transit processing?

☐ Yes ☐ No

If yes:

a) Location of in-transit processing:

☐ In Vehicle ☐ In-storage Tank

b) Describe the method of in-transit processing:

Does this system use barge/boat to transport hauled sewage (septage)?

☐ Yes ☐ No

If yes:

a) Has a minimum of $1,000,000.00 liability insurance been obtained for the barge/boat for which it is required?

☐ Yes ☐ No

b) Does the barge/boat have an engine of 10 horsepower (hp) or more, for which a commercial vessel license is required from Transport Canada?

☐ Yes ☐ No If yes, please include a copy of the commercial vessel license.

Note: For in-transit storage or processing the applicant must include with the application the consent of the landowner, if the landowner is different than the applicant. A financial assurance estimate must be provided by applicants using in-transit storage or using in-transit processing where processing is conducted in the in-transit storage tanks.

Hauled Sewage (Septage) Waste Management System - Land Application Sites ☐ N/A

List the Environmental Compliance Approval Number(s) of all disposal site(s) approved by the Ministry of the Environment and Climate Change for land application of hauled sewage in association with this waste management system.

Instrument Type	Instrument Number	Approval or Application Date (yyyy/mm/dd)

✓ Completion Status (5.5.5 Hauled Sewage (Septage) Waste Management System)

✓ Completion Status (5.5 Waste Management Systems (Except Mobile Waste Processing))

5.6 Waste Management System - Mobile Waste Processing

Note**: If the application is not for the use and operation of mobile waste processing equipment, proceed to Section 5.7

5.6.1 Mobile Waste Management System Process and Equipment Description

Type(s) of Waste to be Processed (select all that apply)

Subject:

☐ Hazardous Waste

☐ Liquid Industrial Waste

Non-subject:

☐ Municipal (non-hazardous)

☐ Other Liquid Waste

Type of Waste to be Processed by the Unit(s)	Number of Units	Financial Assurance (per unit)	Financial Assurance Required
Non-hazardous Solid Waste		$5,000	
Hazardous Waste		$20,000	
Liquid Industrial Waste		$20,000	
Other Liquid Waste		$20,000	
Multiple Types of Waste from the Categories Above		$20,000	
	Total Financial Assurance		

Municipal (non-hazardous) Waste Categories to be Processed (select all that apply)

☐ Contaminated Soil at Cleanup Site ☐ Wood Waste ☐ Construction and Demolition Waste

☐ Asbestos Waste ☐ Tires ☐ Domestic Waste

☐ Other (specify) _____

Other Liquid Waste Categories to be Processed (select all that apply)

☐ Hauled Sewage ☐ Waste from Food Processing/Preparation Operations ☐ Processed Organic

☐ Other (specify) _____

Hazardous / Liquid Industrial Waste Types to be Processed

Class Code	Class Code	Class Code	Class Code	Class Code

✓ Completion Status (5.6.1 Mobile Waste Management System Process and Equipment Description)

5.6.2 Equipment Information - Please attach a separate list if more space is required.

Equipment List

Unit No.	Unit Type	Process Description	Equipment Type	Make	Model	Serial Number	Equipment Capacity (including unit of measurement)

Separate list attached?

☐ Yes ☐ No

✓ Completion Status (5.6.2 Equipment Information)

✓ Completion Status (5.6 Waste Management System - Mobile Waste Processing)

5.7 Cleanup of Contaminated Sites

Note** - If the application is not for a cleanup of a contaminated site please proceed to Section 6.

Type of Cleanup

☐ In-situ ☐ Ex-situ ☐ Both

Contaminated media to be treated:

☐ Groundwater ☐ Surface water ☐ Sediment ☐ Soil

Waste Type

Subject:

☐ Hazardous Waste

☐ Liquid Industrial Waste

Non-subject:

☐ Municipal (non-hazardous)

☐ Other Liquid Waste

Type of discharge

☐ Air ☐ Groundwater ☐ Storm or sanitary ☐ Surface water

☐ Noise

✓ Completion Status (5.7 Cleanup of Contaminated Sites)

6. Supporting Documentation and Technical Requirements

6.1 General

This is a list of supporting information to this application and is subject to the FIPPA and EBR.

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Proof of legal name	Optional	☑ Yes ☐ No		☐
Enhanced EBR description	N/A	☐ Yes ☐ No		☐
Provincial Officer Notice	N/A	☐ Yes ☐ No		☐
Inspection Report	N/A	☐ Yes ☐ No		☐
Detailed project and process description	Required	☑ Yes ☐ No		☐
Pre-application Consultation Record	N/A	☐ Yes ☐ No		☐
Legal Survey(s)	N/A	☐ Yes ☐ No		☐
Site Plan(s)	Required	☑ Yes ☐ No		☐
Scaled area location plan(s) with geo-referencing points identified	Required	☑ Yes ☐ No		☐
Documentation in support of EBR Exception	N/A	☐ Yes ☐ No		☐
Proof of Compliance with EAA Requirements	N/A	☐ Yes ☐ No		☐
Proof of Consultation/Notification	Required	☐ Yes ☑ No	ERT Appeal Case No. 12-033	☐
Financial Assurance Estimate	Optional	☐ Yes ☑ No	Not applicable	☐
Name, address and consent of land/ site owner for the installation and operation of the proposed activity or storage location of equipment or vehicle	N/A	☐ Yes ☐ No		☐
Name, address and phone number of the Operating Authority	N/A	☐ Yes ☐ No		☐
Copy of NEPDA Permit	N/A	☐ Yes ☐ No		☐
Copy/Proof of Municipal Planning Approval (ORMCA, general)	N/A	☐ Yes ☐ No		☐
Municipal Zoning Confirmation Letter	N/A	☐ Yes ☐ No		☐
Zoning map	Required	☐ Yes ☑ No	Not available	☐
Conservation Authority Clearance	N/A	☐ Yes ☐ No		☐
Director's approval for Policy 2 Deviation	N/A	☐ Yes ☐ No		☐
Application Fee	Required	☐ Yes ☑ No	Please contact frichard@blumetric.ca ((613) 558-5936) for credit card details	☐
A copy of this application has been sent to the Ministry Local District Office	Required	☑ Yes ☐ No		☐
Other (please describe)	Optional	☐ Yes ☐ No		☐

✓ Completion Status (6.1 General)

6.2 Air

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Emission Summary and Dispersion Modelling (ESDM) Report prepared in accordance with s. 22 and of O. Reg. 419/05 (including signed checklist)	N/A	☐ Yes ☐ No		☐
Electronic copy of the Dispersion Modelling input and output files prepared in accordance with s. 26 of O. Reg. 419/05	N/A	☐ Yes ☐ No		☐
Supporting Information for a Maximum Ground Level Concentration Acceptability Request for Compounds with no Ministry POI Limit - Supplement to Application for Approval, EPA S. 9	N/A	☐ Yes ☐ No		☐
Copies of forms requesting O. Reg. 419/05 instruments and supporting documentation	N/A	☐ Yes ☐ No		☐
Other (please describe)	Optional	☐ Yes ☐ No		☐

✓ Completion Status (6.2 Air)

6.3 Noise and Vibration

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Primary Noise Screening	N/A	☐ Yes ☐ No		☐
Secondary Noise Screening	N/A	☐ Yes ☐ No		☐
Acoustic Assessment Report including signed checklist (AAR)	N/A	☐ Yes ☐ No		☐
Vibration Assessment Report	N/A	☐ Yes ☐ No		☐
Noise Abatement Action Plan	N/A	☐ Yes ☐ No		☐
Other (please describe)	Optional	☐ Yes ☐ No		☐

✓ Completion Status (6.3 Noise and Vibration)

6.4 Sewage Works

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Signed Municipal Responsibility Agreement	N/A	☐ Yes ☐ No		☐
Detailed description of the proposed activities/works	N/A	☐ Yes ☐ No		☐
Notice of Completion for the Environmental Study Report (ESR)	Optional	☐ Yes ☐ No		☐

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Design Brief	N/A	☐ Yes ☐ No		☐
Preliminary Engineering Report	Optional	☐ Yes ☐ No		☐
Final Plans	N/A	☐ Yes ☐ No		☐
Engineering Drawings and Specifications	N/A	☐ Yes ☐ No		☐
Sewage quantity and quality characteristics	N/A	☐ Yes ☐ No		☐
Stormwater Management Report	N/A	☐ Yes ☐ No		☐
Stormwater Management Plan	N/A	☐ Yes ☐ No		☐
Hydrogeological Assessment with proof of concurrence from the Ministry's Regional technical support section	N/A	☐ Yes ☐ No		☐
Environmental Impact Analysis	Optional	☐ Yes ☐ No		☐
Final effluent criteria accepted with proof of concurrence from the Ministry's Regional Technical Support Section	N/A	☐ Yes ☐ No		☐
Sewage Works Limited Operational Flexibility Requirements - Engineer's Report	N/A	☐ Yes ☐ No		☐
Sewage Works Limited Operational Flexibility Requirements - Declarations	N/A	☐ Yes ☐ No		☐
Pipe Design Data Form	N/A	☐ Yes ☐ No		☐
Other (please describe)	Optional	☐ Yes ☐ No		☐

✓ Completion Status (6.4 Sewage)

6.5 Waste Disposal Sites

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Design and Operations Report	Required	☐ Yes ☑ No	not applicable	☐
Stormwater Management Report	Optional	☐ Yes ☑ No	not applicable	☐
Hydrogeological Assessment with proof of concurrence from the Ministry's Regional technical support section	Required	☐ Yes ☑ No	All relevant Hydrogeological Assessments have previously been submitted to MECP. Attachment B provides letter confirming concurrence from Ministry Regional technical support section	☐
Assessment of Physical and Water Use Conditions	Optional	☐ Yes ☑ No	Not applicable	☐
Waste Limited Operational Flexibility Requirements - Engineer's Report	N/A	☐ Yes ☐ No		☐
Waste Limited Operational Flexibility Requirements - Declarations	N/A	☐ Yes ☐ No		☐
Copy of notification to adjacent landowners	Required	☑ Yes ☐ No		☐

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Other (please describe)	Optional	☐ Yes ☐ No		☐

✓ Completion Status (6.5 Waste Disposal Sites)

6.6 Waste Management Systems

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Proof of vehicle and/or equipment ownerships	N/A	☐ Yes ☐ No		☐
Complete Fleet List (list of all vehicles, trailers and equipment used)	N/A	☐ Yes ☐ No		☐
Copy of the Liability Insurance for all vehicles for which insurance is required	N/A	☐ Yes ☐ No		☐
Copy of BUC recommendation	N/A	☐ Yes ☐ No		☐
Copy of the storage tank design	N/A	☐ Yes ☐ No		☐
Copy of commercial vehicle licence	N/A	☐ Yes ☐ No		☐
Description of the physical location where the vehicles transporting biomedical waste are being disinfected	Optional	☐ Yes ☐ No		☐
Drivers Training Manual (for PCB/ Biomedical Waste)	Optional	☐ Yes ☐ No		☐
A copy of the applicant's Operation Plan including detailed packaging and biomedical waste handling methods	Optional	☐ Yes ☐ No		☐
Contingency and Emergency Procedures Plan (for PCB/ Biomedical Waste/Hauled Sewage (Septage))	Optional	☐ Yes ☐ No		☐
Other (please describe)	Optional	☐ Yes ☐ No		☐

✓ Completion Status (6.6 Waste Management Systems)

6.7 Mobile Waste Processing ☐ N/A

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Design and Operations Report - Mobile Waste Processing of General Waste	N/A	☐ Yes ☐ No		☐
Design and Operations Report - Mobile Waste Processing of Liquid Waste	N/A	☐ Yes ☐ No		☐
Other (please describe)	Optional	☐ Yes ☐ No		☐

✓ Completion Status (6.7 Mobile Waste Processing)

6.8 Cleanup of Contaminated Sites ☐ N/A

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Design Report for Cleanup of Contaminated Sites	N/A	☐ Yes ☐ No		☐
Other (please describe)	Optional	☐ Yes ☐ No		☐

✓ Completion Status (6.8 Cleanup of Contaminated Sites)

6.9 Other Attachments ☐ N/A

Title	Reference	Confidential
Letter from MECP Confirming Delineation Complete	Attachment B	☐
Certificate of Amalgamation	Attachment C	☐
Notice letter to residents	Attachment D	☐
Proposed Post-Closure EMP	Attachment E	☐

Is there an attachment of an additional list of attachments?

☐ Yes ☑ No

If there is not enough space to list all of the attachments included in this application package, please include an additional listing of these attachments.

✓ Completion Status (6.9 Other Attachments)

6.10 Confidentiality

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Explanation for confidentiality	N/A	☐ Yes ☐ No		☐

✓ Completion Status (6.10 Confidentiality)

Please note: The collection of personal information in this application is necessary to administer the Ministry's approvals program, which is authorized pursuant to the *Environmental Protection Act* and the *Ontario Water Resources Act*. The personal

information collected in this application will be used to administer the program, including for the purposes of the Ministry's compliance and enforcement activities under the aforementioned acts, and for the purposes of making information in respect of Environmental Compliance Approvals available to the public with the exception of payment information. Questions about the collection of the information can be directed to a Client Service Representative, Client Services and Permissions Branch, 135 St. Clair Avenue West, 1st Floor, Toronto ON M4V 1P5; Telephone outside Toronto 1-800-461-6290 or in Toronto 416-314-8001 or Fax 416-314-8452.

7. Authorization

7.1 Statement of the Applicant

I am authorized to prepare and submit this application and to make this certification. I have reviewed the complete application and I have made all inquiries that are necessary to declare to the best of my knowledge, information and belief:

- The information contained in this application is complete and accurate.
- The Technical Contact(s) identified in this application has/have been authorized to prepare certain technical material, and act on behalf of the applicant to discuss this application with the Ministry of the Environment and Climate Change and to provide additional information about this application to the Ministry on request.
- The information provided to the Technical Contact(s) in relation to this application is complete and accurate.

Name of Signing Authority (Please print) *
Bill McDonough

Title *
Senior Project Manager

Telephone Number	ext.	Mobile Number	Fax Number
		226-280-1795	

Email Address
wmcdonou@wm.com

Signature	Date (yyyy/mm/dd)
	2021/11/23

✓ Completion Status (7.1 Statement of the Applicant)

7.2 Statement of the Municipality ☐ N/A

I, the undersigned hereby declare on behalf of the Municipality, that the Municipality has no objection to the construction of the works in the Municipality.

Name (Please print)

Title	Name of Municipality

Signature	Date (yyyy/mm/dd)

✓ Completion Status (7.2 Statement of the Municipality)

7.3 Statement of Technical Contacts

Technical Contact 1

I have been authorized by the applicant to prepare the technical materials for the area(s) of responsibility identified in section 2.6 that are included in the application. I have reviewed those technical materials and I have made all inquiries that are necessary to declare to the best of my knowledge, information and belief:

- The technical materials contained in this application in respect of the area(s) of responsibility identified in section 2.6 are complete and accurate.
- I have the relevant education and experience necessary to provide this certification.

Name of Technical Contact (Please print) *
Francois Richard

Signature	Date (yyyy/mm/dd)
	2021/11/23

✓ Completion Status (7.3 Statement of Technical Contacts)

8. Payment Information - Application for an Environmental Compliance Approval

Please Note:

1. If this form has been completed by hand, the fee calculations must be completed and attached separately. The supplemental fee calculations do not need to be included if this form has been completed electronically.

2. If this form has been completed electronically, the fees for this application have been calculated based on the information provided. The Ministry may require additional information during the review of the application that could impact the total fee required.

3. All fees should be paid in Canadian funds, payable to the *Minister of Finance*, except fees for *Transfer of Review*, which are payable to the local municipality.

4. Credit card payments are accepted for payments under $10,000 only. **Never email credit card information.**

5. If payment is being made by certified cheque or money order, please staple the payment to this page.

6. The information collected in this section of the form is considered confidential and will only be used to process the application fee.

7. To protect credit card information, do not submit this page containing payment information via e-mail or any other electronic means if it includes credit card information. Credit card information should be submitted only by mail, facsimile, or hand-delivery. Applications containing payment information that are submitted via e-mail or any other electronic means will not be processed and will be destroyed.

Do not include this page in the copies of the application that are being provided to the Local Ministry District Office.

Amount Enclosed	Method of Payment *
	☐ Certified Cheque ☐ Money Order ☐ VISA ☐ MasterCard

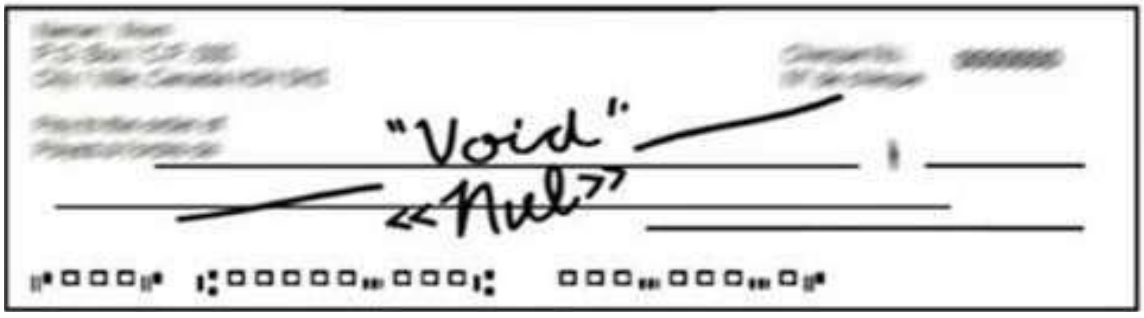
Credit Card Information (if paying by VISA or MasterCard)

Name of Cardholder (Please print)

Card Number	Expiry Date (mm/yy)
Card Holder's Signature	Date (yyyy/mm/dd)

✗ Completion Status (8 Payment Information)

If paying by certified cheque or money order, please attach it here.



Application Summary

For Office Use Only			
Reference Number	Payment Received ($)	Date (yyyy/mm/dd)	Initials

Applicant Name
Waste Management of Canada Corporation

Project Name
WM Richmond Landfill - Application to Amend ECA No. A371203

Project Description Executive Summary
The purpose of this amendment is to: establish a Contaminant Attenuation Zone (CAZ) for the WM Richmond Landfill (the Site); and, update the environmental monitoring plan (EMP) for the site.

Supplemental Application Information
On December 24, 2015, the Environmental Review Tribunal issued a decision regarding ECA No. A371203 including a requirement to demonstrate delineation of leachate-impacted groundwater at the Site, and off-Site. On August 24, 2021, MECP Kingston District Manager Trevor Dagilis confirmed that the extent of leachate-impacted groundwater related to the Site has been delineated (Attachment B). In accordance with Condition 8.5 of ECA No. A371203, WM is submitting this application for approval to amend the ECA to address non-compliance with Condition 8.8 and Guideline B-7, including incorporation of a contaminant attenuation zone (CAZ) into the approval (Attachment E), and a proposed updated environmental monitoring plan (EMP) (Attachment F).

Conditions to be removed or revised are as follows:

- Proposed for removal: Conditions 8.5 (c), (d) and (e); Conditions 8.6, 8.11 and 8.12.
- Proposed for revision: Condition 4.8; Condition 8.5 (a) and (b); Condition 8.10; Condition 8.13; Condition 14.1.

Application Status

Section	Completed?			
1. Application Information	✓	Yes		No
2. Project Information	✓	Yes		No
3. Regulatory Requirements	✓	Yes		No
4. Site Information	✓	Yes		No
5. Facility Information		Yes	✗	No
6. Supporting Documentation	✓	Yes		No
7. Payment Information		Yes	✗	No
8. Authorization		Yes	✗	No

Fee Summary

Activity	Amount ($)
Administrative Processing	$200.00
Review of EPA s. 9 activities	$0.00
Review of EPA s. 27 activities	$0.00
Review of OWRA s. 53 activities	$0.00
Total Fee	$200.00

The Ministry may request additional fees upon review of this application.
If this form is submitted in print version only and the smart calculation feature is not used, please attach the fee calculation separately.

ATTACHMENT B

MECP Confirmation of Delineation

Ministry of the Environment, Conservation and Parks
Kingston District Office
1259 Gardiners Road, Unit 3
Kingston ON K7P 3J6

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Bureau du district de Kingston
1259, rue Gardiners, unité 3
Kingston (Ontario) K7P 3J6

Ontario

William (Bill) McDonough
Senior Project Manager
Via Email : wmcdonou@wm.com

August 24, 2021

Dear Bill McDonough:

On December 24, 2015 the Environmental Review Tribunal (now called the Ontario Land Tribunal, and referred to the "Tribunal" in this letter) issued a decision ("the Decision") regarding the Environmental Compliance Approval issued in relation to the Richmond Landfill (the "Site"). While the Decision was extensive and touched on many aspects of the approval, the Decision laid out a process by which Waste Management ("WMCC" or "the Owner") would be required to demonstrate the delineation of the leachate-contaminated groundwater at the Site, and off-Site.

The Decision noted the criteria for determining whether the leachate-impacted groundwater has been delineated as follows:

> *"The extent of leachate impacted groundwater shall be delineated if it is demonstrated that water within a sufficient number of monitoring wells at the outer extent of the impacted area that are hydraulically connected to the defined leachate impacted groundwater does not exceed any reasonable use limits (RUL) as defined in Guideline B-7 and its corresponding procedure, B-7-1 or any RUL set out in this approval."*

Of particular emphasis was the process by which the ministry would evaluate the information put forward by WMCC, and the information provided in response by both the Mohawks of the Bay of Quinte ("MBQ") and the Concerned Citizens Committee of Tyendinaga and Environs ("CCCTE"). The Tribunal Decision laid out a process to ensure CCCTE and MBQ had an opportunity to provide input that could be considered by the ministry when making a decision regarding the acceptability of the proposed delineation. The Decision stated in paragraph 467:

> *…8.5(d) The following process shall be followed with respect to the report submitted under 8.5(c) v.:*
>
> *i. CCCTE, the MBQ and NGL shall have until June 1, 2016 to provide written comments on the report to the Owner and the District Manager and specifically whether delineation has been completed in accordance with the criteria.*
>
> *ii. After receiving the written comments from CCCTE, the MBQ and NGL, the District Manager will convene a meeting among all the parties to*

> *obtain further input and attempt to reach a consensus on whether delineation has been completed.*
> *iii. By no later than July 31, 2016, the District Manager shall issue a written notice to the Owner and copying the parties indicating whether delineation has been completed in accordance with the criteria …*

It must be noted that the timeframes for completing the necessary work at the Site were much longer than envisioned by the Tribunal. Given the complex hydrogeology at the Site, there were many cycles of installing additional monitoring wells, sampling the new monitoring wells, analysing the sample results and updating the overall site conceptual model based on the results by WMCC. The ministry prepared interim commitments, and the MBQ and CCCTE were given opportunities to review and comment before the ministry finalized a technical review of each major submission. As additional monitoring wells were installed the cycle repeated itself several times.

While some may consider this a slow process, I am satisfied that this was a thorough and practical approach to ensure the leachate-contaminated groundwater plume could be effectively assessed, and the complex groundwater regimes at the Site and off-Site could be properly tested, assessed and understood. The requirement for repeated expansion of the monitoring program is an indication of the complexity of the groundwater at the Site, and also testament to the thoroughness, ability and dedication of all involved to understand the hydrogeologic systems involved in contaminant migration in the area.

While a schedule was developed for a technical meeting as envisioned by the Tribunal in 8.5(d)ii in 2018 and 2020, the technical meeting was held on July 23, 2021. The delay from 2018 and 2020 was in response to assessments made by the ministry, the MBQ and CCCTE, that additional information was needed in order to validate proper delineation of the contamination related to the landfill. While some were frustrated by the delay, I am satisfied that this iterative process in assessing the subsurface of the Site and off-Site is complex and subject to many different competing professional viewpoints. I therefore acknowledge and thank Waste Management, the Mohawks of the Bay of Quinte and Concerned Citizens Committee of Tyendinaga and Environs and their respective technical experts for their continued focus and efforts in providing comments and analysis that was considered by ministry experts throughout the past many years.

I note that the issue at hand is the analysis, consideration and assessment of the submission by Waste Management regarding the delineation of the leachate contaminated groundwater plume at the Site and off-Site. There are several individual documents that collectively form the submission. Rather than identify them here, I will only mention that they are identified in the comments and reports made by ministry surface water scientists and hydrogeologists.

As noted by ministry Technical Support (memo dated August 11, 2021 from Hydrogeologist Kyle Stephenson to Environmental Officer David Arnott), the July 23,

2021 technical meeting, among other topics, allowed for focus on three key areas of discussion and differing opinions: delineation to the east of the landfill, issues related to shallow groundwater and karst features in the south-central off-site area, and issues related to the north lagoon. I will not repeat the various perspectives of the technical contributors or of Mr. Stephenson here. Rather, I have set out below the conclusion I have reached after assessing all of the relevant information.

Delineation to the East of the Landfill

In recent years there has been an increasing trend of 1,4 dioxane in the wells to the east of the landfill onto adjacent private property. As noted by Mr. Stephenson, the company will have to secure groundwater rights to this property or establish an engineered system to ensure control of the leachate plume such that it does not extend to the adjacent property.

That said, I understand that the unimpacted wells further east have not been shown to be hydraulically connected to the wells that demonstrate leachate impacts. However, I understand that the hydrogeological reality of limestone in that area indicates extremely low permeability, and that attempts were made at drilling other monitoring wells in the area but they were non-producing, and that the land owner has not been supportive of additional wells being drilled. In sum, I note that based on the specific conditions in that area, I believe that there are a sufficient number of wells at the outer extent of the contaminant plume to confirm delineation to a suitable accuracy and granularity.

I also note that the hydrocarbon contamination on the neighbouring property will require assessment and delineation, and therefore additional monitoring wells will be required in this area for that purpose. If Waste Management owns the property at that time, the testing for 1,4-dioxane can be added as a requirement. If Waste Management does not own the property, the ministry can obtain samples to be tested for 1,4-dioxane as may be needed via the wells drilled by the owner.

I therefore am satisfied that the landfill leachate contaminant plume is sufficiently delineated and that the hydrogeological evaluation of that area is acceptable for the purposes of the ministry at this time.

South-Central Off-Site Area

South of the landfill, there is an area where groundwater discharges at times to the surface, and subsequently enters a karst feature and flows into the subsurface again. While groundwater conditions beyond this karst entry point have not been characterized, Mr. Stephenson has identified that the 1,4-dioxane limit for groundwater has not been exceeded in samples of this water. Therefore, this is not considered to be part of the area requiring further delineation for compliance purposes. I agree with Mr. Stephenson’s perspective.

I note that updates to the Environmental Monitoring Plan will be required to ensure regular sampling of such waters to allow for on-going monitoring of conditions.

North Lagoon

While the leachate management at the site has been unacceptable in recent years and was the focus of a Provincial Officer's Order and has led to several amendments of the Site Environmental Compliance Approval, I note that the groundwater and surface water monitoring adjacent to the north lagoon has not shown any associated leachate-related impacts. I am therefore in agreement that the north lagoon issues are an operational and compliance issue, but with the requirement of extensive testing before any additional leachate may be transferred to the north lagoon, I am in agreement that no further groundwater delineation work is required due to issues of the north lagoon.

I therefore hereby agree with the submission by Waste Management and the technical comments from Mr. Stephenson that the extent of leachate impacted groundwater related to the Richmond Landfill leachate contamination plume has been delineated and has been done in accordance with the criteria given the overall risk and the complexity of the hydrogeology at the Site as explained above.

In accordance with Condition 8.5(e) of the Amended Environmental Compliance Approval Number A371203, WMCC is required within 90 days of the receipt of this letter to "*submit to the Director, Environmental Permissions Branch, Ministry of the Environment, Conservation and Parks an application for approval to amend the ECA to address any non-compliance with Condition 8.8 and Guideline B-7, including if warranted an application to incorporate a contaminant attenuation zone into the approval, and including a proposed updated EMP*."

Should you have any additional questions, please feel free to contact me at 613-548-6906 or trevor.dagilis@ontario.ca.

Sincerely,

Trevor Dagilis
District Manager
Kingston District

ec: David Arnott, Senior Environmental Officer, MECP
Kyle Stephenson, Hydrogeologist, MECP
Victor Castro, Supervisor (A), Water Resources Unit, MECP
James Mahoney, Manager (A), Technical Support Section, MECP

ATTACHMENT C

Proof of Legal Name

Nova Scotia

CERTIFICATE OF AMALGAMATION

Companies Act

Registry Number

3268826

I hereby certify that

WASTE MANAGEMENT OF CANADA CORPORATION

3268125 NOVA SCOTIA LIMITED

WASTELESS ENVIRONMENTAL SERVICES INC.

have amalgamated pursuant to Section 134 of the Nova Scotia Companies Act, R.S.N.S., 1989, as amended, and the name of the amalgamated company is:

WASTE MANAGEMENT OF CANADA CORPORATION

and the amalgamation is approved by the Registrar of Joint Stock Companies effective this date and the liability of the members is unlimited.

Registrar of Joint Stock Companies

January 1, 2013

Date of Amalgamation

Nova Scotia

CERTIFICATE OF REGISTRATION

Corporations Registration Act

Registry Number

3268826

Name of Company

WASTE MANAGEMENT OF CANADA CORPORATION

I hereby certify that the above-mentioned company, resulting from the amalgamation of:

WASTE MANAGEMENT OF CANADA CORPORATION
3268125 NOVA SCOTIA LIMITED
WASTELESS ENVIRONMENTAL SERVICES INC.

is hereby registered this date under the Corporations Registration Act.

Registrar of Joint Stock Companies

January 1, 2013
Date of Registration

ATTACHMENT D

Copy of Notification Letter and Distribution List

November 23, 2021

Dear Resident:

WM has submitted an ECA application to the Ministry of the Environment, Conservation and Parks (MECP), seeking an amendment to ECA No. A371203 issued for the Richmond Landfill to address non-compliance with Condition 8.8 and Guideline B-7, including incorporation of a contaminant attenuation zone (CAZ) into the approval, and a proposed post-closure environmental monitoring plan (EMP).

Conditions to be removed or revised are as follows:

- Proposed for removal: Conditions 8.5 (c), (d) and (e); Conditions 8.6, 8.11 and 8.12.
- Proposed for revision: Condition 4.8; Condition 8.5 (a) and (b); Condition 8.10; Condition 8.13; Condition 14.1.

If you have any questions, concerns or objections to the proposal, you must send written comments to:

Director, Client Services and Permissions Branch
Ministry of Environment, Conservation, and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, ON M4V 1P5

Written comments must be received by the MECP within 15 days of receipt of this notice.

Should you have any questions or comments regarding the application before expressing these comments to the MECP, please do not hesitate to contact the undersigned.

Regards,

Bill McDonough
Manager, Richmond Landfill
Waste Management of Canada Corporation
Phone: (226) 280-1795
Email: wmdonou@wm.com

Waste Management of Canada Corporation - Richmond Landfill
Application to Amend Environmental Compliance Approval No. A371203
Notification to Neighbouring Residents of Application Submission

Resident Name	Residence Address
Resident	1097 Beechwood Road, Napanee, ON
Mr. Paul Martin	1121 Beechwood Road, Napanee, ON
Mr. and Mrs. Lyn Russell	3424 Selby Road, Napanee, ON
Mary Blair and Leona Wells	3684 Selby Road, Napanee, ON
Mr. Bob Russell	3591 Selby Road, Napanee, ON
The Bakers	3462 Selby Road, Napanee, ON
R. C. Murray	3703 Selby Road, Napanee, ON
Mr. and Mrs. Leo Walsh	3832 Selby Road, Napanee, ON
Resident	1464 Callaghan Side Road, Napanee, ON
Mrs. Angela Scharf	1398 Callaghan Side Road, Napanee, ON
Mr. and Mrs. Doug Cranston	1388 Callaghan Side Road, Napanee, ON
Mr. and Mrs. Cory Wilson	1360 Callaghan Side Road, Napanee, ON
Mr. Ken Brown	1379 Callaghan Side Road, Napanee, ON
Mr. and Mrs. James Shearer	172 Tuckers Lane, Marysville, ON
Mr. Gary Tucker	138 Tuckers Lane, Marysville, ON
Mr. and Mrs. Ron Allison	207 Tuckers Lane, Marysville, ON
Mr. Ken Sutcliffe	37 Johnson Side Road, Napanee, ON
Mr. Tim Oillenbeck	66 Johnson Side Road, Napanee, ON
Ms. Julie Butcher	66 Johnson Side Road, Napanee, ON
Resident	67 Johnson Side Rd, Napanee ON
Resident	71Johnson Side Rd, Napanee ON
Resident	75 Johnson Side Rd, Napanee ON
Resident	185 Johnson Side Rd, Napanee ON
Mr. and Mrs. Brian Powers	603 Kennelly Road, Napanee, ON
Mr. Charles Goodfellow	554 Kennelly Road, Napanee, ON
Mr. Shaun Kennelly	494 Kennelly Road, Napanee, ON

ATTACHMENT E

Proposed Post-Closure Environmental Monitoring Plan (BluMetric, 2021)

FINAL REPORT

POST-CLOSURE ENVIRONMENTAL MONITORING PLAN

WASTE MANAGEMENT RICHMOND LANDFILL TOWN OF GREATER NAPANEE, ONTARIO

Submitted to:

Waste Management of Canada Corporation
1271 Beechwood Road
R.R. #6 Napanee, ON K7R 3L1

Prepared by:

BluMetric Environmental Inc.
4 Cataraqui Street
The Woolen Mill, The Tower
Kingston, ON K7K 1Z7

Project Number: 210166-05
23 November 2021

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4 Cataraqui Street
Kingston, ON K7K 1Z7

Project Number: 210166-05
Revision Number: 06

23 November 2021

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1. INTRODUCTION

This document provides the details of the post-closure Environmental Monitoring Plan (EMP) for the Waste Management (WM) Richmond Landfill. This document represents an updated version of the EMP (BluMetric, 2016a), which has been used on an interim basis in accordance with Environmental Compliance Approval (ECA) No. A371203 and was most recently amended on March 19, 2021. It is intended that this EMP will be reviewed and updated periodically, considering any recommendations provided in monitoring reports and subject to review and approval from the Ontario Ministry of the Environment, Conservation and Parks (MECP).

The WM Richmond Landfill Site (the Site) is approved as a 16.2 hectare waste disposal (landfilling) facility within a total area of 138 hectares, located on Part of Lots 1, 2 and 3, Concession IV of the former Township of Richmond, now in the Town of Greater Napanee, Ontario (see Figure 1). The Site has been closed to further waste disposal since June 30, 2011 and the current Site layout is shown on Figure 2.

Hydrogeologic investigations have identified the presence of groundwater impacted by leachate from the landfill extending beyond the current approved Site boundaries. An application to amend ECA No. A371203 has been prepared for submission to MECP to establish a Contaminant Attenuation Zone (CAZ) downgradient from the Site. This EMP incorporates the CAZ area and includes a monitoring network to observe the groundwater conditions on and around the property including within the CAZ, as shown on Figure 2.

This document provides a summary of the physical setting of the Site, the rationale and design of the proposed environmental monitoring network (groundwater, surface water, leachate and landfill gas), monitoring frequencies and parameters for each monitoring location, an appropriate Site-specific method for data evaluation and trigger mechanisms, and contingency plans.

2. SITE CONCEPTUAL MODEL

Background information concerning the Site geology and hydrogeology was described in detail in the Site Conceptual Model (SCM) report (BKA & WESA, 2009) and updated based on results from subsequent hydrogeological investigations (BluMetric 2015, 2016b, 2016c, 2017, 2018 and 2019), and is summarized here. The SCM report describes the groundwater flow conditions at the Richmond Landfill. Based on the results from extensive studies conducted previously at the Site, the basic hydrogeological framework for the facility has been defined as follows:

- The active groundwater flow zone at the Site extends to a depth of approximately 30 m below the top of bedrock;
- The shallow groundwater flow zone is conceptualized as the overburden, the overburden-bedrock contact and the upper one to two metres of bedrock;
- The direction of groundwater flow in the shallow flow zone is strongly influenced by topography;
- The intermediate bedrock flow zone extends from one to two metres below top of bedrock to a depth of approximately 30 m below top of bedrock;
- Groundwater flows through a network of fractures in the upper 30 m of bedrock;
- The dominant fracture orientation is horizontal to sub-horizontal; however, vertical to subvertical fractures are present providing hydraulic connection between horizontal fractures;
- Hydraulic connection of fractures exists in the intermediate bedrock flow zone to the west, south and east of the Site (horizontal and vertical connections);
- Intermediate bedrock flownets show that groundwater flow directions are variable with season and generally flows to the west from the western edge of the landfill, to the southeast from the southern edge of the landfill, to the south along the eastern edge of the landfill, and north to northwest from the northern limit of the landfill;
- The hydraulic conductivity of the intermediate bedrock is lower to the north and east of the landfill compared to other areas of the Site, implying that the rate of groundwater flow is lower than in areas immediately south, southeast and west of the landfill;
- South of the landfill, the intermediate bedrock flow zone has distinct areas of interacting hydrogeological zones which are not isolated from one another, but are distinct based on hydraulic conductivity, water level variations and the rate of response to recharge events; and,
- Groundwater monitoring wells in the southern portion of the CAZ have static groundwater elevations that are similar to each other and much lower than wells further north in the CAZ; these deep groundwater elevations appear to be controlled by karst systems confirmed to exist in the southern portion of the CAZ.

3. GROUNDWATER MONITORING PROGRAM

The groundwater monitoring program includes water elevation measurements and groundwater quality monitoring. The following sections describe the monitoring network for the Site and presents specific assessment parameters with concentration limits to monitor groundwater quality.

The groundwater monitoring network has been developed to monitor hydraulic and chemical conditions in the established flow zones in both vertical and horizontal orientations along the critical flow pathways. The targeted intervals are the Shallow Groundwater Flow Zone and the Intermediate Bedrock Groundwater Flow Zone.

3.1 GROUNDWATER ELEVATION MONITORING

Groundwater elevations have been monitored at the Site on a semi-annual basis since 1991, providing an exhaustive database of groundwater elevations. Groundwater elevations will continue to be recorded annually from hydraulically active locations to monitor the local flow system. Groundwater elevations will be monitored alternately in the spring and fall each year.

The list of groundwater monitors to be included in the surveys of groundwater elevations is presented in Table 1 and shown on Figures 3(a) & 3(b) (Shallow Groundwater Flow Zone) and Figure 3(c) (Intermediate Bedrock Groundwater Flow Zone). From past investigations, it has been determined that all monitoring wells listed in Table 1 are hydraulically active.

Table 1: Groundwater Elevation Monitoring Locations

Location	Shallow Groundwater Zone (42 locations)	Intermediate Bedrock Groundwater Zone (49 locations)
West of landfill footprint	M27, M67-2, M98, M99-2, M101, M102, OW37-*s*	M58-3, M72, M74, M82-2, M91-1, M95-1
East of landfill footprint	M23, M47-3, M68-4†, M70-3, M77, M96	M50-3, M52-2
North of landfill footprint	M35, M60-4, M65-2, M66-2, M86, M94-2, M103, M104	M5-3, M6-3, M46-2, M59-4, M60-1, M75, OW1
South/Southeast of landfill footprint and north of Beechwood Road	M14, M18, M41, M53-4, M54-4, M80-2, M81, M87-2, M97	M10-1, M49-1, M53-2, M56-2, M105, M106, M107, M108, M109-1, M109-2, M110-1, M111-1, M112-1, M170, M192*, M193*
South of landfill footprint and south of Beechwood Road (within CAZ)	M114-2, M178R-5, M188-2, M200, M201-DP, M203, M204, M205, M206, M206-DP, M207-DP, M209-DP	M63-2, M64-2, M114-1, M121, M123, M167, M168, M177, M178R-2, M178R-4, M179, M185-1, M185-2, M186, M187, M188-1, M190, M191

† Monitoring well M68-4 is damaged and will be replaced
* Access to monitoring wells M192 and M193 is subject to permission from the property owner

3.2 GROUNDWATER QUALITY MONITORING

The rationale for measuring the groundwater chemistry at any landfill Site is to determine the extent and movement of leachate-impacted groundwater in relation to the Site boundaries. This program is intended to monitor for leachate-impacted groundwater at the Site boundaries and to determine if the observed concentrations of the parameters are adversely impacting neighbouring properties. This EMP presents a consistent approach that involves monitoring at hydraulically active locations within the primary groundwater flow paths from areas of high hydraulic head to low head, defined based on the extensive Site database that includes groundwater elevation and chemistry data collected since 1991. The main criteria used in selecting monitoring locations are:

- monitoring well located within a hydraulically active groundwater zone;
- groundwater flow path within the hydraulically active zone (with flow being from areas of high hydraulic head to low head);
- landfill and property boundary proximity; and
- areas outside of known impacted areas.

3.2.1 Groundwater Quality Monitoring Locations

The groundwater quality monitoring locations are summarized in Table 2 and are illustrated along with pertinent Site features on Figures 3(a) and 3 (b) (Shallow Groundwater Flow Zone), and Figure 3(c) (Intermediate Bedrock Groundwater Flow Zone). Representative groundwater contours from April 2019 are also shown on the Figures to illustrate the relationship of the monitoring locations to typical groundwater flow patterns on the Site (e.g., background areas, low-head areas, etc.).

Table 2: Groundwater Quality Monitoring Locations

Location	Selected Monitors	Frequency of Sampling
Shallow Groundwater Flow Zone		
Background Locations	M68-4†, M96, M99-2	Once every three years
Known Impacted Areas	M101, M103, M104, M178R-5, M205, M206	
West of Landfill Footprint	M67-2, OW37-s	Once each year, alternating between spring and fall
North of Landfill Footprint	M86	
South of Landfill Footprint and North of Beechwood Road	M53-4, M80-2	
South of Landfill Footprint and South of Beechwood Road (within Proposed CAZ)	M114-2, M188-2, M200, M203, M204	
Intermediate Bedrock Groundwater Flow Zone		
Background Locations	M56-2, M58-3, M59-4, M91-1, M95-1	Once every three years
Known Impacted Areas	M6-3, M108, M114-1, M178R-2, M178R-4	
	M167, M170, M192*	Once each year, alternating between spring and fall
West of Landfill Footprint	M72, M74, M82-2	
North of Landfill Footprint	M5-3, M75, OW1	
South/Southeast of Landfill Footprint and North of Beechwood Road	M52-2, M106, M193*	
South of Landfill Footprint and South of Beechwood Road (within Proposed CAZ)	M177, M179, M185-2, M186, M187, M188-1	

Notes:
† Monitoring well M68-4 is damaged and will be replaced
* Access to monitoring wells M192 and M193 is subject to permission from the property owner

3.2.2 Groundwater Quality Monitoring Parameters and Sampling Frequency

Monitoring wells will be sampled once per year, with the exception of background locations and monitoring wells known to be located in leachate-impacted areas and where steady or declining trends in 1,4-dioxane concentrations have been observed in recent years, which will be sampled once every three years (Table 2). The timing of annual sampling events will alternate between Spring and Fall in order to capture seasonal variations. Environmental Monitoring events will be conducted annually in Spring 2022, Fall 2023, Spring 2024, Fall 2025 and so forth.

Groundwater samples will be analyzed for the parameters shown in Tables 3 and 4.

Table 3: Groundwater Quality Monitoring Parameters (Inorganic and General List)

Groundwater Inorganic and General Parameters	
Total dissolved solids	Boron
Alkalinity	Iron
Conductivity	Manganese
Dissolved organic carbon	Ammonia (total)
Calcium	Nitrate
Magnesium	Nitrite
Sodium	Chloride
Potassium	Sulphate

Table 4: Groundwater Quality Monitoring Parameters (VOC List)

Volatile Organic Compounds (VOCs) Monitoring List	
1,4-Dioxane	Chloroethane
Benzene	1,1,2,2-Tetrachloroethane
Toluene	1,1,1,2-Tetrachloroethane
Ethylbenzene	1,1,1-Trichloroethane
m&p-Xylene	1,1,2-Trichloroethane
o-Xylene	1,1-Dichloroethane
Styrene	1,2-Dichloroethane
1,3,5-Trimethylbenzene	1,1-Dichloroethylene
Chlorobenzene	Cis-1,2-Dichloroethylene
1,2-Dichlorobenzene	Trans-1,2-Dichloroethylene
1,3-Dichlorobenzene	Trichloroethylene
1,4-Dichlorobenzene	Tetrachloroethylene
Methylene chloride	Vinyl chloride
Chloromethane	

3.2.3 Groundwater Quality Assessment Limits

Two active flow zones have been identified for groundwater monitoring purposes at the WM Richmond Landfill: i) the Shallow Groundwater Flow Zone; and, ii) the Intermediate Bedrock Groundwater Flow Zone. The background groundwater chemistry in these two zones is distinct; therefore, quantitative limits for the purpose of assessing potential groundwater impacts are developed separately for each of the two zones.

The primary indicator that is used to discern impacts from landfill leachate at this Site is 1,4-dioxane. The presence of 1,4-dioxane at detectable concentrations (> 0.001 mg/L) indicates the furthest extent of groundwater impacts. Other parameters that are used to assist in determining leachate impacts, including alkalinity which is generally above 400 mg/L where 1,4-dioxane is detected. and are included in the routine monitoring program are listed in Table 5.

Table 5: Groundwater Indicator Parameters Used in Routine Monitoring Program

Primary Leachate Indicator Parameter	
• 1,4-dioxane	
Other Inorganic and General Indicators	**Volatile Organic Compounds**
• Alkalinity • Total dissolved solids • Conductivity • Chloride • Sodium • Dissolved organic carbon • Ammonia • Iron • Manganese	• Benzene • Toluene • Ethylbenzene • Xylenes • 1,1,1-Trichloroethane • 1,1-Dichloroethane • 1,1-Dichloroethylene • Chloroethane

The median background concentrations in the Shallow Groundwater Flow Zone and Intermediate Bedrock Groundwater Flow Zone for each of the parameters listed in Table 5 are presented in Table 6. Reasonable Use Limits (RULs) have been calculated for parameters that have Ontario Drinking Water Standards (ODWS), and for which concentration limits can be calculated using the procedure outlined in Guideline B-7.

The monitoring wells that were used to define the background dataset for the Shallow Groundwater Flow Zone are as follows:

- M28
- M58-4
- M60-4
- M68-4
- M70-3
- M77
- M96
- M97
- M98
- M99-2

As indicated in Table 2, the following monitoring wells will be used to monitor background groundwater quality in the Shallow Groundwater Flow Zone going forward in the post-closure EMP:

- M68-4
- M96
- M99-2

The monitoring wells that were used to define the background dataset for the Intermediate Bedrock Groundwater Flow Zone are as follows:

- M56-2
- M58-3
- M59-2
- M59-4
- M91-1
- M95-1

The monitoring wells to be used to represent background groundwater quality in the Intermediate Bedrock Groundwater Flow Zone include the following:

- M56-2
- M58-3
- M59-4
- M91-1
- M95-1

Four of these monitoring wells (M56-2, M58-3, M91-1 and M95-1) were selected from locations near the western boundary of WM property along County Road 10, in areas that are hydraulically downgradient from the landfill. The wells have all been classified as responsive wells in the SCM report, and the water quality in these monitoring wells reveals low and stable concentrations of dissolved constituents, not impacted by anthropogenic sources. The use of these wells as background monitors will ensure that the dataset adequately represents natural variations in water quality within the intermediate bedrock across the Site.

Concentration trends in the downgradient background monitoring wells (M56-2, M58-3, M91-1 and M95-1) will be monitored once every three years. If the data remain at low and stable concentrations, then the downgradient monitoring wells will remain in the background dataset. However, if increasing concentration trends are apparent which are indicative of potential impacts, the previous three years of data for the wells (collected since the previous evaluation of RULs) will not be used in the calculation of median background concentrations and RULs.

Table 6: Summary of Indicator Parameters, Background Concentrations and Reasonable Use Limits

			Shallow Bedrock Flow Zone			Intermediate Bedrock Flow Zone		
Parameter[1]	ODWS[2]	X[3]	Background Range	Median Background	RUL	Background Range	Median Background	RUL
Primary Leachate Indicators								
1,4-dioxane[4]	---	---	< 0.001	< 0.001	0.001	< 0.001	< 0.001	0.001
Inorganic and General Parameters								
alkalinity	30 - 500	0.5	204 - 440	290	395	234 - 460	303	402
ammonia	---	---	< 0.02 - 1.85	<0.15	---	< 0.02 - 3.41	0.17	---
chloride	250	0.5	1 - 86	11	131	3 - 72	9.9	130
conductivity (µS/cm)	---	---	489 - 1120	652	---	556 - 1100	690	---
DOC	5.0	0.5	< 0.5 - 6.7	2.2	3.6	< 0.5 - 8.2	1.7	3.4
iron	0.3	0.5	< 0.01 - 4.6	< 0.1	0.18	< 0.01 - 2.5	< 0.1	0.18
manganese	0.05	0.5	< 0.002 - 0.31	0.017	0.033	< 0.002 - 0.07	0.01	0.030
sodium	200	0.5	3 - 82	18	109	3 - 123	13	107
TDS	500	0.5	255 - 774	425	462	252 - 696	414	457
Volatile Organic Compounds (VOCs)								
1,1,1-trichloroethane	---	---	< 0.0001 - < 0.0001	< 0.0001	---	< 0.0001 - < 0.0004	< 0.0001	---
1,1-dichloroethane	---	---	< 0.0001 - < 0.0001	< 0.0001	---	< 0.0001 - < 0.0004	< 0.0001	---
1,1-dichloroethylene	0.014	0.25	< 0.0001 - < 0.0001	< 0.0001	0.0035	< 0.00005 - < 0.0002	< 0.0001	0.0035
chloroethane	---	---	< 0.0002 - < 0.001	< 0.0002	---	< 0.0002 - < 0.001	< 0.0002	---
benzene	0.001	0.25	< 0.0001 - 0.0013	< 0.0001	0.0003	< 0.00005 - 0.001	< 0.0001	0.0003
ethylbenzene	0.14	0.5	< 0.0001 - < 0.0016	< 0.0001	0.0700	< 0.00005 - 0.0042	< 0.0001	0.0700
m+p-xylene o-xylene	0.09	0.5	< 0.0001 - 0.0041	< 0.0001	0.0035	< 0.0001 - 0.0031	< 0.0001	0.0035
toluene	0.06	0.5	< 0.0002 - 0.004	< 0.0002	0.0036	< 0.0002 - 0.0022	< 0.0002	0.0036

Notes:

1) All units expressed as mg/L, except where noted.
2) ODWS - Ontario Drinking Water Standards, Objectives and Guidelines.
3) X - denotes the factor used in the Reasonable Use calculations:
   - 0.25 for health-related parameters;
   - 0.5 for aesthetic parameters.
4) Site-specific RUL for 1,4 dioxane (0.001 mg/L) set by ERT Order dated December 24, 2015, to be re-calculated in accordance with procedure document B-7-1 should an ODWS standard be set for 1,4 dioxane

There is no ODWS for 1,4-dioxane, and consequently a RUL cannot be calculated for this parameter. However, owing to its presence in leachate at the Site, and its high aqueous solubility and conservative nature in groundwater, 1,4-dioxane has been identified as a significant and effective parameter to determine the furthest extent of leachate impacts at this Site. In the absence of an ODWS for 1,4-dioxane, a Site-specific RUL of 0.001 mg/L (1 µg/L) is used as required by Condition 8.9 in the current ECA. Should Ontario amend O. Reg. 169/03 to set an ODWS for 1,4-dioxane, or should WM petition the ERT for modification of the mandated, Site-specific RUL for 1,4-dioxane, the RUL will be re-calculated in accordance with procedure document B-7-1, and the EMP shall be amended as necessary to reflect the re-calculated RUL.

The RULs shown in Table 6 represent the concentrations that will be used to support the evaluation of whether groundwater quality on properties downgradient from the WM Richmond Landfill and CAZ would be considered acceptable. However, the groundwater geochemistry across the Site is variable, as indicated by the concentration ranges shown in Table 6, reflecting mineralization along the bedrock bedding planes and fractures conveying groundwater and varying amounts of mixing within the fracture network (i.e., water from lower hydraulic conductivity fractures with poor water quality, mixes with fresher water within higher hydraulic conductivity fractures). In essence, background water quality can vary naturally from good to poor (i.e., potable to non-potable). Therefore, the Guideline B-7 (Reasonable Use) assessment for groundwater will be complemented with a review of water quality trends over time at individual wells (an "intra-well analysis") to better evaluate whether the downgradient groundwater is impacted with leachate. The groundwater evaluation method, including the intra-well analysis, is presented in Section 7.1.

3.2.4 Review of Groundwater Monitoring Program

The adequacy of the groundwater monitoring program will be reviewed every year to ensure that the program remains effective and comprehensive. Recommendations for revisions will be developed if appropriate and submitted to the MECP Kingston District Office for review and concurrence.

The RULs listed in Table 6 will be re-calculated once every three years, using the updated background groundwater quality dataset.

4. SURFACE WATER MONITORING PROGRAM

The two watercourses that may receive direct surface water/stormwater runoff, as well as potentially impacted shallow groundwater, from the closed WM Richmond Landfill are Marysville Creek to the north of the waste mound and Beechwood Ditch to the south (Figure 2). Across most of the WM property, Marysville Creek is an intermittent watercourse. However, northerly flowing groundwater discharges to the creek in an area northwest of the landfill. Water is ponded in this area and the surface water is conveyed west of County Road 10 by a culvert beneath the road. Marysville Creek then flows on a continuous basis west of County Road 10.

Groundwater has also been observed to be naturally discharging to ground surface in a diffuse wet low-lying area located in the central portion of the CAZ. A local intermittent receiving water course is present south and downgradient of the groundwater discharge area.

Stormwater runoff from the existing landfill area flows to one of three stormwater management ponds, located to the northeast, northwest and south of the landfill footprint. These ponds are approved under Environmental Compliance Approval No. 1688-8HZNJG issued January 10, 2012. The ponds are located (1) north of the eastern half of the landfill footprint, (2) northwest of the footprint and (3) south of the landfill footprint (see Figure 2).

4.1 SURFACE WATER ELEVATION MONITORING

Surface water elevations will be monitored at locations within the three inter-connected ponds located south of the landfill footprint, to assist with the interpretation of shallow groundwater elevation contours south of the landfill. These measurements will be used to complement the groundwater elevations to determine the direction of shallow groundwater flow. Surface water elevations will be recorded once per year (at the same time as the groundwater levels) from stream gauges installed at the following locations (refer to Figure 4):

- Westernmost pond in the system (SG-1);
- Central pond in the system (SG-2); and
- Easternmost pond in the system (SG-3).

Additionally, water levels in the North Lagoon will be recorded when the lagoon is in use.

4.2 SURFACE WATER QUALITY MONITORING

The purpose of surface water sampling is to monitor the quality of surface water flowing onto and away from the landfill property to evaluate whether the quality of the water is impacted by the closed landfill.

4.2.1 Surface Water Quality Monitoring Locations

A list of surface water quality monitoring locations is provided in Table 7. The respective monitoring points are shown on Figure 4.

Table 7: Surface Water Quality Monitoring Program

Drainage Course	Monitoring Location	Parameters	Monitoring Frequency
Beechwood Ditch	S5, S4R and S8R	Surface Water (Table 8)	Two times each year, in spring and fall
Marysville Creek	S2, S3 and S7	Surface Water (Table 8)	Two times each year, in spring and fall
Unnamed water course in central portion of CAZ	S23	Surface Water (Table 8)	Event based*; maximum quarterly

* Location to be equipped with an alarm to alert sampling staff that surface water is discharging

4.2.2 Surface Water Quality Monitoring Parameters and Sampling Frequency

Surface water will be sampled from all locations included in Table 7 (provided they are not dry) and analyzed for the list of parameters specified below in Table 8. Field measurements of flow rate, temperature, pH, conductivity and dissolved oxygen will be collected at the same time as the sampling for laboratory analysis.

Sampling frequency at all surface water monitoring locations except S23 will be two times per year, in the spring and fall. Surface water sampling at monitoring location S23 will be event-based and will be conducted when flow is occurring, a maximum of once per season as defined below:

- Winter: between December 21 and March 20;
- Spring: between March 21 and June 20;
- Summer: between June 21 and September 20; and
- Fall: between September 21 and December 20.

This location will be instrumented with a pressure transducer or other suitable equipment capable of monitoring active discharge into the nearby karst feature that will trigger an alarm when flow is occurring. The flow monitoring equipment will be connected to a battery or solar powered real-time logger telemetry system accessible via cellular modem communication.

Table 8: Surface Water Quality Monitoring Parameters

Surface Water Parameters	
1,4-Dioxane	Iron
Total suspended solids	Lead
Total dissolved solids	Nickel
Biological oxygen demand	Zinc
Chemical oxygen demand	Ammonia (total & un-ionized)
Alkalinity	Nitrate
Conductivity	Nitrite
Hardness	Chloride
Calcium	Sulphate
Magnesium	Phenols
Sodium	Total phosphorus
Potassium	Naphthalene
Boron	
Cadmium	Field measurements:
Chromium (total, Cr6+, Cr3+)	pH, temperature, conductivity, dissolved oxygen, estimated flow rate
Cobalt	
Copper	

1,4-Dioxane will be analyzed in samples from all surface water monitoring locations, for five years. If 1,4-dioxane is not detected in any of the samples during the initial five-year period, it will be removed from the monitoring parameter list for surface water upon written notification to the MECP District Manager.

4.2.3 Surface Water Quality Assessment Limits

Representative indicator parameters for surface water monitoring were chosen based on leachate indicators, shallow groundwater and surface water concentrations, and Provincial Water Quality Objectives (PWQO) values. The surface water parameters to be assessed are listed in Table 9 with their respective PWQO values, where applicable. Upstream and downstream concentrations will be compared to each other and to PWQO to observe whether concentrations of surface water indicator parameters increase across the landfill property and whether they meet the MECP water quality objectives.

Table 9: Surface Water Assessment Parameters and PWQO

Parameter	PWQO (µg/L)
1,4-Dioxane	20
Alkalinity	Should not be decreased by more than 25% of the natural concentration
Ammonia (unionized)	20
Boron*	1,500
Chloride	----
Chromium	1.0 for hexavalent chromium (Cr VI) 8.9 for trivalent chromium (Cr III)
Cobalt	0.9
Conductivity	----
Copper	5.0 (revised Interim PWQO)
Iron	300
Lead	5.0 (revised Interim PWQO)
Naphthalene	7.0
Nickel	25
Phenols (4-AAP)	1.0
Total phosphorus	30
Zinc	20 (revised Interim PWQO)

* The assessment limit for boron is based on the CCME guidelines for the protection of aquatic life (CCME, 2009)[1]

[1] https://ccme.ca/en/res/boron-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf

4.2.4 Groundwater-Surface Water Interaction

Shallow groundwater discharge occurs in an area along Marysville Creek northwest of the landfill. As a result, groundwater quality may influence surface water chemistry.

As noted in Section 3.1 above, water levels in shallow and intermediate bedrock wells will be monitored to continue to observe and evaluate groundwater flow directions and hydraulic gradients in the vicinity of Marysville Creek.

Surface water downstream from the area of groundwater discharge in the central area of the CAZ will be monitored to assess the water quality of the groundwater discharge to surface water, and assess any potential impacts to surface water along the local water course.

4.2.5 Review of Surface Water Monitoring Program

The surface water monitoring program will be re-evaluated every year to ensure the program remains effective and comprehensive. Recommendations for revisions will be developed if appropriate and submitted to the MECP Kingston District Office for review and concurrence.

5. LEACHATE MONITORING PROGRAM

Considerable information has been gathered on the quality of leachate that is generated at the WM Richmond Landfill. This understanding of leachate quality has allowed the selection of Site-specific indicator parameters that are used to monitor the groundwater and surface water environments. Leachate monitoring will continue during the post-closure period of the landfill.

5.1 LEACHATE QUALITY MONITORING

The purpose of leachate sampling is to monitor for any changes in the leachate parameter concentrations as the waste in the closed landfill gradually decomposes over time.

5.1.1 Leachate Quality Monitoring Locations

Leachate samples will be collected from the North and South Chambers of the leachate collection system, shown on Figure 4. Sampling ports installed in a pumping station (PS#3) associated with the leachate holding tank will be used for leachate sampling once the system has been commissioned.

5.1.2 Leachate Quality Monitoring Parameters and Sampling Frequency

The leachate samples will be collected from the above locations once every three years (concurrent with calculation of contaminating lifespan) and will be analyzed for the list of parameters specified in Table 10.

Table 10: Leachate Quality Monitoring Parameters

Leachate Inorganic and General Parameters		
Total dissolved solids	Boron	Ammonia (total)
Conductivity	Cadmium	Total Kjeldahl nitrogen
Alkalinity	Chromium (total)	Nitrate
pH	Cobalt	Nitrite
Hardness	Copper	Chloride
Calcium	Iron	Sulphate
Magnesium	Lead	Total phosphorus
Sodium	Manganese	Phenols
Potassium	Nickel	Naphthalene
Biological oxygen demand	Zinc	N-nitrosodimethylamine (NDMA)
Chemical oxygen demand		
Dissolved organic carbon		

Leachate VOC List	
1,4-Dioxane	1,1,2,2-Tetrachloroethane
Benzene	1,1,1,2-Tetrachloroethane
Toluene	1,1,1-Trichloroethane
Ethylbenzene	1,1,2-Trichloroethane
m&p-Xylene	1,1-Dichloroethane
o-Xylene	1,2-Dichloroethane
Styrene	Chloroethane
1,3,5-Trimethylbenzene	1,1-Dichloroethylene
Chlorobenzene	Cis-1,2-Dichloroethylene
1,2-Dichlorobenzene	Trans-1,2-Dichloroethylene
1,3-Dichlorobenzene	Trichloroethylene
1,4-Dichlorobenzene	Tetrachloroethylene
Methylene chloride	Vinyl chloride
Chloromethane	

6. LANDFILL GAS MONITORING PROGRAM

WM has an odour monitoring and abatement program at the closed Site, approved under Condition 8.7 of Amended ECA No. A371203 dated March 19, 2021.

Continuous gas sensors and alarms are installed in all on-Site buildings within 30 metres of the landfill. Buildings that are not vented or equipped with methane detectors are monitored using a portable gas detector, with readings recorded on a quarterly basis. These facilities are, therefore, not included in the landfill gas migration EMP.

The landfill gas collection and flaring system has been taken offline because methane gas generated by the landfill is insufficient to keep the flare lit. Six gas monitoring probes are installed around the perimeter of the landfill (denoted GM1, GM3, GM4-1, GM4-2, GM5 and GM6; see Figure 4) and are included in the EMP. The six gas probes will be monitored annually using a portable combustible gas detector to measure the concentration of methane.

The recorded measurements of landfill gas from the monitoring locations identified above will be compared to the assessment limits shown in Table 11.

Table 11: Landfill Gas Assessment Concentrations

Landfill Gas Probes
Concentrations must be less than 2.5% methane by volume (50% LEL).

7. DATA EVALUATION AND CONTINGENCY PLANS

This section outlines the evaluation methods that will be used if observed concentrations at the groundwater, surface water or landfill gas monitoring locations exceed the Reasonable Use Limits (RULs) and other assessment limits specified above (Tables 6, 9 and 11 for groundwater, surface water and landfill gas, respectively).

7.1 GROUNDWATER EVALUATION METHODS AND TRIGGER MECHANISMS

The groundwater monitoring program is summarized in Table 2. Monitoring wells within the low-head areas of the WM Richmond Landfill, at or proximal to the downgradient boundaries, in both the Shallow Groundwater and Intermediate Bedrock Groundwater Flow Zones will be evaluated following the procedures outlined below. These monitoring wells, denoted trigger wells, are listed in Table 12.

The trigger wells were selected on the basis of their locations in the groundwater flow paths within the hydraulically active flow zones, in a low-head region either in proximity to a downgradient property boundary, or for the trigger wells on the CAZ, immediately downgradient of the known extent of leachate impacts.

Table 12: Summary of Groundwater Trigger Wells

Shallow Flow Zone (see Figure 3(a,b))		Intermediate Bedrock Flow Zone (see Figure 3(c))	
North and West	OW37-*s*	North and West	M56-2‡, M58-3‡, M91-1‡, M95-1‡, M82-2
South	M200	South and Southeast	M177, M179, M185-2, M186, M187, M188-1 and M193

Notes:

‡ denotes a background monitoring well. The chemistry from these wells will be used to determine background water quality; unless increasing concentration trends indicate potential impacts (refer to Section 3.2.1).

Data evaluation for the trigger wells will focus on the list of leachate indicators outlined in Section 3.2.3. The laboratory analytical results obtained from each sampling event will be compared to the RULs derived for the Shallow Groundwater and Intermediate Bedrock Groundwater Flow Zones (Table 6). Any new detection of 1,4-dioxane above the RUL or any new exceedance of the RULs will trigger the evaluation procedures described below. The approach will include a confirmation step whereby observations of concentrations above the compliance limits will be verified through re-sampling. This approach improves the accuracy of the detection monitoring program by eliminating potential false positives from cross-contamination, laboratory error, or other possible causes. For any new exceedances, an intra-well trend analysis will be conducted. This will consist of an examination for significant geochemical trends using the results of the laboratory analyses in time-series graphs and using Piper and Stiff geochemical diagrams, where appropriate. A significant trend will be noted when the inorganic chemistry of a monitor shifts progressively towards the geochemical signature typical of leachate or other potential source for two consecutive monitoring events. A minimum of five baseline events must exist prior to the beginning of the trend evaluation. Following the verification re-sampling procedure, if a geochemical trend is documented, an alternate source evaluation will be completed to ascertain the source of the trend or exceedance.

The specific steps to water quality evaluation and trigger mechanisms are as follows:

Step 1 – Water Quality Conformance Assessment and Confirmation Re-sampling

If there is a documented new exceedance of the groundwater RULs (Table 6), complete a comprehensive water quality assessment within 90 days of receiving the laboratory analysis that indicates an exceedance. The major ion chemistry, VOCs and other tools such as time-series graphs, Piper and Stiff diagrams will be used, as appropriate, with the current and historical monitoring program results to further evaluate any changes in leachate indicator concentrations. If the water quality assessment indicates that leachate may be the source of the observed exceedance and increasing concentrations, proceed to Step 2.

Confirmation sampling will occur within 15 days of the determination of a new RUL exceedance in a groundwater trigger well. If the initial exceedance or trend is verified and the water quality assessment indicates that leachate may be the source, begin accelerated monitoring and proceed to Step 2.

Accelerated monitoring will consist of the following procedure. The monitoring frequency of the monitor(s) with the elevated concentrations is increased to quarterly for one year and groundwater is sampled for all parameters included in the Groundwater Inorganic and General list (Table 3) and VOC list (Table 4).

Step 2 – Alternate Source Evaluation

The geochemical results from the accelerated monitoring program will be used with the interpretative tools described above (time-series graphs, Piper and Stiff diagrams, etc.) to evaluate the source(s) of the observed exceedance or increasing trend in leachate indicator concentration. This will be completed within 90 days of receiving the laboratory analysis from the last quarterly sampling round. If leachate is confirmed as the source, proceed to Step 3. If the source is not confirmed to be leachate, adjust the program if warranted to prevent re-occurrence (i.e., review sampling procedures, re-evaluate limits) and return to routine monitoring.

Step 3 – Development and Implementation of Corrective Action Plan (CAP)

At this point a CAP will be developed, reviewed and approved by the MECP, and implemented to prevent exceedance of groundwater assessment parameter concentrations at the WM property boundary. The CAP will be prepared and submitted to the MECP within 90 days of leachate being identified as the source of water quality exceedances (i.e., 90 days from completion of Step 2).

Data evaluation according to the aforementioned methods will be completed after receipt of results from each monitoring event and submitted as part of the routine reporting.

7.2 Surface Water Evaluation

The applicable objectives for surface water monitoring are based on PWQO for the indicator parameters listed in Table 9. The surface water monitoring locations at the downstream boundaries of the WM Richmond Landfill (S3, S4R and S8R), as well as the downstream sampling location along the unnamed surface water course within the CAZ (S23), will be evaluated as described above for the low-head groundwater monitoring wells. Comparisons will first be made to PWQO and to upstream concentrations. If there are new occurrences of downstream concentrations higher than the PWQO and higher than upstream concentrations, further evaluation will be conducted, as described above for groundwater. This will begin with an assessment of water chemistry using the interpretive tools described above for groundwater (time-series graphs, Piper and Stiff diagrams, etc.). If the water quality assessment indicates that leachate could be a potential source of the observed exceedance and increasing concentrations, the accelerated monitoring program will commence along with Step 2, *Alternate Source Evaluation*. For surface water monitoring, the accelerated monitoring program will take place at a weekly frequency for a maximum of eight weeks, rather than quarterly as described for groundwater monitoring.

7.3 Landfill Gas Evaluation

Landfill gas migration monitoring is completed in subsurface gas probes located around the landfill footprint (GM1 to GM6). If the methane concentration exceeds the criterion listed in Table 11, then the source of the gas will be determined. The steps that will be followed for this process are as follows:

Step 1 – Landfill Gas Assessment

Compare results to criterion in Table 11; if concentration exceeds criterion, report to WM immediately and proceed to Step 2.

Step 2 – Confirmation Monitoring

Conduct another round of monitoring within one week. If the initial exceedance is verified, proceed to Step 3. If unverified, return to routine monitoring. If confirmed, ensure that health and safety procedures are in place through active temporary means until further steps are completed and further data indicate that no problem exists or a permanent solution is put into place.

Step 3 – Alternate Source Evaluation

Conduct investigation to determine the source of the gas within 30 days of the confirmation of the exceedance. If landfill gas is confirmed as the source, proceed to Step 4. If the source is not confirmed to be of landfill origin (in the case of background sources), identify the sources and consider these sources or adjust the program if warranted to prevent re-occurrence (i.e., review sampling procedures, re-assess limits) and return to routine monitoring.

Step 4 – Development and Implementation of Corrective Action Plan (CAP)

At this point a CAP will be developed, reviewed and approved by the MECP, and implemented. The CAP will be prepared and submitted to the MECP within 90 days of the landfill being identified as the source of the gas migration exceedances (i.e., 90 days from completion of Step 3).

7.4 CONTINGENCY PLANS

Contingency plans for leachate, groundwater and surface water are outlined below. Within the scope of this report, contingency plans are defined as general procedures that will be followed to respond to potential future environmental impacts associated with the closed WM Richmond Landfill. These plans typically include assessing the scope of a potential problem, additional investigation to determine the precise extent of a problem, assessing the feasibility of implementing potential remedial alternatives ("contingency measures") and the installation of any additional engineered facilities not originally part of the landfill design, or the implementation of other mitigative action.

A flow chart illustrating the process of implementing a Contingency Plan is presented on Figure 5. Contingency plans would be implemented as part of Step 4 of the Data Evaluation procedures as described above in Section 7.0. Note that the contingency plans for landfill gas are beyond the scope of this document, and are described in the report entitled *"Richmond Sanitary Landfill Site – Landfill Gas Collection System Contingency Plan"*, prepared by Genivar Inc., dated June 25, 2010.

Brief descriptions of the contingency measures that potentially could be implemented as part of the Contingency Plans are provided below.

7.4.1 Leachate Contingency Plan

This section deals with a contingency plan for leachate breakout or seepage from the closed landfill toe or side slopes. Additional information regarding the contingency plan for the leachate collection system is presented in the report entitled *"Richmond Sanitary Landfill Site – Leachate Collection System Contingency Plan"*, prepared by Genivar Inc.

The main concerns associated with potential leachate impacts include visible breakouts or seepage through the final cap of the closed landfill. Inspection, maintenance and monitoring programs will continue during the post-closure period, and will assist WM in detecting any future leachate break-outs or seepage faces. The proposed contingency to address these failures is to repair the seepage locations as required.

Typical approaches to repair areas of leachate break-out involve excavating into the waste and backfilling with clear stone to improve drainage, or drilling into the waste to promote vertical drainage. In some situations, subsurface drainage (French drains) can be installed along the landfill slope to promote drainage to the leachate collection system. The final clay cap is then placed and re-compacted over the repaired area.

7.4.2 Groundwater Contingency Plan

Groundwater monitoring programs will continue during the post-closure period, with the data evaluation methods and trigger mechanisms in place, as described in Section 7.1. In the event it is necessary, the planned contingency for addressing groundwater impacts will be to first evaluate the degree of impact (in consultation with the MECP District Office) and the need to carry out additional subsurface investigation, as per Step 2 of the Groundwater Data Evaluation Method (Section 7.1).

The results of any additional investigations will be used to determine the extent of off-Site migration and to develop a Corrective Action Plan (CAP), as described in Step 3 of the Groundwater Data Evaluation Method (Section 7.1). Following approval of the CAP by MECP, a comparative evaluation of various remedial alternatives will be completed. This will include an assessment of the feasibility of implementing various remedial alternatives. The remedial alternatives, or "contingency measures", will be evaluated on the basis of several criteria, such as:

- Technical feasibility in a fractured bedrock context;
- Potential advantages and disadvantages;
- Effectiveness in achieving remedial objectives;
- Implementation time and scheduling constraints; and
- Required resources and costs (capital, O&M, etc.).

Potential remedial activities to be implemented, also known as contingency measures will depend on the scope and extent of groundwater impacts. For example, impacts to the Shallow Groundwater Zone may be addressed using different contingency measures than impacts to the Intermediate Bedrock Zone. Also, localized impacts of limited scope (e.g., shallow chlorinated aliphatic hydrocarbons from a well-defined source) may be managed differently than extensive impacts from a broad range of parameters.

The selected remedial approach will represent the most viable technical and economic option.

7.4.3 Surface Water Contingency Plan

The main concerns associated with potential surface water impacts relate to the discharge of leachate from surface seeps or the discharge of shallow impacted groundwater into Beechwood Ditch or Marysville Creek. Routine visual inspections and surface water sampling will be carried out to identify leachate seeps, characterize the surface water chemistry at the discharge locations in relation to background chemistry, and determine if contingency measures are warranted. The data evaluation methods and trigger mechanisms for contingency action are described in Section 7.2.

The planned contingency measure for potential non-groundwater impact will be to divert leachate-impacted water from entering the surface water receptor (Marysville Creek or Beechwood Ditch), and to repair any leachate seeps or areas of break-out. The diverted impacted water will be collected in one of the on-Site stormwater management ponds where it will be contained for treatment and disposal. Treatment of the impacted water is available at the Town of Greater Napanee wastewater treatment plant, subject to the discharge agreement with Waste Management. While this contingency measure is in place, the feasibility of on-Site treatment and polishing of surface water discharge will be investigated. Any shallow impacted groundwater that is contributing to the need for contingency action will be addressed as described above in Section 7.4.2.

The current status of contingency plans will be reviewed as required. Proposed contingency actions will be implemented if necessary, in consultation with the MECP District Office.

8. REPORTING REQUIREMENTS

Reporting requirements related to the environmental monitoring program are specified in ECA No. A371203. Proposed updates to the reporting requirements for this Environmental Monitoring Program are outlined below.

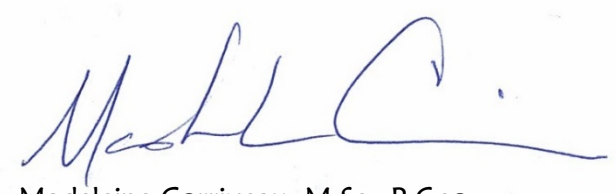
8.1 ANNUAL MONITORING REPORT

A report describing the results of the monitoring program for the preceding period is to be prepared on an annual basis, and submitted to the MECP District Office by February 15 (when sampling is in the fall) or August 15 (on years when sampling in the spring). The report is also to be posted on a publicly accessible website. The report is to include the components outlined in Condition 14.1 of Notice No. 1 of ECA No. A371203. The recommended components of the annual reports are listed below:

a) The results in tabular form and an interpretive analysis of the results from the leachate, groundwater, surface water, and landfill gas monitoring programs approved by the ECA, including:
   i. an assessment of the need to amend the monitoring programs;
   ii. an evaluation of any observations of saline upwelling in the groundwater;
   iii. an estimation of the leachate generated at the Site;
   iv. an evaluation of leachate quality, levels, and mounding within the landfill;
   v. figure(s) showing the landfill Site and contaminant attenuation zone;
   vi. figures delineating the extents of impacted groundwater (1-4 dioxane exceeding the RUL) in the shallow and intermediate bedrock aquifers;
   vii. figure(s) showing the off-Site properties suspected or confirmed of being impacted by leachate from the landfill;
   viii. a complete inventory of the groundwater monitoring well locations;
   ix. detailed analysis on groundwater quality trends on downgradient groundwater wells which have been impacted or are suspected of being impacted by leachate from the landfill; and
   x. trend analysis for leachate indicator parameters in surface water.
b) An assessment with regards to the compliance of the groundwater quality at the property boundary and compliance points with regards to Guideline B-7 Reasonable Use Concept;
c) A report on the status of any monitoring wells required to be tested pursuant to the EMP and a statement as whether those wells are in compliance with Ontario Regulation 903;

d) An Annual Summary section which describes the results from the current calendar year and notable data quality changes identified from previous years, or through the current year. The Annual Summary section will also include a listing and summary of any hydrogeologic investigations carried out during the current calendar year that were beyond the scope of the Environmental Monitoring Plan; and
e) All surface and groundwater analytical results reported in Annual Monitoring Reports shall be reported by groups of substances (i.e. VOCs, PAHs, inorganics, etc.) and by numeric location, and shall be posted by WM on a publicly accessible website, with the data being posted on such website being updated annually.

Report Prepared by:
BluMetric Environmental Inc.



Madeleine Corriveau, M.Sc., P.Geo.
Senior Geoscientist

François Richard, Ph.D. P.Geo.
Senior Hydrogeologist

9. REFERENCES

BluMetric, 2015: *Supporting Document, Application to Amend Environmental Compliance Approval No. A371203*, Waste Management Richmond Landfill Site, prepared by BluMetric Environmental Inc., March 2015

BluMetric 2016a: *Revised Interim Environmental Monitoring Plan v. 05, WM Richmond Landfill, Town of Greater Napanee, Ontario*, BluMetric Environmental Inc., Report dated April 2016.

BluMetric, 2016b: *Site Conceptual Model Update and Contaminant Attenuation Zone Delineation, Waste Management Richmond Landfill Site*, prepared by BluMetric Environmental Inc., Report dated January 2016.

BluMetric, 2016c: *Addendum to Site Conceptual Model Update and Contaminant Attenuation Zone Delineation, Waste Management Richmond Landfill Site*, prepared by BluMetric Environmental Inc., Report dated April 2016.

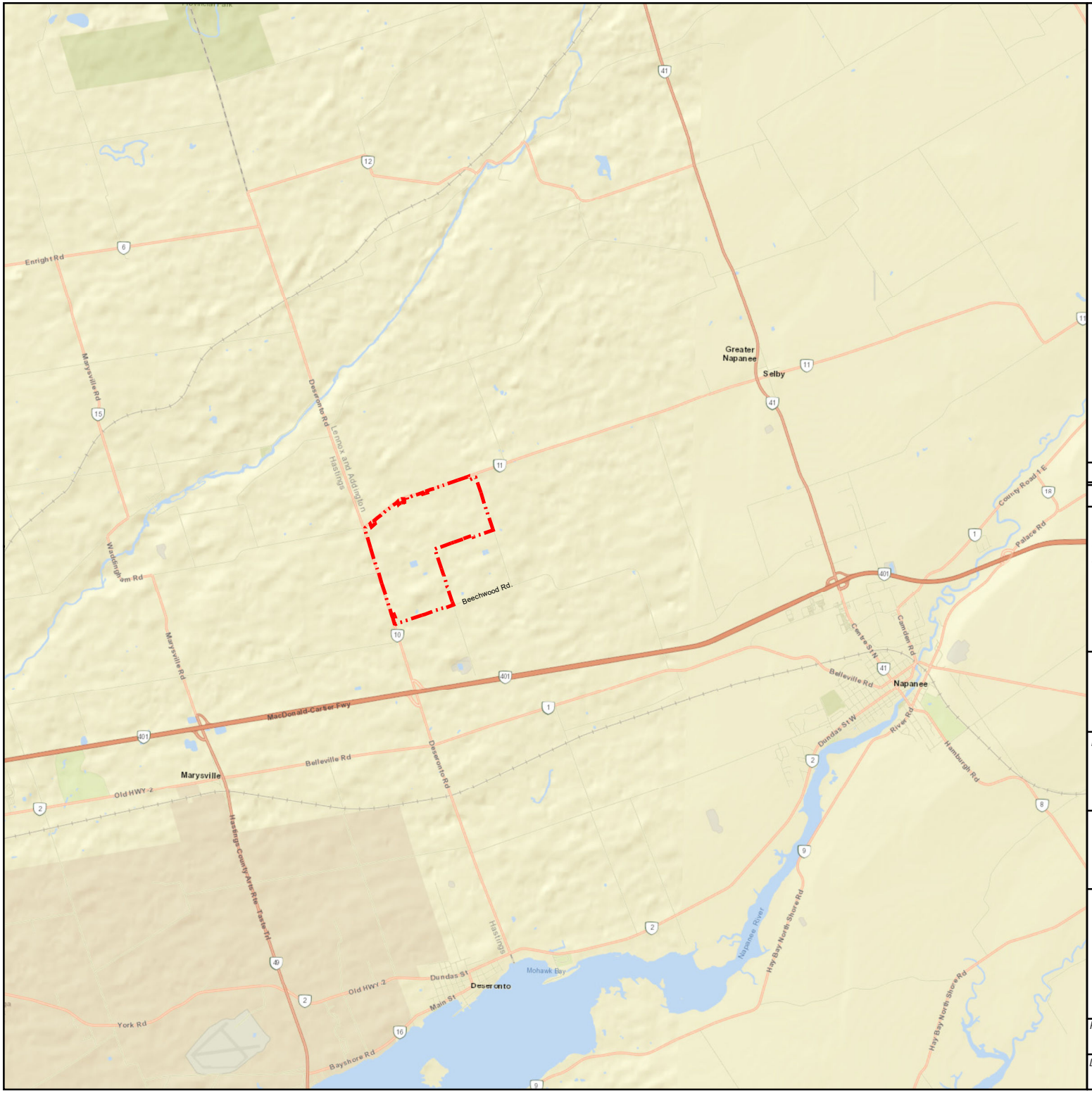
BluMetric, 2017: *Site Conceptual Model Update and Contaminant Attenuation Zone Delineation, Waste Management Richmond Landfill Site*, prepared by BluMetric Environmental Inc., Report dated July 2017.

BluMetric, 2018: *Site Conceptual Model Update and Contaminant Attenuation Zone Delineation, Waste Management Richmond Landfill Site*, prepared by BluMetric Environmental Inc., Report dated October 2018.

BluMetric, 2019: *Addendum to Site Conceptual Model Update and Contaminant Attenuation Zone Delineation, Waste Management Richmond Landfill Site*, prepared by BluMetric Environmental Inc., Report dated May 2019.

BKA and WESA 2009: Site Conceptual Model Report, WM Richmond Landfill, B. Kueper & Assoc. Ltd. and WESA Inc., Report dated October, 2009.

FIGURES



LEGEND

Property Boundary

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REFERENCES

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CLIENT

WM

PROJECT

Waste Management Richmond Landfill Environmental Monitoring Plan

TITLE

Site Location

BluMetric™ Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
210166	**November 22, 2021**

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KG	**FR**	**01**	**0**

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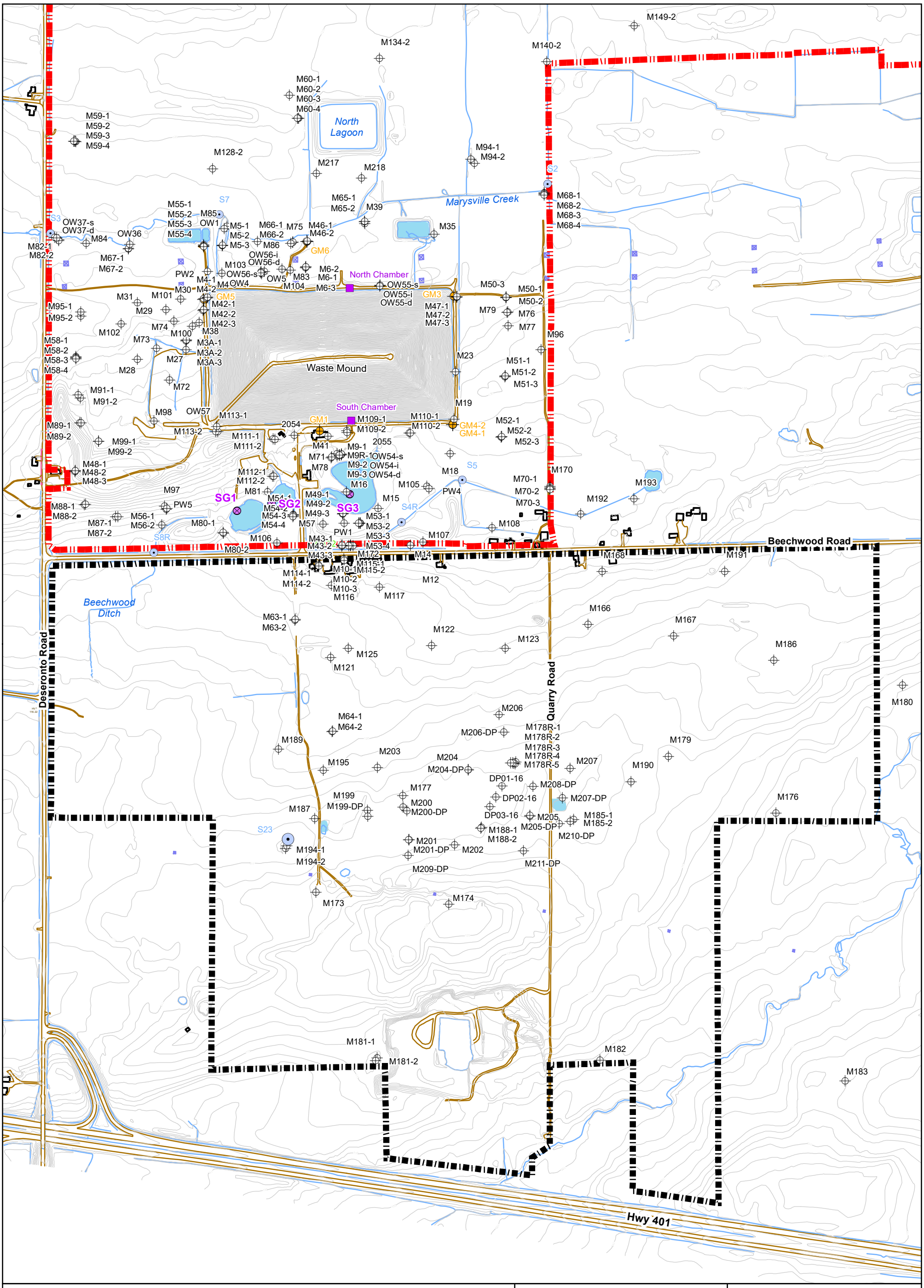

LEGEND

- Topographic Contour Lines
- Surface Water
- Property Boundary
- Contaminant Attenuation Zone
- M35 — Groundwater Monitoring Well
- GM1 — Gas Monitoring Well
- Leachate Sump
- S2 — Surface Water Monitoring Location
- Stream Gauge

REFERENCES

DO NOT SCALE DRAWING.
THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.
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-PROJECTION: UTM NAD83 ZONE 18
-DATA SOURCE: WM CANADA, BLUMETRIC, MNRO, NRCAN

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BluMetric Environmental
The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

CLIENT: WM

PROJECT: WASTE MANAGEMENT RICHMOND LANDFILL ENVIRONMENTAL MONITORING PLAN

TITLE: SITE PLAN

PROJECT #	DATE		
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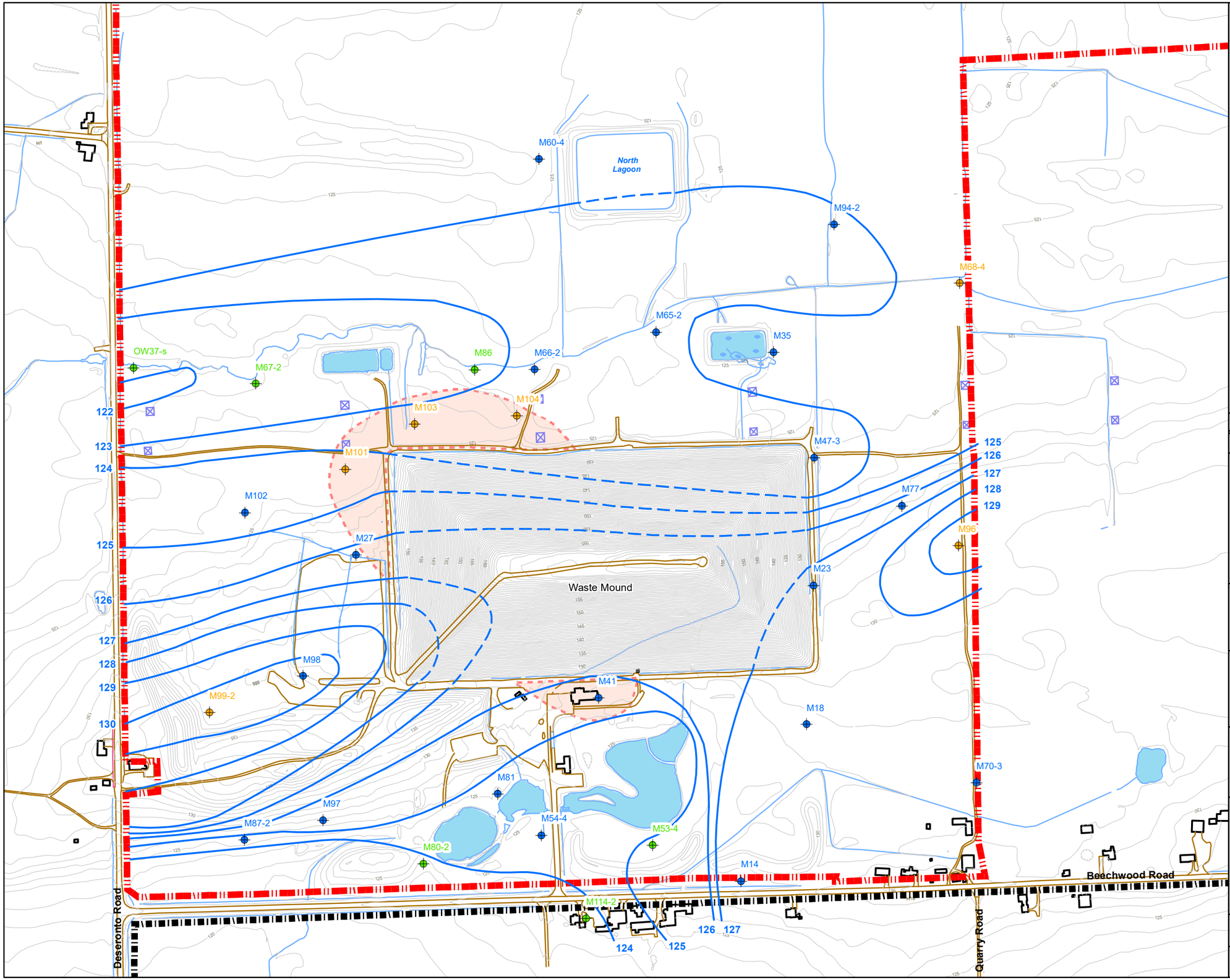

LEGEND

- Monitoring Well - Water level only (not sampled)
- Monitoring Well - Water level and chemistry (annual)
- Monitoring Well - Water level and chemistry (every 3 years)
- Potentiometric Surface (Interpolated)
- Potentiometric Surface (Inferred)
- 1,4 Dioxane Impacted Area
- Topographic Contour Lines
- Surface Water
- Property Boundary
- Contaminant Attenuation Zone

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REFERENCES

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CLIENT

WM

PROJECT

WASTE MANAGEMENT RICHMOND LANDFILL ENVIRONMENTAL MONITORING PLAN

TITLE

Groundwater Monitoring Locations – Shallow Groundwater Flow Zone (North of Beechwood Road)

BluMetric™ Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
210166-05	November 22, 2021

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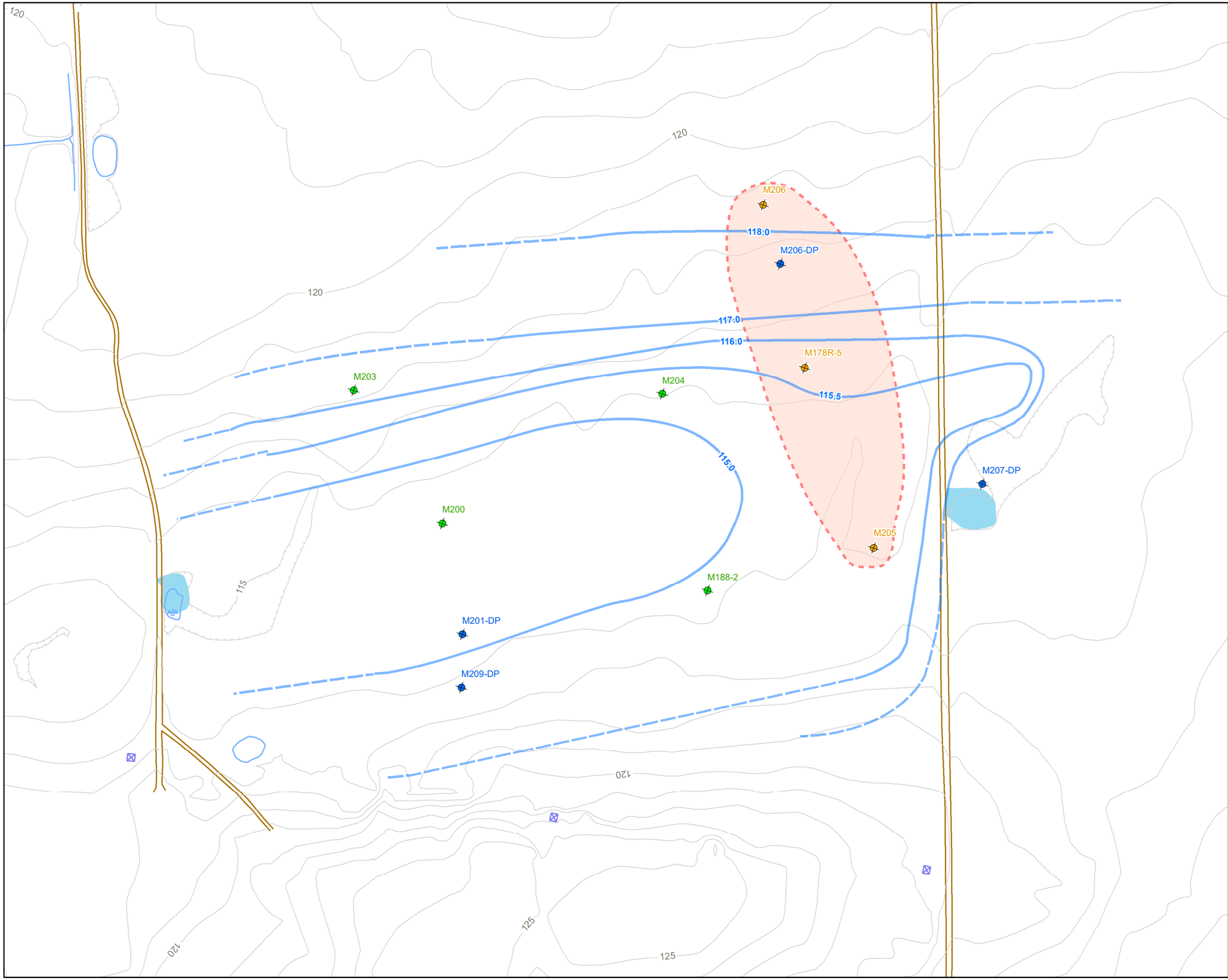

LEGEND

- Monitoring Well - Water level only (not sampled)
- Monitoring Well - Water level and chemistry (annual)
- Monitoring Well - Water level and chemistry (every 3 years)
- Potentiometric Surface (Interpolated)
- Potentiometric Surface (Inferred)
- Extents of 1,4 Dioxane Impacted Area
- Topographic Contour Lines
- Surface Water

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REFERENCES

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CLIENT

PROJECT

WASTE MANAGEMENT RICHMOND LANDFILL ENVIRONMENTAL MONITORING PLAN

TITLE

Monitoring Locations – Shallow Groundwater Flow Zone (Central CAZ)

BluMetric™ Environmental
The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
210166-05	November 22, 2021

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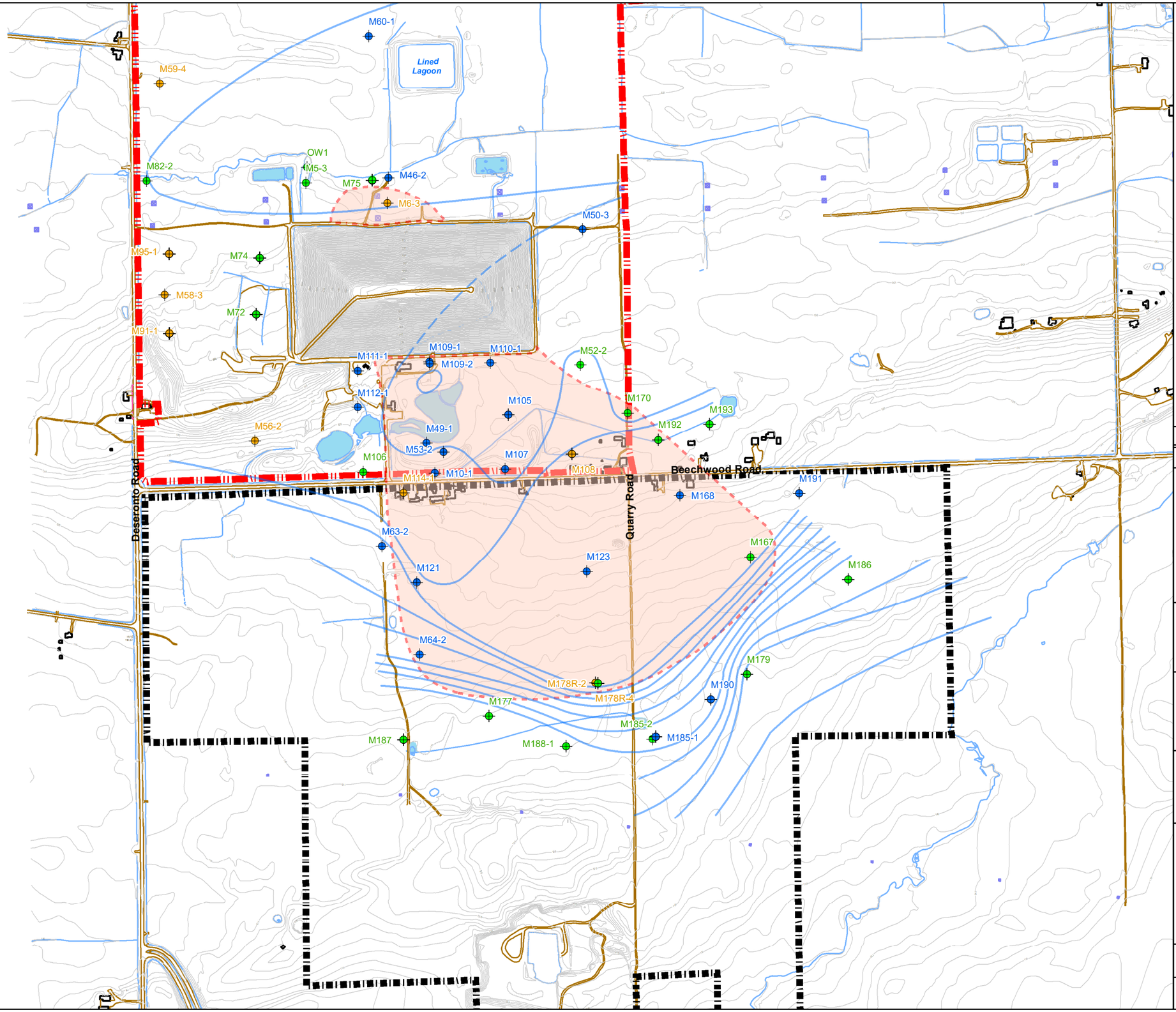

LEGEND

- Monitoring Well - Water level only (not sampled)
- Monitoring Well - Water level and chemistry (annual)
- Monitoring Well - Water level and chemistry (every 3 years)
- Potentiometric Surface (Inferred)
- Potentiometric Surface (Interpolated)
- 1,4 Dioxane Impacted Area
- Topographic Contour Lines
- Surface Water
- Property Boundary
- Contaminant Attenuation Zone

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REFERENCES

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Metres
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CLIENT

WM

PROJECT

WASTE MANAGEMENT RICHMOND LANDFILL ENVIRONMENTAL MONITORING PLAN

TITLE

Monitoring Locations – Intermediate Groundwater Flow Zone

BluMetric™ Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

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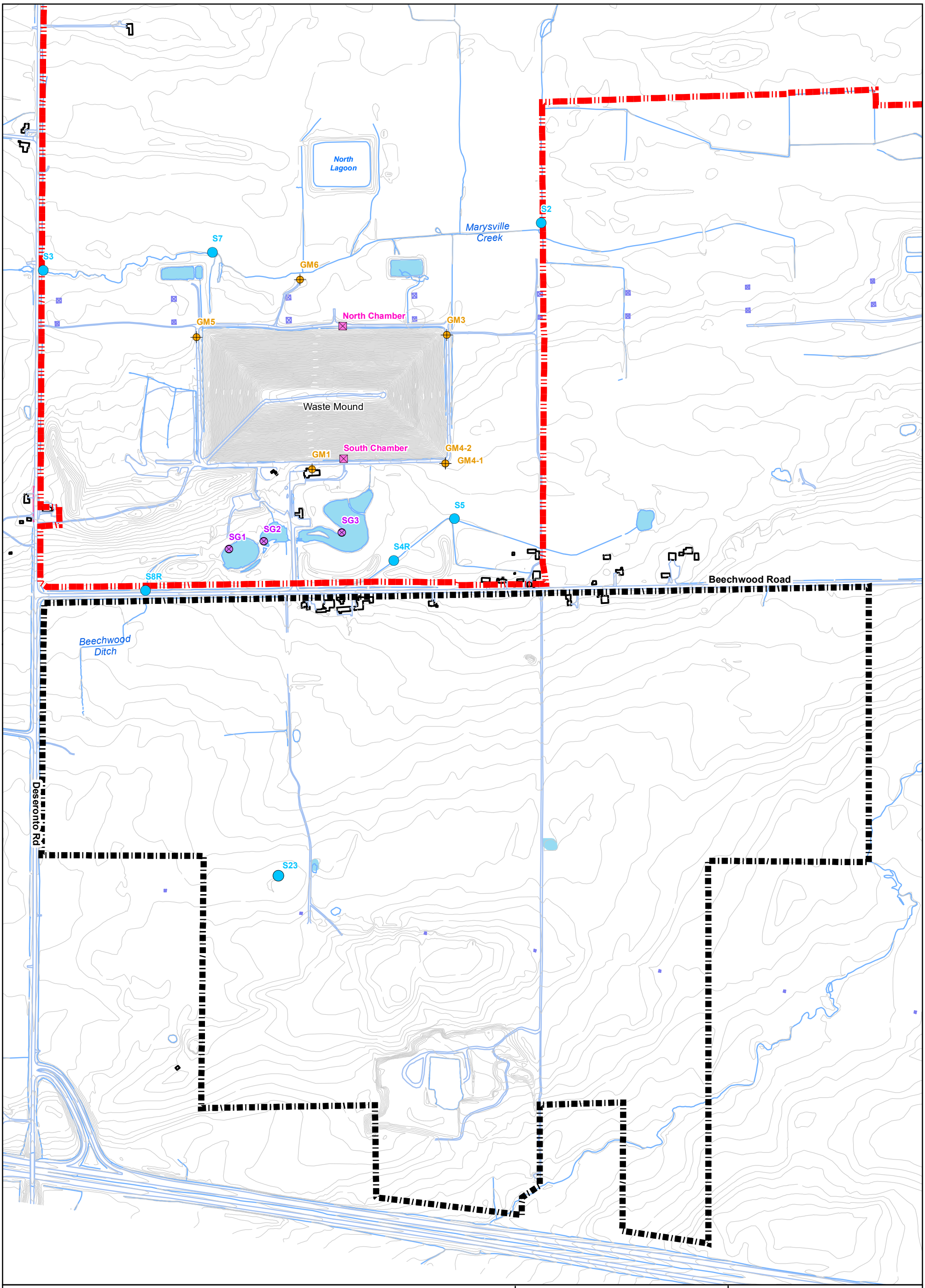

LEGEND

M100 Gas Monitoring Well

Leachate Monitoring Location

S2 Surface Water Monitoring Location

Stream Gauge

Topographic Contour Lines

Surface Water

Property Boundary

Contaminant Attenuation Zone

REFERENCES

THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.
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0 50 100 200 300 400
Meters

1:8,000

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Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
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Web: http://www.blumetric.ca

CLIENT

WM

PROJECT

WASTE MANAGEMENT RICHMOND LANDFILL ENVIRONMENTAL MONITORING PLAN

TITLE

SURFACE WATER, LEACHATE AND LANDFILL GAS MONITORING LOCATIONS

PROJECT #	DATE
210166-05	November 22, 2021

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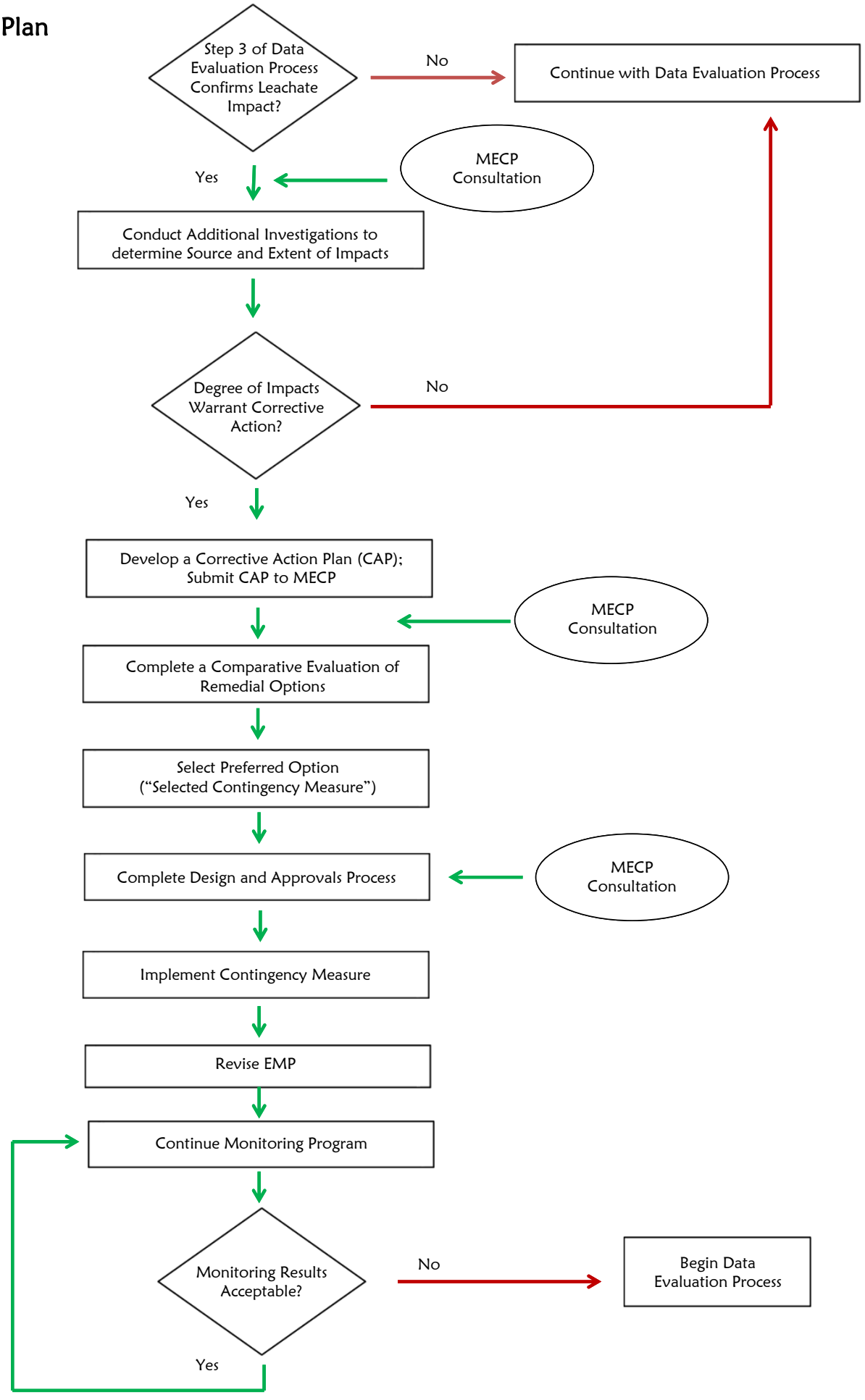
210166-05

Figure 5: Contingency Plan Process



APPENDIX A

Post-Closure EMP Monitoring Well Construction Details

Waste Management Richmond Landfill

Post-Closure EMP Monitoring Well Construction Details

Monitoring Well Location	Easting	Northing	Dip Angle	Date Drilled	Monitor Type	Reference Elevation (masl)	Ground Elevation (masl)	Bedrock Elevation (masl)	Overburden Thickness (m)	Monitored Interval		
										Top Elevation (masl)	Bottom Elevation (masl)	Mid-Point Elevation (masl)
Shallow Groundwater Flow Zone												
M14	335625	4902637	90	04-Jun-91	Single Screen	127.71	127.38	124.59	2.79	125.08	124.68	124.88
M18	335648	4902866	90	05-Jun-91	Single Screen	128.32	127.81	126.34	1.47	126.81	126.51	126.66
M23	335602	4903049	90	05-Jun-91	Single Screen	128.48	127.82	123.45	4.37	124.22	123.42	123.82
M27	334997	4902908	90	19-Jun-91	Single Screen	127.85	127.16	122.13	5.03	122.86	122.26	122.56
M35	335458	4903336	90	18-Jun-91	Single Screen	124.83	124.49	122.89	1.60	123.20	122.89	123.04
M41	335368	4902818	90	21-Jun-91	Single Screen	127.22	126.68	121.78	4.90	122.09	121.78	121.94
M47-3	335552	4903215	90	n/a	Multilevel	127.74	126.82	121.82	5.00	123.82	121.82	122.82
M53-4	335496	4902649	90	17-Feb-98	Single Screen	126.69	125.89	123.91	1.98	124.39	124.09	124.24
M54-4	335348	4902618	90	18-Feb-98	Single Screen	125.71	124.06	119.95	4.11	122.08	120.56	121.32
M60-4	335077	4903494	90	17-Mar-98	Single Screen	126.71	125.87	122.67	3.20	124.07	121.87	122.97
M65-2	335298	4903316	90	29-May-98	Multilevel	124.41	123.83	122.03	1.80	120.58	119.23	119.91
M66-2	335155	4903219	90	29-May-98	Multilevel	124.41	123.54	122.04	1.50	122.24	121.54	121.89
M67-2	334799	4903090	90	01-Jun-98	Multilevel	123.81	123.11	121.61	1.50	121.61	120.91	121.26
M68-4	335672	4903499	90	03-Jun-98	Single Screen	125.24	124.43	122.30	2.13	124.43	122.93	123.68
M70-3	335891	4902858	90	29-Jun-98	Single Screen	128.26	127.12	124.68	2.44	126.12	125.82	125.97
M77	335685	4903188	60	22-Jun-00	Single Screen	129.22	128.27	123.94	4.33	123.59	121.34	122.47
M80-2	335206	4902534	90	06-Oct-04	Single Screen	125.97	123.34	118.64	4.70	119.77	116.74	118.25
M81	335275	4902654	90	06-Oct-04	Single Screen	125.90	125.05	120.05	5.00	121.30	118.24	119.77
M86	335077	4903195	90	08-Oct-04	Single Screen	123.99	123.18	122.48	0.70	121.35	119.83	120.59
M87-2	334965	4902495	90	09-Jun-05	Single Screen	126.38	125.29	117.78	7.51	120.72	117.67	119.19
M94-2	335486	4903526	90	24-Oct-06	Single Screen	125.05	124.31	122.18	2.13	120.95	117.90	119.42
M96	335774	4903158	90	26-May-08	Single Screen	130.59	129.61	125.40	4.21	126.87	122.29	124.58
M97	335059	4902551	90	26-May-08	Single Screen	127.55	126.65	118.42	8.23	119.95	115.38	117.66
M98	334976	4902730	90	27-May-08	Single Screen	131.13	130.23	120.78	9.45	122.30	117.73	120.01
M99-2	334869	4902646	90	04-Jun-08	Single Screen	131.37	130.51	120.76	9.75	122.21	117.63	119.92
M101	334949	4903015	90	28-May-08	Single Screen	125.30	124.35	122.03	2.32	122.37	119.02	120.69
M102	334836	4902919	90	28-May-08	Single Screen	125.52	124.72	122.03	2.68	122.69	119.03	120.86
M103	335021	4903101	90	17-Jun-08	Single Screen	125.30	124.42	122.31	2.10	122.59	119.54	121.06
M104	335150	4903152	90	17-Jun-08	Single Screen	124.46	123.57	122.05	1.52	122.20	119.15	120.68
M114-2	335439	4902528	90	10-Feb-11	Single Screen	125.36	124.41	122.41	2.00	123.34	122.12	122.73
M178R-5	335997	4902232	90	14-Nov-16	Single Screen	117.33	116.49	114.74	1.75	115.27	114.05	114.66
M188-2	335978	4902068	90	14-Nov-16	Single Screen	116.53	115.71	115.18	0.53	114.19	112.36	113.28
M200	335793	4902059	90	17-Apr-18	Single Screen	116.02	115.40	114.97	0.43	113.58	112.05	112.81
M201-DP	335828	4901991	90	18-Apr-18	Drive Point Piezometer	116.20	115.21	113.52	1.69	114.18	113.72	113.95
M203	335709	4902128	90	18-Apr-18	Single Screen	118.91	118.18	117.11	1.07	116.66	115.13	115.90
M204	335910	4902186	90	17-Apr-18	Single Screen	116.92	116.06	114.54	1.52	113.01	111.49	112.25
M205	336077	4902128	90	17-Apr-18	Single Screen	116.58	115.83	114.92	0.91	113.85	112.32	113.08
M206	335938	4902329	90	17-Apr-18	Single Screen	119.70	118.89	117.98	0.91	117.21	115.69	116.45
M206-DP	335961	4902294	90	24-Apr-18	Drive Point Piezometer	118.95	117.79	116.35	1.44	117.01	116.55	116.78
M207-DP	336135	4902191	90	24-Apr-18	Drive Point Piezometer	117.71	116.36	115.22	1.14	115.88	115.42	115.65
M209-DP	335838	4901957	90	04-May-18	Drive Point Piezometer	117.38	116.20	113.66	2.54	114.32	113.86	114.09
OW37-s	334634	4903062	90	29-Jan-78	Open Borehole	122.93	121.89	120.49	1.40	120.19	118.84	119.51

Waste Management Richmond Landfill

Post-Closure EMP Monitoring Well Construction Details

Monitoring Well Location	Easting	Northing	Dip Angle	Date Drilled	Monitor Type	Reference Elevation (masl)	Ground Elevation (masl)	Bedrock Elevation (masl)	Overburden Thickness (m)	Monitored Interval		
										Top Elevation (masl)	Bottom Elevation (masl)	Mid-Point Elevation (masl)
Intermediate Bedrock Groundwater Flow Zone												
M5-3	335003	4903163	90	12-Mar-91	Multilevel	124.02	123.20	122.44	0.76	117.20	115.70	116.45
M6-3	335201	4903174	90	08-Mar-91	Multilevel	124.39	123.73	122.23	1.50	118.73	117.23	117.98
M10-1	335494	4902596	90	18-Mar-91	Multilevel	127.04	126.47	123.47	3.00	98.47	96.27	97.37
M46-2	335185	4903232	90	n/a	Multilevel	125.03	123.96	123.66	0.30	117.66	116.16	116.91
M49-1	335454	4902658	90	26-Aug-96	Multilevel	125.75	125.47	122.77	2.70	99.97	98.37	99.17
M50-3	335660	4903248	90	26-Aug-96	Multilevel	125.85	125.25	122.00	3.25	116.25	114.75	115.50
M52-2	335748	4902940	90	27-Aug-96	Multilevel	129.36	128.78	126.88	1.90	115.98	114.78	115.38
M53-2	335499	4902650	90	17-Feb-98	Single Screen	126.70	125.89	123.91	1.98	98.94	95.89	97.42
M56-2	335065	4902545	90	23-Nov-05	Single Screen	127.15	126.12	118.20	7.92	112.32	109.32	110.82
M58-3	334761	4902812	90	18-Mar-98	Single Screen	126.04	125.32	121.21	4.11	116.32	113.32	114.82
M59-4	334604	4903287	90	19-Mar-98	Single Screen	125.13	124.63	124.02	0.61	117.63	115.43	116.53
M60-1	335044	4903538	60	17-Mar-98	Single Screen	125.70	124.71	122.82	1.89	98.30	96.13	97.21
M63-2	335425	4902394	90	02-Apr-98	Multilevel	122.61	121.71	119.81	1.90	113.71	111.71	112.71
M64-2	335585	4902176	90	07-Apr-98	Multilevel	121.60	120.95	120.05	0.90	112.45	109.95	111.20
M72	334981	4902831	60	15-Jun-00	Single Screen	129.22	128.39	122.50	5.89	112.37	110.20	111.29
M74	334950	4902962	60	19-Jun-00	Single Screen	126.13	125.04	121.92	3.12	117.68	115.51	116.60
M75	335151	4903215	60	21-Jun-00	Single Screen	124.44	123.57	122.53	1.04	118.98	116.64	117.81
M82-2	334641	4903058	90	06-Oct-04	Single Screen	123.19	122.33	121.13	1.20	117.33	114.33	115.83
M91-1	334798	4902729	60	25-Sep-06	Single Screen	130.40	129.80	121.45	8.35	109.80	107.15	108.47
M95-1	334743	4902908	60	04-Oct-06	Single Screen	124.13	123.42	122.11	1.31	108.91	106.26	107.59
M105	335620	4902778	90	30-Mar-09	Single Screen	127.48	126.81	125.21	1.60	109.50	106.15	107.83
M106	335331	4902549	90	16-Aug-10	Single Screen	124.73	124.03	119.61	4.42	100.35	97.00	98.67
M107	335650	4902654	90	17-Aug-10	Single Screen	128.71	127.98	124.32	3.66	103.11	99.76	101.44
M108	335791	4902733	90	19-Aug-10	Single Screen	128.39	127.69	125.31	2.38	103.40	100.05	101.73
M109-1	335405	4902844	90	03-Feb-11	Single Screen	127.42	126.62	122.40	4.22	108.52	105.62	107.07
M109-2	335407	4902840	90	11-Mar-11	Single Screen	127.49	126.72	122.19	4.53	117.03	113.68	115.35
M110-1	335543	4902883	90	07-Feb-11	Single Screen	127.55	126.82	123.80	3.02	107.86	104.82	106.34
M111-1	335250	4902774	90	09-Feb-11	Single Screen	128.95	128.21	120.40	7.81	100.84	97.81	99.33
M112-1	335274	4902692	90	11-Feb-11	Single Screen	126.38	125.65	120.45	5.20	99.63	96.58	98.11
M114-1	335437	4902530	90	23-Feb-11	Single Screen	125.36	124.41	122.50	1.91	97.25	94.21	95.73
M121	335529	4902337	90	17-May-12	Single Screen	121.78	120.97	119.75	1.22	96.99	94.00	95.50
M123	335905	4902479	90	23-May-12	Single Screen	123.60	122.92	122.46	0.46	101.00	97.96	99.48
M167	336266	4902624	90	06-Mar-13	Single Screen	120.68	119.98	119.60	0.38	96.91	94.07	95.49
M168	336063	4902714	90	06-Mar-13	Single Screen	126.29	125.29	124.22	1.07	100.25	97.24	98.74
M170	335889	4902865	90	07-Mar-13	Single Screen	128.21	127.51	125.18	2.33	104.11	101.30	102.70
M177	335784	4902084	90	13-Nov-13	Single Screen	116.60	115.90	115.75	0.15	112.90	109.90	111.40
M178R-2	336008	4902233	90	19-Aug-15	Single Screen	117.51	116.52	114.90	1.62	102.82	96.72	99.77
M178R-4	336002	4902232	90	15-Aug-15	Single Screen	117.34	116.54	114.86	1.68	112.94	111.04	111.99
M179	336338	4902357	90	11-Nov-13	Single Screen	117.67	117.04	116.89	0.15	102.04	99.04	100.54
M185-1	336175	4902152	90	17-Jun-14	Single Screen	117.33	116.57	116.14	0.43	87.57	84.57	86.07
M185-2	336169	4902145	90	28-Aug-14	Single Screen	117.38	116.68	115.99	0.69	103.18	100.18	101.68
M186	336502	4902641	90	17-Jun-14	Single Screen	121.34	120.58	120.38	0.20	111.08	108.08	109.58
M187	335607	4901972	90	27-Jan-15	Single Screen	116.31	115.76	115.25	0.51	90.53	87.53	89.03
M188-1	335979	4902069	90	28-Jan-15	Single Screen	116.37	115.81	115.05	0.76	86.81	83.81	85.31
M190	336274	4902275	90	27-Jan-15	Single Screen	118.00	117.32	116.56	0.76	103.24	100.24	101.74
M191	336332	4902802	90	27-Jan-15	Single Screen	123.31	122.81	121.95	0.86	94.29	91.29	92.79
M192	335976	4902826	90	04-Dec-15	Single Screen	128.09	127.28	125.25	2.03	102.08	99.08	100.58
M193	336082	4902896	90	04-Dec-15	Single Screen	128.13	127.44	123.86	3.58	114.44	111.44	112.94
OW1	334995	4903200	90	01-Jan-78	Single Screen	123.60	122.96	122.66	0.30	117.71	117.21	117.46

APPENDIX B

Groundwater Monitoring Well Logs

morrison beatty limited
consulting engineers and hydrogeologists
4500 dixie road, 12e, mississauga, ontario (416) 624 - 9308

OW1/78

CLIENT Sutcliffe Sanitation Services Ltd. FILE NO. 90-781

PROJECT LANDFILL LOCATION RICHMOND TOWNSHIP

GEOLOGIST/ENGINEER JWW DATE COMPLETED

DESCRIPTION	DEPTH metres	DEPTH feet	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL	REMARKS BLOWS PER FOOT
GROUND ELEVATION122.96							
TOPSOIL: dark brown, clayey,partly organic						C	
	1						
		5				A	
	2						
LIMESTONE: grey,dense							
	3	10				B	
	4						
		15				C	
	5					D	
						E	
	6	20					
E.O.H.							
	7						
		25					
	8						
	9	30					

10 20 30 40 50 60 70 80 90

GS- GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

WL-040281

morrison beatty limited
consulting engineers and hydrogeologists
4500 dixie road, 12e, mississauga, ontario (416) 624 - 9508

OW4/78

CLIENT Sutcliffe Sanitation Services Ltd. FILE NO. 90-781

PROJECT LANDFILL LOCATION RICHMOND TOWNSHIP

GEOLOGIST/ENGINEER JWW DATE COMPLETED

DESCRIPTION	DEPTH metres	DEPTH feet	SAMPLE no.	SAMPLE type	SAMPLE "N"	WELL DETAIL	REMARKS BLOWS PER FOOT 10 20 30 40 50 60 70 80 90
GROUND ELEVATION 123.96							
TILL: light brown, clayey, silt, boulders	1	5				C, A, C	
LIMESTONE: grey, dense	2, 3, 4, 5	10, 15				B, C, D, E	
E.O.H.	6, 7, 8, 9	20, 25, 30					

GS - GRAB SAMPLE SS - SPLIT SPOON ST - SHELBY TUBE "N" BLOWS PER FOOT WATER LEVEL ▽

WL-040281

FIGURE	RECORD OF TEST HOLE	DESIGNATION	COMPLETION DATE
		W 5	March 12, 1991

PROJECT Richmond Township Landfill
PROJECT NO. 2300

DRILLING METHODS Cable Tool
SUPERVISOR J. Meadows
DRILLING CONTRACTOR Jack Knox Well Drilling

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING INTERVAL
0	123.20			Lockable well cap; W5-1, W5-2, W5-3; 0.83m stickup	
	122.44	0.76m CLAY TILL: with silt, gravel & sand			
2		LIMESTONE: blue-grey, fine to medium crystalline, thin to medium bedded with shaly partings		16.5 cm diameter steel casing; bentonite seal 1.5m, 2.5cm I.D., 10 slot PVC screen 5.5m; 8.0m	
4					
6					
8					
		9.75m		2.5cm I.D., PVC Pipe	
10		LIMESTONE: brown-grey, fine to medium crystalline, thin to medium bedded with shaly partings			
12				bentonite seal	
14					
16					
18					
20				19.5m 3m sand pack 3.0m, 2.5cm I.D., 10 slot PVC screen	
22					
24	99.23			24.5m bentonite seal 26.1m	
26					
28				3m sand pack 3.0m, 2.5cm I.D., 10 slot PVC screen	
30	92.60	END OF HOLE at 30.6m			
32					
34					

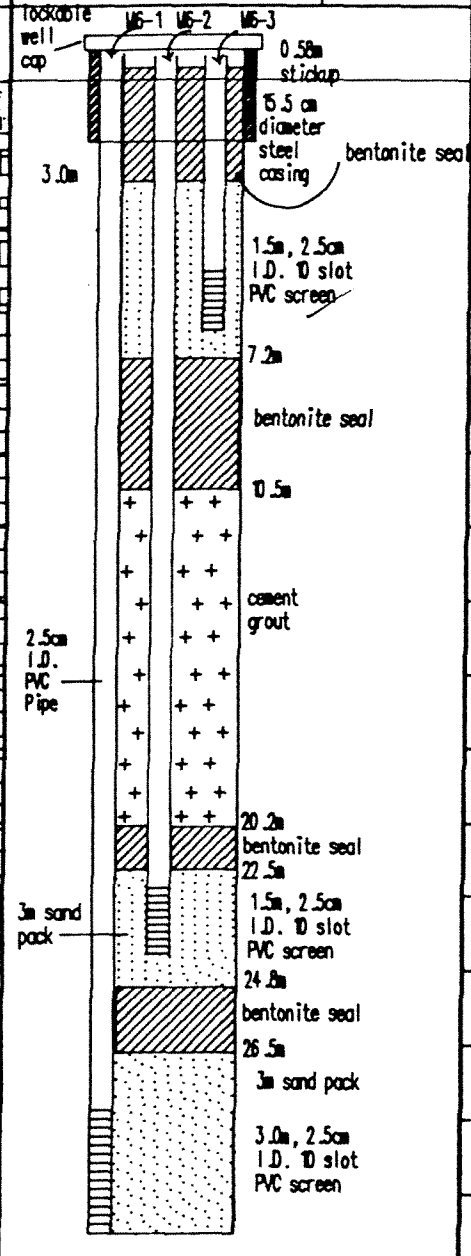
*Measurements in piezometer construction details referenced from ground surface

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE	RECORD OF TEST HOLE	DESIGNATION	COMPLETION DATE
		M 6	March 8, 1991

PROJECT Richmond Township Landfill
PROJECT NO. 2300
DRILLING METHODS Cable Tool
SUPERVISOR
DRILLING CONTRACTOR Jack Knox Well Drilling

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING INTERVAL
0	123.73				
	122.23	CLAY TILL: with silt, gravel & sand 1.5m			
2		LIMESTONE: blue-grey fine to medium crystalline, thin to medium bedded with shaly partings			
4	117.25				
6					
8					
10					
12					
14		Water-bearing fracture at 14.0 m Gas at 14.0 m			
16					
18					
20					
22	99.65				
24					
26					
28					
30					
	93.01	END OF HOLE AT 30.8m			
32					
34					



*Measurements in piezometer construction details referenced from ground surface

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE

RECORD OF TEST HOLE

DESIGNATION: M 10

COMPLETION DATE: March 18, 1991

PROJECT: Richmond Township Landfill

PROJECT NO.: 2300

DRILLING METHODS: Cable Tool

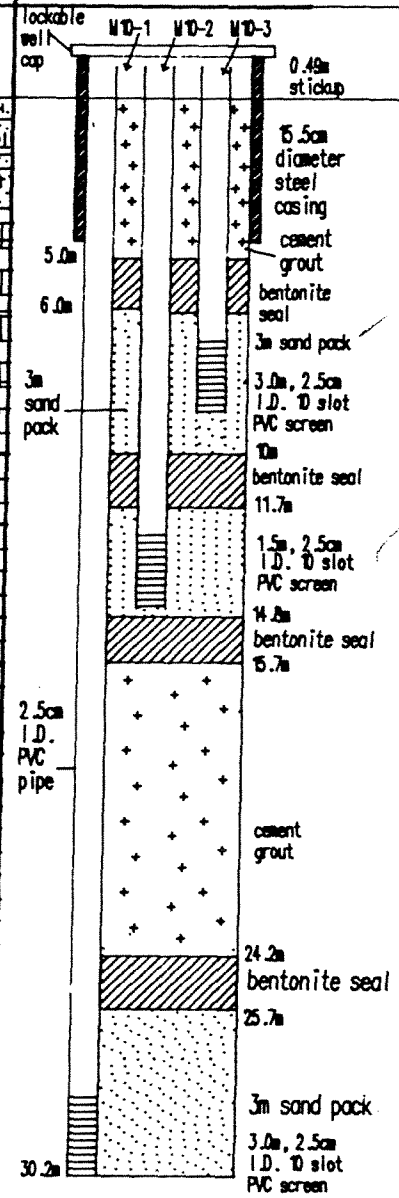
SUPERVISOR: J. Meadows

DRILLING CONTRACTOR: Jack Knox Well Drilling

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY
0	126.47	
2	123.47	CLAY TILL: with silt, gravel & sand with some cobbles
		3.0m
4		LIMESTONE: blue-grey, fine to medium crystalline, thin to medium bedded with shaly partings
6		
8	117.10	
10		
12		
14	112.26	
16		
18		
20		20.1m
22		LIMESTONE: brown-grey fine to medium crystalline, thin to medium bedded with shaly partings
24		
26		
28		
30	96.26	Water-bearing fracture at 29.3m
		END OF HOLE AT 30.2m
32		
34		

LOG

INSTRUMENTATION



SAMPLING

INTERVAL

GS

GS

*Measurements in piezometer construction details referenced from ground surface

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE

RECORD OF TEST HOLE

DESIGNATION: M 14

COMPLETION DATE: June 4, 1991

PROJECT: LAIDLAW - Richmond Township Landfill
PROJECT NO.: 2300

DRILLING METHODS: Hollowstem Auger
SUPERVISOR: R. Winters
DRILLING CONTRACTOR: All-Terrain Drilling

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING TYPE	SAMPLING INTERVAL	N VALUE
0				Locking well cap			
		0 - 0.76: Light brown, sandy SILT TILL with trace of boulders and rounded cobbles		cement grout	G1	0.0 0.31	
					G2	0.31 1.52	
1.0		0.76 - 1.52: Light grey, sandy SILT TILL with trace rounded gravels			SS1	1.52 1.98	
		1.52 - 2.29: Dark brown grey, sandy SILT TILL with some subangular to subrounded boulders & cobbles		bentonite seal	G3	1.98 2.29	
2.0				3m sand pack	G4	2.29 2.82	
		2.29 - 2.82: Buff brown grey, sandy SILT TILL with some subangular to subrounded gravel & cobbles		1" ID, 10 slot screen			
3.0		2.82: Bedrock/Refusal, LIMESTONE					
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							
10.0							
12.0							

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE	**RECORD OF TEST HOLE**	DESIGNATION MW 18	COMPLETION DATE June 5, 1991
PROJECT LAIDLAW - Richmond Township Landfill PROJECT NO. 2300		DRILLING METHODS Hollowstem Auger SUPERVISOR R. Winters DRILLING CONTRACTOR All-Terrain Drilling	

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING TYPE	SAMPLING INTERVAL	SAMPLING N VALUE
0		Surface: Grassed		Locking well cap			
		0 - 0.3m Dark brown sandy silty clay (organic) topsoil		cement grout	GS1	0.0 0.3	
		0.3 - 1.2m Grey/brown silty clay TILL with some sand & a trace of gravel, dry to damp		bentonite seal	GS2	0.3 0.7	
1.0		1.2 - 1.4m Dense, grey/brown silty clay TILL with some sand & gravel dry to damp		3m sand pack	GS3	0.7 1.2	
		1.4m Auger/Refusal		0.3m, 10 slot, 1" I.D. screen	SS1	1.2 1.4	
2.0							
3.0							
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							
10.0							
12.0							

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE

RECORD OF TEST HOLE

DESIGNATION W 23

COMPLETION DATE June 5, 1991

PROJECT LAIDLAW - Richmond Township Landfill

PROJECT NO. 2300

DRILLING METHODS Hollowstem Auger

SUPERVISOR R. Winters

DRILLING CONTRACTOR All-Terrain Drilling

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING TYPE	SAMPLING INTERVAL	N VALUE
0		SURFACE: Grassed		Locking well cap			
		0 - 0.8m - Grey/brown silty CLAY with a trace of sand, dry		cement grout	GS1	0.0 0.3	
1.0		0.8 - 2.0m - Grey silty clay TILL with some sand & gravel, dry		1" I.D. PVC pipe	GS2	0.3 0.76	
2.0		2.0 - 2.3m Grey silty clayey TILL with some gravel (subrounded) dry		Bentonite seal			
		2.3 - 3.0m Grey silty clayey sand TILL with some gravel (subrounded), wet					
3.0		3.0 - 3.5m - Grey sandy silt TILL with some clay and gravel, moist		3m sand pack			
		3.5 - 4.4m - Grey clayey silt TILL with some sand & gravel, very wet at 3.8 - 4.4m					
4.0		4.4m Bedrock/Refusal, LIMESTONE		0.60m, 1" I.D. PVC 10 slot screen			
5.0							
6.0							
7.0							
8.0							
9.0							
10.0							
12.0							

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE	RECORD OF TEST HOLE	DESIGNATION M 27	COMPLETION DATE June 19, 1991
PROJECT LAIDLAW - Richmond Township Landfill PROJECT NO. 2300		DRILLING METHODS Hollowstem Auger SUPERVISOR R. Winters DRILLING CONTRACTOR All-Terrain Drilling	

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING TYPE	SAMPLING INTERVAL	SAMPLING N VALUE
0		SURFACE: Grassed		Locking well cap			
		0 - 0.6m Light brown sand TILL with some gravel and cobbles and a trace of silt		cement grout	GS1	0.0 - 0.6	
1.0		0.6 - 2.0m Grey, silty and TILL with some gravel (rounded), wet, dense		1" I.D. PVC pipe	GS2	0.6 - 1.5	
2.0		2.0 - 3.4m Grey sandy silt TILL with some gravel and cobbles (rounded) and a trace of clay, dense			SS1	1.5 - 2.0	
3.0					GS3	2.0 - 3.0	
				bentonite seal	SS2	3.0 - 3.4	
4.0		3.4 - 4.6m Grey sandy silt TILL with some gravel (rounded), very dense			GS4	3.4 - 4.6	
				3m sand pack			
		4.6 - 5.0m Grey sandy silty TILL with some gravel and cobbles, moist, very dense			SS3	4.6 - 5.0	
5.0		5.0m Bedrock/Refusal: LIMESTONE		0.60m, 1" I.D. 10 slot screen			
6.0							
7.0							
8.0							
9.0							
10.0							
12.0							

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE	**RECORD OF TEST HOLE**	DESIGNATION M 35	COMPLETION DATE June 18, 1991

PROJECT LAIDLAW - Richmond Township Landfill
PROJECT NO. 2300
DRILLING METHODS Hollowstem Auger
SUPERVISOR M. Grinnell
DRILLING CONTRACTOR All-Terrain Drilling

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING TYPE	SAMPLING INTERVAL	N VALUE
0		Ground Surface: Grass		Locking well cap; 0			
	0.15	TOPSOIL: Dark brown, organic silty sand with clay		cement grout	GS1	0.15	
					GS2	0.76	
1.0		Mottled dark greenish grey brown, SILTY CLAY TILL, with trace sands and subrounded gravels. Some organics (rootlets) present. Unit is stiff with high plasticity.		0.93; sand pack; 1.29	SS1		
	1.60				GS3	1.24	
					GS4	1.55	
		1.60m Bedrock/Refusal LIMESTONE				1.60	
2.0							
3.0							
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							
10.0							
12.0							

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE	RECORD OF TEST HOLE	DESIGNATION MW 41	COMPLETION DATE June 21, 1991
PROJECT LAIDLAW - Richmond Township Landfill PROJECT NO. 2300		DRILLING METHODS Hollowstem Auger SUPERVISOR R. Winters DRILLING CONTRACTOR All-Terrain Drilling	

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY & HYDROSTRATIGRAPHY	LOG	INSTRUMENTATION	SAMPLING TYPE	SAMPLING INTERVAL	SAMPLING N VALUE
0		Surface: Granular 'B' gravel fill		Locking well cap			
	0.47	FILL: Sand and angular gravels Gravels have oil staining		cement grout	SS1	0.47	
1.0		FILL: coarse grained gravel with some sand. Unit is damp. Gravel particles are angular, 2.5 to 15cm in dia. Fill is contaminated			GS1		
	1.55				SS2	1.55 2.02	
2.0		Greyish-brown, CLAYEY SILT TILL with some sand and trace subrounded gravels and cobbles. Unit is damp.			GS2		
3.0				3.28 bentonite seal	SS3	3.20 3.57	
4.0				4.19 sand pack	GS3		
				4.59	SS4	4.85	
5.0		4.90m Bedrock/Refusal LIMESTONE					
6.0							
7.0							
8.0							
9.0							
10.0							
12.0							

WATER AND EARTH SCIENCE ASSOCIATES LTD.

FIGURE:

RECORD OF TEST HOLE

DESIGNATION	COMPLETION DATE
M46	

PROJECT: RICHMOND LANDFILL

PROJECT NO.: 3759

DRILLING METHODS: AIR ROTARY

SUPERVISOR: EMMANUEL SAYDEH

DRILLING CONTRACTOR: CHALK DRILLING NAPANEE

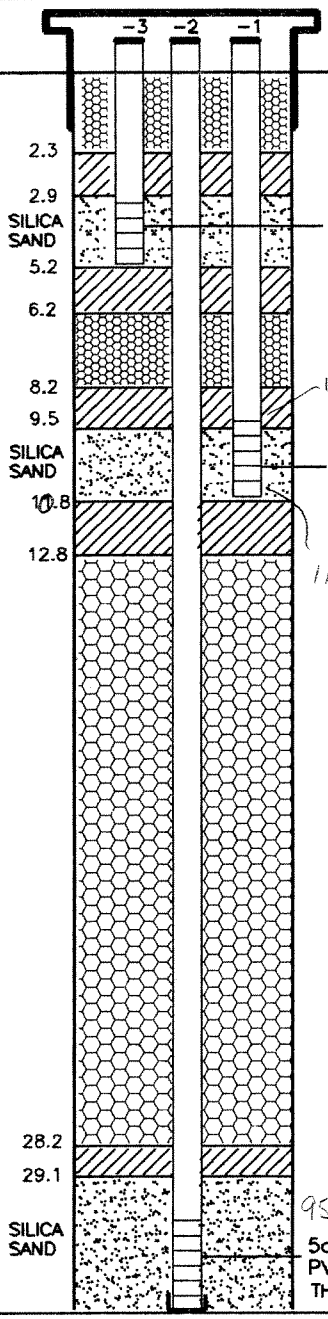
DEPTH METRES	ELEVATION METRES	STRATIGRAPHY	LOG	INSTRUMENTATION	TYPE	INTERVAL	N VALUE
0				.91m CASING STICK-UP			
1				.18m CASING BENTONITE SEAL			
				1.3	CLEAN PEA GRAVEL		
2					BENTONITE		
				2.4			
3					CLEAN PEA GRAVEL		
4							
				4.8			
5					BENTONITE		
6				6.0			
7					SAND		
					1.5m SCREEN		
8				8.2			
					BENTONITE		
9				9.1			
10					CLEAN PEA GRAVEL		
11							
12				12.1			
					BENTONITE		
13				13.4			
14					SAND		
					1.5m SCREEN		
15		15.2			BELL END CAP		
16							
17							
18							
19							
20							

WATER AND EARTH SCIENCE ASSOCIATES LTD.
P.O.BOX 430 CARP, ONTARIO. KOA 1L0

FIGURE:	RECORD OF TEST HOLE	DESIGNATION	COMPLETION DATE
		M47	

PROJECT: RICHMOND LANDFILL
PROJECT NO.: 3759
DRILLING METHODS: AIR ROTARY
SUPERVISOR: EMMANUEL SAYDEH
DRILLING CONTRACTOR: CHALK DRILLING NAPANEE

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY
0	126.82	
		SILTY SAND (BACKFILL) – PEBBLES & COBBLES 1.8 LIGHT BROWN COLOUR
2		SILTY CLAY (BACKFILL) – DARK BROWN – PEBBLES & COBBLES
		3.6
4		SILTY SAND WITH SOME CLAY 4.45 LIGHT BROWN COLOUR – MOIST – SOME WATER
		5.0
6	121.82	BEDROCK – SOFT – LIMESTONE – DARK GREY
8		CASING SET TEMPORARILY @ 5.0m UNTIL HOLE IS INSTRUMENTED – NO GROUT
		10.0
10		10.2 SAND, MEDIUM
		10.3
12		10.8 FRACTURE – <1.0 GPM WATER – LIGHT BROWN COLOUR, SAND
14	▽	
16		SHALE, SOFT – VISIBLE TEXTURAL STRUCTURES I.E. LAMINATION RIPPLE STRUCTURES
18		
20		
22		
24		
26		
28		BEDROCK LIMESTONE – NO WATER
30		
32	93.68	33.14 END OF HOLE
34		– OBSERVED GASES COMING OUT @ WELL HEAD WHEN COMPLETED DRILLING. – DRILL RODS WERE BLACK
36		
38		
40		



INSTRUMENTATION	TYPE	INTERVAL	N VALUE

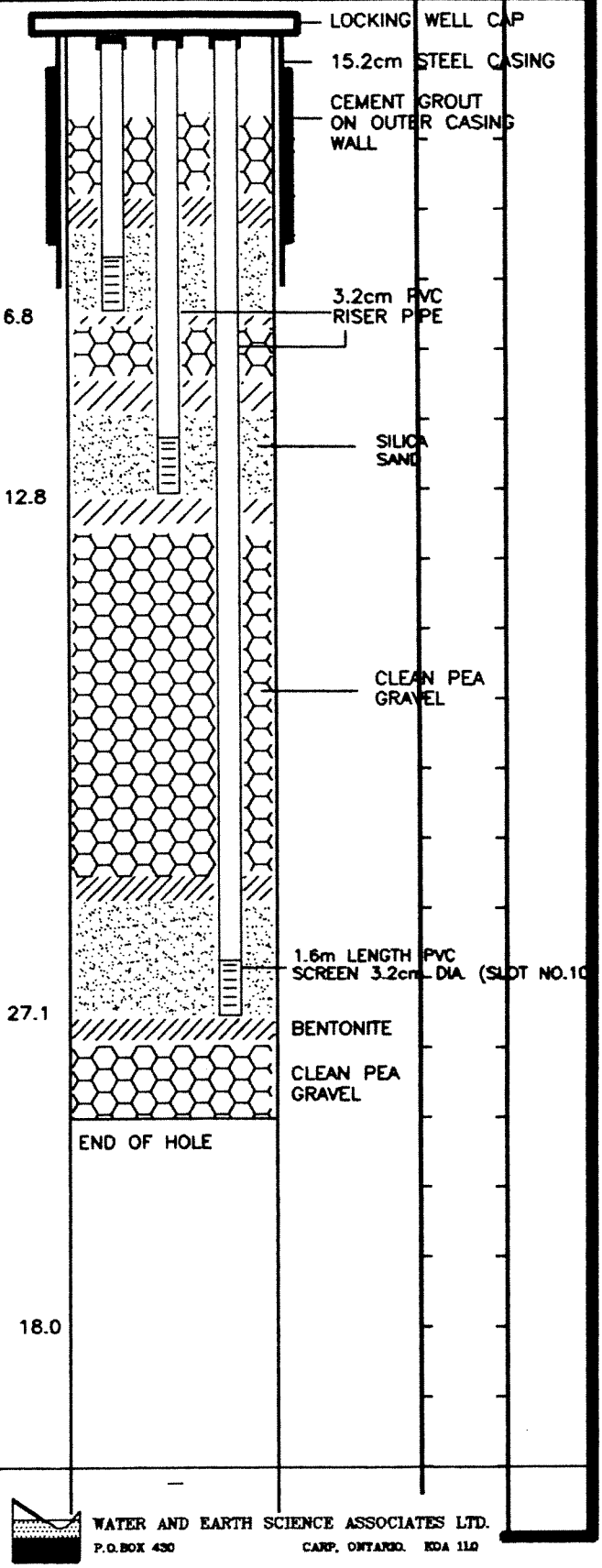
WATER AND EARTH SCIENCE ASSOCIATES LTD.
P.O.BOX 430 CARP, ONTARIO. K0A 1L0

FIGURE:	**RECORD OF TEST HOLE**	DESIGNATION M49	COMPLETION DATE AUGUST 26, 1996
PROJECT:	RICHMOND LANDFILL	DRILLING METHODS:	AIR ROTARY
PROJECT NO.:	A276	SUPERVISOR:	EMMANUEL SAYDEH
		DRILLING CONTRACTOR:	CHALK DRILLING NAPANEE

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY
0		
		SAND AND GRAVEL TILL
2		
		LIMESTONE
4		
		FRACTURE @ 5.80m
6		
8		
10		
12		FRACTURE @11.8m
14		
16		
18		
20		
22		
24		FRACTURE @ 24.0m
		FRACTURE @ 25.9m
26		FRACTURE @ 26.8m
		GROUNDWATER : < 1GPM
28		
		END OF HOLE
30		

LOG

INSTRUMENTATION



TYPE	INTERVAL	N VALUE

WATER AND EARTH SCIENCE ASSOCIATES LTD.
P.O.BOX 430 CARP, ONTARIO. KOA 1LO

FIGURE:

RECORD OF TEST HOLE

DESIGNATION	COMPLETION DATE
M50	AUGUST 26, 1996

PROJECT: RICHMOND LANDFILL

PROJECT NO.: A276

DRILLING METHODS: AIR ROTARY

SUPERVISOR: EMMANUEL SAYDEH

DRILLING CONTRACTOR: CHALK DRILLING NAPANEE

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY	LOG	INSTRUMENTATION	TYPE	INTERVAL	N VALUE
0			~0.6		LOCKING WELL CAP		
		SAND AND GRAVEL TILL			15.2cm STEEL CASING		
2					CEMENT GROUT ON OUTER CASING WALL		
		WEATHERED LIMESTONE/SHALE					
4		LIMESTONE					
6					3.2cm PVC RISER PIPE		
8							
10		FRACTURE ● 9.45m		10.9	SILICA SAND		
12							
14				15.5			
16							
18					CLEAN PEA GRAVEL		
20							
22		FRACTURE ● 21.9m					
24							
26							
		FRACTURE ● 26.5m			1.6m LENGTH PVC SCREEN 3.2cm DIA. (SLOT NO.10		
28				28.0	BENTONITE		
		END OF HOLE					
30					END OF HOLE		
		STRONG ORGANIC ODOUR NOTICED IN GROUNDWATER ● 26.8 m		18.0			

WATER AND EARTH SCIENCE ASSOCIATES LTD.

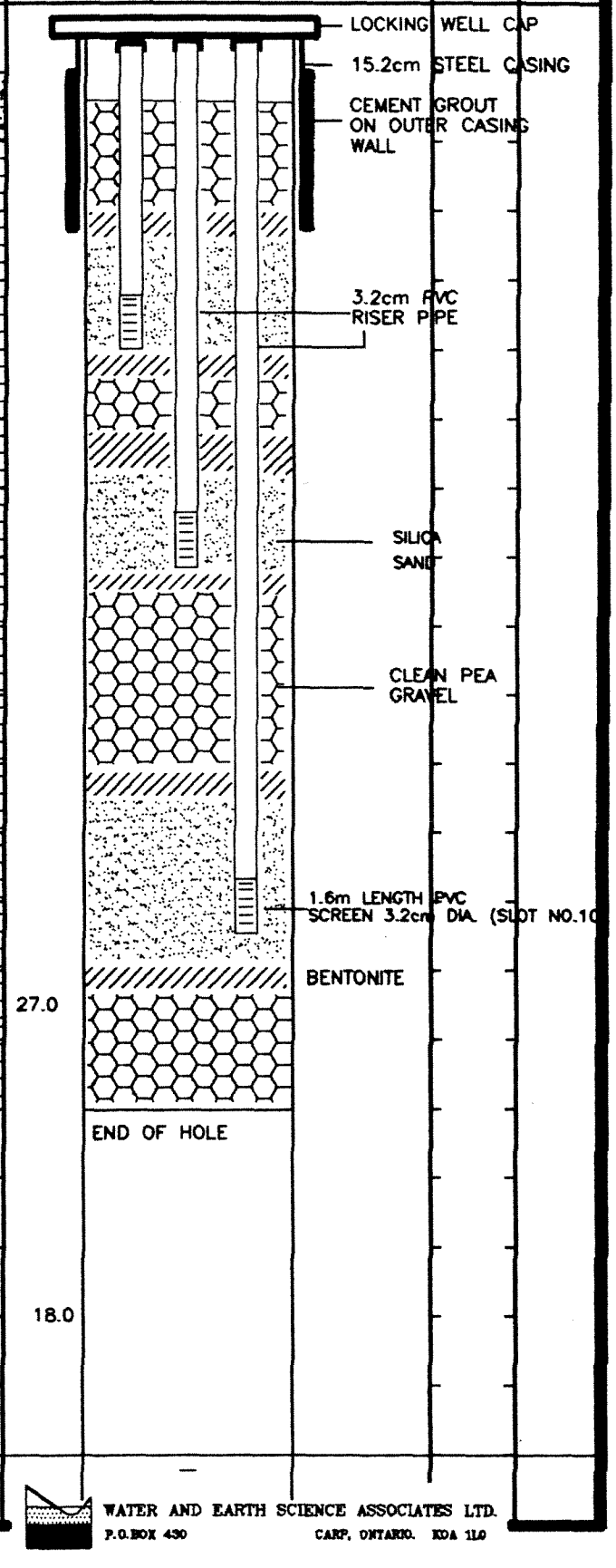
P.O.BOX 430 CARP, ONTARIO. KOA 1L0

FIGURE:	RECORD OF TEST HOLE	DESIGNATION	COMPLETION DATE
		M52	AUGUST 27, 1996
PROJECT:	RICHMOND LANDFILL	DRILLING METHODS:	AIR ROTARY
PROJECT NO.:	A276	SUPERVISOR:	EMMANUEL SAYDEH
		DRILLING CONTRACTOR:	CHALK DRILLING NAPANEE

DEPTH METRES	ELEVATION METRES	STRATIGRAPHY
0		
		SAND AND GRAVEL TILL
2		LIMESTONE
4		
6		FRACTURE @ 6.7m
8		
10		
12		FRACTURE @ 12.8m
14		
16		
18		FRACTURE @ 19.8m
20		
22		
24		FRACTURE @ 24.4m
26		
28		
30		END OF HOLE

NOTES:

NOTICED GAS PRESSURE AT 13.0 m



WATER AND EARTH SCIENCE ASSOCIATES LTD.
P.O.BOX 430 CARP, ONTARIO. KOA 1L0

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Inc.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary / Cable Tool

Well ID: M53

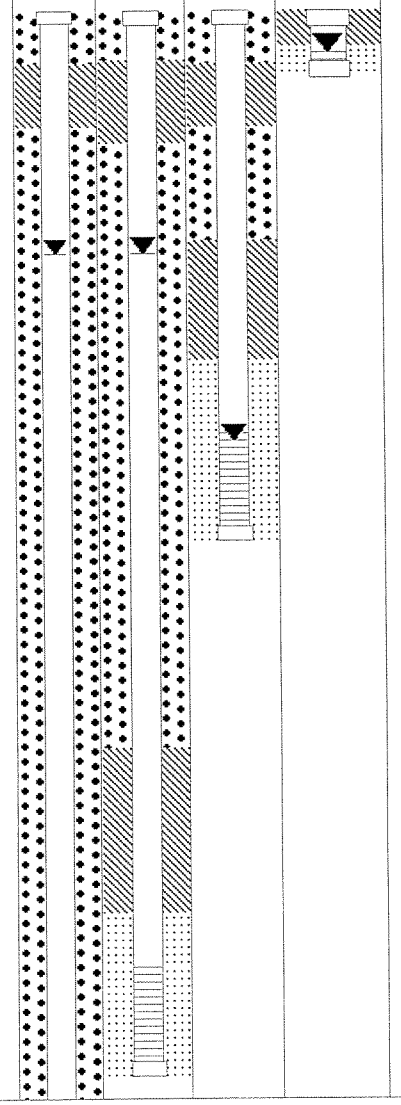
Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Fractures
0		Ground Surface	125.92	
1		***CLAY*** brown		
2		***CLAY TILL*** with gravel and sand, brown	124	
3			123	x
4		***LIMESTONE*** grey	122	
5			121	
6			120	x
7			119	
8			118	
9			117	
10			116	
11			115	
12			114	x
13			113	
14			112	
15			111	
16			110	
17			109	
18			108	x
19			107	x
20			106	
21			105	
22			104	
23			103	
24			102	x
25			101	x
26			100	x
27			99	
28			98	x
29			97	
30			96	
			95	

Well Construction



Comments

elev. TOC/ground (m):
53-1 126.55/125.92
53-2 126.56/125.89
53-3 126.81/125.87
53-4 126.46/125.89

Hole Size: 15.9 cm diameter

Datum: 125.92 m (at M53-1)

Drill Date: February 16-17, 1998

Sheet: 1 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Inc.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary / Cable Tool

Well ID: M53

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE					Well Construction				Comments
Depth	Symbol	Description	Elevation (m)	Fractures	1	2	3	4	
31		***LIMESTONE*** grey	94	x					blue-green colour from 48.5 to 49.7 m
32			93						
33			92						
34			91						
35			90						
36			89	x					
37			88						
38			87						
39			86						
40			85	x					
41			84						
42			83						
43			82	x					
44			81						
45			80						
46			79						
47			78						
48			77						
49			76						
50			75						
51			74						
52			73						
53			72						
54			71						
55			70						
56			69						
57			68						
58			67						
59			66						
60		***EOH at 60.96 m depth***	65						
61									

Hole Size: 15.9 cm diameter

Datum: 125.92 m (at M53-1)

Drill Date: February 16-17, 1998

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Inc.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary / Cable Tool

Well ID: M54

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Fractures	Well Construction 1	2	3	4	Comments
0		Ground Surface	124.02						elev. TOC/ground (m):
1		*CLAY* brown, becoming dense							54-1 124.47/124.02
2			122						54-2 124.74/123.97
3			121						54-3 124.51/123.99
4		*CLAY TILL* with gravel and sand, brown	120						54-4 124.61/124.06
5		*LIMESTONE* grey	119						
6			118						
7			117						
8			116						
9			115						
10			114	x					
11			113						
12			112						
13			111						
14			110						
15			109						
16			108						
17			107						
18			106						
19			105	x					
20			104						
21			103						
22			102						
23			101	x					
24			100						
25			99						
26			98						
27			97						
28			96						
29			95						
30			94						
			93						

Hole Size: 15.9 cm diameter

Datum: 124.02 m (at M54-1)

Drill Date: February 17-18, 1998

Sheet: 1 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Inc.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary / Cable Tool

Well ID: M54

Enclosure:
Field Personnel: BA

SUBSURFACE PROFILE					Well Construction				Comments
Depth	Symbol	Description	Elevation (m)	Fractures	1	2	3	4	
31		*LIMESTONE* grey	92						
32									
33			91	x					
34			90						
35			89						
36			88						
37			87						
38			86						
39			85	x					
40			84						
41			83						
42			82	x					
43			81						
44			80						
45			79						
46			78						
47			77	x					blue-green colouring from 46.9 to 47.9 m
48			76						
49			75						
50			74						
51			73						
52			72						
53			71						
54			70						
55			69						
56			68						
57			67						
58			66						
59			65						
60		*EOH at 60.96 m depth*	64						blue green colouring from 59.1 to 61.0 m
61			63						

Hole Size: 15.9 cm diameter

Datum: 124.02 m (at M54-1)

Drill Date: February 17-18, 1998

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A757-7

Project: Additional Wells - SW Quadrant

Client: WM - Richmond Landfill

Location: Napanee

Well ID: M56-2

Log File: M56-2
Tem. File: WESA-Bedrock

Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (m)	Elevation (m)	Description	Stratigraphy	Fractures	Well	Comments
ft -3 / m -1	126.12	Ground Surface				
1 to 13 / 0 to 4		***Clay TILL*** Brown Clayey TILL with small gravel and trace sand.				Drilled through overburden with 8" Tricone. Drilled through bedrock with 6" air hammer. 6" steel casing grouted in place with 20% solids bentonite quickgrout from bedrock to surface using tremie pipe and grout pump.
	121.55					
15 to 25 / 4 to 8		***Clay TILL*** Grey Clayey TILL with gravel and trace sand.				Clean pea gravel from top of holeplug to surface inside steel casing.
	118.20					
27 / 8		***LIMESTONE BEDROCK***		26' - 26'9" soft limestone		3/8" Bentonite Holeplug from top of filter pack to up inside steel casing.
29	117.28					

Drilled By: Chalk Well Drilling

Drill Method: Air Rotary

Drill Date: November 23, 2005

Hole Size: 6"

Datum: Top of Casing Elevation - 126.991 masl

WESA
A Better Environment For Business

Project No: A757-7

Project: Additional Wells - SW Quadrant

Client: WM - Richmond Landfill

Location: Napanee

Well ID: M56-2

Log File: M56-2
Tem. File: WESA-Bedrock

Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (m)	Elevation (m)	Description	Stratigraphy	Fractures	Well	Comments
31		***LIMESTONE BEDROCK***				
33 – 10						3/8" Bentonite Holeplug
35						
37						
39 – 12						
41						
43				Water Producing fracture 43' 44'		
45						
47 – 14						
49						10' Slot 10 PVC Screen with #3 Silica Sand Filterpack
51						
53 – 16				Water Producing fracture 52' -53'		
55	109.05					Limestone Cuttings (fall in)
57		End of Borehole				
59 – 18						
61						

Drilled By: Chalk Well Drilling

Drill Method: Air Rotary

Drill Date: November 23, 2005

Hole Size: 6"

Datum: Top of Casing Elevation - 126.991 masl

WESA
A Better Environment For Business

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Dilling Ltd.
Drill Method: Cable Tool / Air Rotary

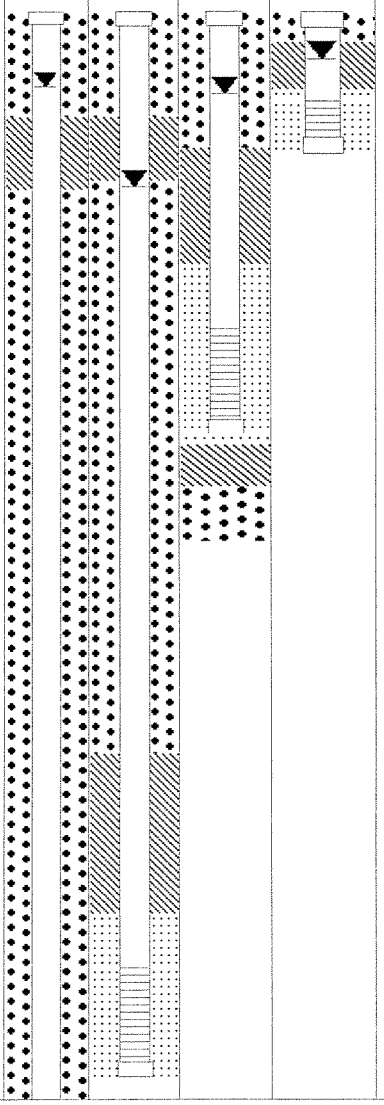
Well ID: M58

Enclosure:
Field Personnel: BA / ES

SUBSURFACE PROFILE

Depth	Description	Elevation (m)	Fractures
0	Ground Surface	125.34	
1	***CLAY*** brown		
2	***CLAY TILL*** brown, with sand and gravel	123	
3		122	
4	***SAND AND GRAVEL*** brown	121	x
5	***LIMESTONE*** grey	120	x
6		119	
7		118	
8		117	x
9		116	x
10		115	x
11		114	x
12		113	
13		112	
14		111	
15		110	
16		109	
17		108	
18		107	
19		106	
20		105	x
21		104	
22		103	
23		102	
24		101	
25		100	
26		99	
27		98	
28		97	x
29		96	
30		95	

Well Construction: 1, 2, 3, 4



Comments

elev. TOC/ground (m):
M58-1 126.05/125.34
M58-2 125.96/125.30
M58-3 125.96/125.32
M58-4 125.91/125.46

Hole Size: 15.9 cm diameter

Datum: 125.34 m (at M58-1)

Drill Date: March 17-18, 1998

Sheet: 1 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Dilling Ltd.
Drill Method: Cable Tool / Air Rotary

Well ID: M58

Enclosure:

Field Personnel: BA / ES

SUBSURFACE PROFILE					Well Construction				Comments
Depth	Symbol	Description	Elevation (m)	Fractures	1	2	3	4	
31		*LIMESTONE* grey	94						
32			93						
33			92						
34			91						
35			90						
36			89						
37			88						
38			87						
39			86						
40			85	x					
41			84						
42			83						
43			82						
44			81						blue-green colour from 44.5 to 45.7 m
45			80	x					
46			79						
47			78	x					
48			77						
49			76						
50			75						
51			74						
52			73						
53			72						
54			71						
55			70						
56			69						
57			68						
58			67						blue-green colour from 58.2 to 59.4 m
59			66						
60		*EOH at 60.96 m depth*	65						
61			64						

Hole Size: 15.9 cm diameter

Datum: 125.34 m (at M58-1)

Drill Date: March 17-18, 1998

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Dilling Ltd.
Drill Method: Cable Tool / Air Rotary

Well ID: M59

Enclosure:

Field Personnel: BA / ES

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Fractures	Well Construction 1	2	3	4	Comments
0		Ground Surface	124.62						elev. TOC/ground (m):
0		***CLAY***							M59-1 125.19/124.62
1		brown							M59-2 125.32/124.67
2		***LIMESTONE***	123						M59-3 125.32/124.69
3		grey	122						M59-4 125.16/124.63
4			121						
5			120						
6			119						
7			118						
8			117	x					
9			116						
10			115						
11			114						
12			113						
13			112						
14			111	x					
15			110						
16			109						
17			108	x					
18			107	x					
19			106						
20			105						
21			104	x					
22			103						
23			102	x					
24			101	x					
25			100						
26			99	x					
27			98						
28			97						
29			96						
30			95	x					
			94						

Hole Size: 15.9 cm diameter

Datum: 124.62 m (at M59-1)

Drill Date: March 18-19, 1998

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Dilling Ltd.
Drill Method: Cable Tool / Air Rotary

Well ID: M59

Enclosure:

Field Personnel: BA / ES

SUBSURFACE PROFILE					Well Construction				Comments
Depth	Symbol	Description	Elevation (m)	Fractures	1	2	3	4	
31		*LIMESTONE* grey	93						
32			92						
33			91	x					
34			90						
35			89						
36			88						
37			87						
38			86						
39			85	x					
40			84	x					
41			83						
42			82						
43			81						
44			80						blue-green colour from 44.5 to 45.7 m
45			79						
46			78						
47			77						
48			76						
49			75						
50			74						
51			73						
52			72						
53			71						
54			70						
55			69						
56			68						
57			67	x					
58			66						
59			65						
60		*EOH at 60.96 m depth*	64						
61									

Hole Size: 15.9 cm diameter

Datum: 124.62 m (at M59-1)

Drill Date: March 18-19, 1998

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Inc.
Location: Napanee, Ontario

Drilled By: Downing Drilling/Chalk Drilling
Drill Method: LF70 Core Drill, Air Rotary

Well ID: M60

Enclosure:

Field Personnel: BA

Depth	Symbol	Description	Elevation (m)	Well Construction 1	2	3	4	Rock Quality Designation % 20 60	Fracture Frequency (/m)	Comments
0		Ground Surface	124.71							elev. TOC/ground (m): M60-1 125.33/124.71 M60-2 126.30/125.80 M60-3 126.38/125.86 M60-4 126.67125.87
1		***CLAY*** brown								
2		***CLAY TILL*** brown, some sand present								
3		***LIMESTONE*** medium to dark grey, fine to medium grained limestone interbedded with fine to medium grained calcarenite, occasional brachiopods and crinoids (Lower Bobcaygeon Formation)	123						11.4	
4			122							
5			121						5.1	PACKER TEST: 25 psi for 1 hour depth: 6.6-9.2 m avg. 0.025 gal/min range 0.018-0.035
6			120							
7			119							
8			118						6.6	
9			117							
10			116							
11			115							
12			114						4.9	
13			113							
14		***LIMESTONE*** medium to dark brown lithographic to sub-lithographic limestone, minor amounts of argillaceous, bioclastic, calcarenitic and oolitic limestone present (Gull River Formation, Upper Member)	112						6.1	PACKER TEST: 25 psi for 1 hour depth 14.5-17.2 m no flow
15			111							
16			110							
17			109						5.7	
18			108							
19			107							
20			106						4.5	
21			105							
22			104						4.5	
23			103							
24			102							Note: bedrock elev. at M60-2, 60-3, 60-4 is 122.64 m (3.2 m below surface)
25			101						1.9	
26			100							
27			99							
28			98						2.1	
29			97							
30			96						2.3	
			95							
			94							

Hole Size: 15.9 cm diameter

Datum: 124.71 m (at M60-1)

Drill Date: 98/03/13,16-17

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Inc.
Location: Napanee, Ontario

Drilled By: Downing Drilling/Chalk Drilling
Drill Method: LF70 Core Drill, Air Rotary

Well ID: M60

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE				Well Construction				Rock Quality Designation	Fracture Frequency (/m)	Comments
Depth	Symbol	Description	Elevation (m)	1	2	3	4	% 20 60		
31			93						3.4	PACKER TEST: 18.5 psi for 1 hour depth 30.9-33.5 m avg. 6.2 gal/min range 5.3-7.7 g/min
32			92							
33			91						3.4	
34			90							
35			89							
36			88						3.0	
37			87							
38			86						2.7	
39			85							
40			84							
41			83						3.8	
42			82							
43			81							
44		***LIMESTONE*** interbedded pale green to buff finely crystalline dolomitic limestone and medium to dark brown lithographic limestone (Gull River Formation, Middle Member)	80						2.7	
45			79							
46			78							
47			77						1.9	
48			76							
49			75							
50			74						0.8	
51			73							
52		***EOH at 52.3 m depth***	72						2.3	
53		End of Borehole	71							
54			70							
55			69							
56			68							
57			67							
58			66							
59			65							
60			64							
61										

Hole Size: 15.9 cm diameter

Datum: 124.71 m (at M60-1)

Drill Date: 98/03/13,16-17

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Cable Tool

Well ID: M63

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE					Well Construction	Comments
Depth	Symbol	Description	Elevation (m)	Fractures	1 2	
0		Ground Surface	121.71			elev. TOC: 122.61 m Note: water level in M63-1 is 0.25 m above ground surface
1		***CLAY*** brown				
2		***LIMESTONE*** grey	120			
3			119	x		
4			118			
5			117			
6			116	x		
7			115			
8			114			
9			113			
10			112	x		
11			111			
12			110			
13			109			
14			108			
15			107			
16			106			
17			105			
18			104			
19			103			
20			102			
21			101			
22			100			
23			99	x		H2S gas encountered at 22.6 m depth
24			98			
25			97			
26			96			
27			95			
28			94			
29			93			
30			92			
			91			

Hole Size: 15.9 cm diameter

Datum: 121.71 m

Drill Date: April 2, 1998

Sheet: 1 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Cable Tool

Well ID: M63

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE					Well Construction		Comments
Depth	Symbol	Description	Elevation (m)	Fractures	1	2	
31			90				
32			89				
33			88				
34			87				
35			86				
36		*EOH at 36.5 m depth*	85				
37		End of Borehole	84				
38			83				
39			82				
40			81				
41			80				
42			79				
43			78				
44			77				
45			76				
46			75				
47			74				
48			73				
49			72				
50			71				
51			70				
52			69				
53			68				
54			67				
55			66				
56			65				
57			64				
58			63				
59			62				
60			61				
61							

Hole Size: 15.9 cm diameter

Datum: 121.71 m

Drill Date: April 2, 1998

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary

Well ID: M64

Enclosure:
Field Personnel: BA

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Fractures	Well Construction 1	Well Construction 2	Comments
0		Ground Surface	120.95				elev. TOC: 121.56 m
1		***CLAY*** brown					
2		***CLAY TILL*** brown, with sand and gravel	119				
3			118	x			
4		***LIMESTONE*** grey	117				
5			116	x			
6			115				
7			114				
8			113				
9			112				
10			111				
11			110	x			
12			109				
13			108				
14			107				
15			106				
16			105				
17			104	x			
18			103				
19			102				
20			101				
21			100				
22			99				
23			98	x			
24			97				
25			96				
26			95				
27			94				
28			93				
29			92				
30			91				
			90				

Hole Size: 15.9 cm diameter

Datum: 120.95 m

Drill Date: April 7, 1998

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary

Well ID: M64

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE					Well Construction		Comments
Depth	Symbol	Description	Elevation (m)	Fractures	1	2	
31			89				
32			88	x			
33			87				
34			86				
35			85				
36		*EOH at 36.5 m depth*	84				
37		End of Borehole	83				
38			82				
39			81				
40			80				
41			79				
42			78				
43			77				
44			76				
45			75				
46			74				
47			73				
48			72				
49			71				
50			70				
51			69				
52			68				
53			67				
54			66				
55			65				
56			64				
57			63				
58			62				
59			61				
60			60				
61							

Hole Size: 15.9 cm diameter

Datum: 120.95 m

Drill Date: April 7, 1998

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Cable Tool

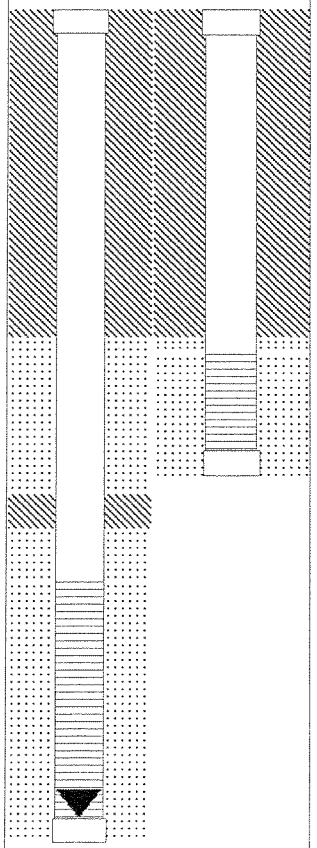
Well ID: M65

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Fractures	Well Construction 1	Well Construction 2	Comments
0		Ground Surface	123.83				elev. TOC: 124.28 m
		CLAY brown					
1			123				
		LIMESTONE grey	122				
2							
			121				
3							
			120				
4		***EOH at 4.8 m depth***					
			119				
5		End of Borehole					
			118				
6							



Hole Size: 15.9 cm diameter

Datum: 123.83 m

Drill Date: May 29, 1998

Sheet: 1 of 1

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Cable Tool

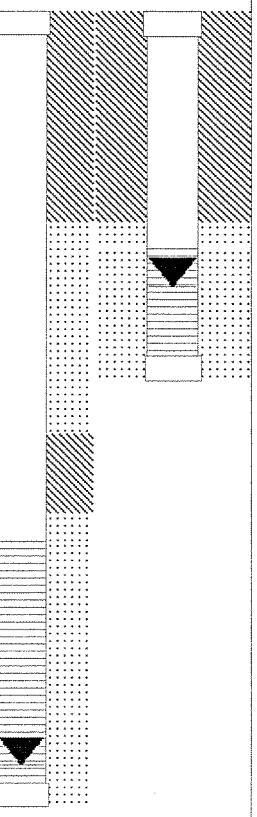
Well ID: M66

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Fractures	Well Construction 1	Well Construction 2	Comments
0		Ground Surface	123.54				elev. TOC: 124.40 m
		CLAY brown					
1			123				
		LIMESTONE grey	122				
2							
			121				
3							
			120				
4		***EOH at 4.5 m depth***					
		End of Borehole	119				
5							
			118				
6							



Hole Size: 15.9 cm diameter

Datum: 123.54 m

Drill Date: May 29, 1998

Sheet: 1 of 1

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Cable Tool

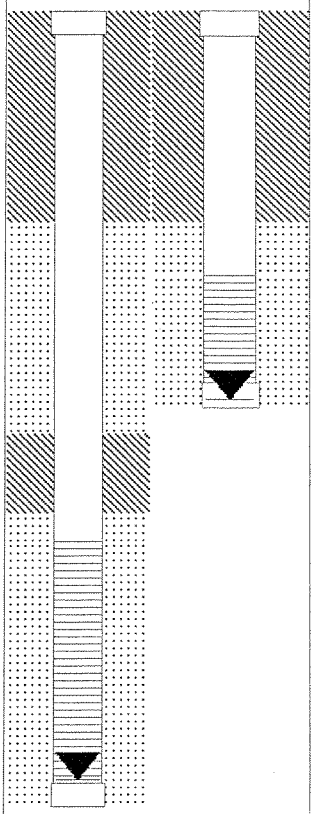
Well ID: M67

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Fractures	Well Construction 1	Well Construction 2	Comments
0		Ground Surface	123.11				elev. TOC: 123.75 m
0		***CLAY*** brown					
1			122				
1		***LIMESTONE*** grey					
2			121				
3			120				
4			119				
4		***EOH at 4.5 m depth***					
		End of Borehole					
5			118				
6			117				



Hole Size: 15.9 cm diameter

Datum: 123.11 m

Drill Date: June 1, 1998

Sheet: 1 of 1

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary

Well ID: M68

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE

Depth	Description	Elevation (m)	Fractures	Well Construction 1	2	3	4	Comments
0	Ground Surface	124.29						elev. TOC/ground (m):
0	*TOPSOIL*							M68-1 124.91/124.29
1	*CLAY TILL* greyish brown, trace of sand and gravel							M68-2 124.92/124.39
2		122						M68-3 124.93/124.41
3		121						M68-4 125.13/124.43
4	*SAND TILL* silty, light brown, some gravel and boulders present	120						
5		119	x					
6	*LIMESTONE* grey	118						
7		117	x					
8		116	x					
9		115						
10		114	x					
11		113						
12		112						
13		111	x					
14		110						H2S gas present
15		109	x					at 14.6 m
16		108						
17		107						
18		106						
19		105						
20		104						
21		103						
22		102	x					
23		101	x					
24		100						
25		99						
26		98	x					
27		97						
28		96						
29		95						
30		94						

Hole Size: 15.9 cm diameter

Datum: 124.29 m (at M68-1)

Drill Date: June 2-3, 1998

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary

Well ID: M68

Enclosure:

Field Personnel: BA

SUBSURFACE PROFILE					Well Construction				Comments
Depth	Symbol	Description	Elevation (m)	Fractures	1	2	3	4	
31		***LIMESTONE*** grey	93						
32			92	x					
33			91						
34			90	x					
35			89	x					
36			88						
37			87						
38			86	x					
39			85						
40			84	x					
41			83						
42			82						
43			81						
44			80						blue-green colour from 44.5 to 44.8 m
45			79	x					
46			78						
47			77						
48			76						
49			75	x					
50			74						
51			73						
52			72						
53			71						
54			70						
55			69						
56			68	x					
57			67						blue-green colour from 56.4 to 59.7 m
58			66						
59			65						
60		***EOH at 60.96 m depth***	64						
61			63						

Hole Size: 15.9 cm diameter

Datum: 124.29 m (at M68-1)

Drill Date: June 2-3, 1998

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754
Project: Richmond Landfill Expansion
Client: Canadian Waste Services Ltd.
Location: Napanee, Ontario

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary

Well ID: M70

Enclosure:

Field Personnel: BA/BM

Depth	Symbol	Description	Elevation (m)	Fractures	Well Construction 1	Well Construction 2	Well Construction 3	Comments
0		Ground Surface	127.2					elev. TOC/ground (m):
1		***CLAY*** brown						M70-1 127.60/127.20
2		***CLAY TILL***	125					M70-2 127.52/127.05
3		brown, with sand and gravel	124	x				M70-3 127.87/127.12
4		***LIMESTONE*** grey	123					
5			122					
6			121					
7			120	x				
8			119					
9			118	x				
10			117	x				
11			116					
12			115	x				
13			114	x				
14			113					
15			112					
16			111					
17			110					
18			109					
19			108	x				
20			107					
21			106					
22			105	x				
23			104					
24			103					
25			102	x				
26			101					
27			100					
28			99					
29			98	x				
30		***EOH at 30.9 m depth***	97					
31			96					

Hole Size: 15.9 cm diameter

Datum: 127.20 m (at M70-1)

Drill Date: June 29, 1998

Sheet: 1 of 1

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754-2-29
Project: Angle Wells Installations
Client: Canadian Waste Systems
Location: Richmond Landfill, Napanee, Ont.

Drilled By: Downing Drilling
Drill Method: Diamond Drilling

Well ID: M72 Angle Hole

File: cwsm72d.log
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency (per meter)	Comments	K (m/sec)
			129.21					
0		Ground Surface						
0			128				S/U 0.83m	
1			127				50mm PVC riser and 20 slot screen	
2			126					
3		***Clay Till*** brown, with sand and gravel, boulders and cobbles present.	125					
4			124					
5			123				HQ casing grouted in bedrock	
6			122					
7			121			4	23'4" weathered shale	
8						4		
9			120			9		
10			119			6	31'2" weathered fract. 32'6"-36'6" Highly fractured	2.E-09
11			118			6	34'6" vert. fract.	
12		***Limestone*** Light grey lithographic fossiliferous limestone with undulatory shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones approximately 6" thick.	117			4	38'4"-40'9" fract.	3.E-11
13			116			5		
14			115			4		
15			114			3		5.E-11
16			113			0		
17			112			4		
18			111			3		1.E-10
19			110			2		
			109			3		

Hole Size: HQ 3.75" (95mm) OD

Datum: Geodetic

Drill Date: June 14, 15/2000

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754-2-29
Project: Angle Wells Installations
Client: Canadian Waste Systems
Location: Richmond Landfill, Napanee, Ont.

Drilled By: Downing Drilling
Drill Method: Diamond Drilling

Well ID: M72 Angle Hole

File: cwsm72d.log
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency (per meter)	Comments	K (m/sec)
19							64'2" fracture	
20			108			4		1.E-05
21			107			5		
22			106			1		4.E-07
23			105			2		
24		***Limestone*** *Light grey lithographic fossiliferrous limestone with undulating shale partings. Styolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones approximately 6" thick.*	104			2		
25			103			1		3.E-11
26			102			4		
27			101			2		
28			100			3		2.E-06
29			99			3		
30			98			0		
31		End of Borehole	97					
32			96					
33			95					
34			94					
35			93					
36			92					
37			91					
38			90					
39								

Hole Size: HQ 3.75" (95mm) OD

Datum: Geodetic

Drill Date: June 14, 15/2000

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754-2-29
Project: Angle Wells Installations
Client: Canadian Waste Systems
Location: Richmond Landfill, Napanee, Ont.

Drilled By: Downing Drilling
Drill Method: Diamond Drilling

Well ID: M74 Angle Hole

File: cwsm74d.log
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency (per meter)	Comments	K (m/sec)
			126.02					
0		Ground Surface					S/U 0.98m	
1		***Clay Till*** brown, with sand and gravel, boulders and cobbles present.	124				50mm PVC riser and 20 slot screen	
2			123				*HQ casing grouted* in bedrock	
3			122			5	11'8"-19'6" highly fractured	
4			121			3		
5			120			6		5.E-09
6			119			2		
7			118			3		6.E-07
8			117			3		
9			116			1	27'8" clay lense 1" thick	
10		***Limestone*** Light grey lithographic fossiliferous limestone with undulatory shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones approximately 6" thick.	115			1		7.E-07
11			114			1		
12			113			3		
13			112			0	38'6" vert. frac.	3.E-09
14			111			1		
15			110			1		
16			109			2		6.E-11
17			108			0		
18			107			2		
19			106			2	58'3" calcite filled vug	6.E-11
						0		

Hole Size: HQ 3.75" (95mm) OD

Datum: Geodetic

Drill Date: June 19, 2000

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754-2-29
Project: Angle Wells Installations
Client: Canadian Waste Systems
Location: Richmond Landfill, Napanee, Ont.

Drilled By: Downing Drilling
Drill Method: Diamond Drilling

Well ID: M74 Angle Hole

File: *cwsm74d.log*
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency (per meter)	Comments	K (m/sec)
19						0		
20			105			1		6.E-11
21			104			1		
22			103			0		
23			102			0		3.E-09
24		***Limestone*** Light grey lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones approximately 6" thick.	101			0		
25			100			0		
26			99			1	84'1" calcite filled vug	6.E-11
27			98			1	87'4" pyrite filled vug	
28			97			0		
29			96			0		8.E-11
30			95			1		
31		End of Borehole	94			0		
32			93					
33			92					
34			91					
35			90					
36			89					
37			88					
38			87					
			86					

Hole Size: HQ 3.75" (95mm) OD

Datum: Geodetic

Drill Date: June 19, 2000

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754-2-29
Project: Angle Wells Installations
Client: Canadian Waste Systems
Location: Richmond Landfill, Napanee, Ont.

Drilled By: Downing Drilling
Drill Method: Diamond Drilling

Well ID: M75 Angle Hole

File: cwsm75d.log
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency (per meter)	Comments	K (m/sec)
			124.39					
0		Ground Surface					S/U 0.82	
1		***Clay Till*** brown, with sand and gravel, boulders and cobbles present.	123				HQ casing grouted in bedrock	
2			122			3		
3			121			3	50mm PVC riser and 20 slot screen	
4			120			3	1'8" weathered shale frac	7.E-08
5			119			3		5.E-09
6			118			4		
7			117			4		
8			116			4	22'6" clay lense	4.E-07
9		***Limestone*** Light grey lithographic fossiliferous limestone with undulatory shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones approximately 6" thick.	115			5		
10			114			6	28'7" 2nd. mineralization	
11			113			3		2.E-09
12			112			1		
13			111			2		3.E-11
14			110			1		
15			109			2		
16			108			2		3.E-11
17			107			3		
18			106			4		
19			105			4		4.E-11
						2		
						1		
						0		

Hole Size: HQ 3.75" (95mm) OD

Datum: Geodetic

Drill Date: June 20, 21/2000

Sheet: 1 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754-2-29
Project: Angle Wells Installations
Client: Canadian Waste Systems
Location: Richmond Landfill, Napanee, Ont.

Drilled By: Downing Drilling
Drill Method: Diamond Drilling

Well ID: M75 Angle Hole

File: cwsm75d.log
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency (per meter)	Comments	K (m/sec)
19			104			4		2.E-10
20			103			3	68'5" weathered frac.	
21			102			1		
22			101			2		5.E-11
23			100			2		
24		***Limestone*** Light grey lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones approximately 6" thick.	99			1		
25			98			0		1.E-09
26			97			1		
27			96			1		
28			95			0		7.E-11
29			94			0		
30			93			3		
31		End of Borehole	92					
32			91					
33			90					
34			89					
35			88					
36			87					
37			86					
38			85					
39								

Hole Size: HQ 3.75" (95mm) OD

Datum: Geodetic

Drill Date: June 20, 21/2000

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754-2-29
Project: Angle Wells Installations
Client: Canadian Waste Systems
Location: Richmond Landfill, Napanee, Ont.

Drilled By: Downing Drilling
Drill Method: Diamond Drilling

Well ID: M77 Angle Hole

File: cwsm77d.log
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency (per meter)	Comments	K (m/sec)
-1			129.32				S/U 1.05m	
0		Ground Surface						
1			128					
2		***Sand Till***	127				HQ casing grouted in bedrock	
3		brown, with silt and gravel, boulder and cobbles present.	126					
4			125					
5			124				50mm PVC *riser and 20 slot screen*	
6			123			5	16'5"-23'10" highly frac.	
7			122			5		2.E-07
8			121			3		6.E-08
9			120			2		
10			119			2	26'10" weathered shale	
11		***Limestone***	118			2		3.E-09
12		Light grey lithographic fossiliferous limestone with undulatory shale partings.	117			5		
13		Stylolites are common. Numerous calcite stringers throughout.	116			1		
14		Occasional coarse crystalline zones approximately 6" thick.	115			0		
15			114			3		5.E-08
16			113			2	41'6" weathered 2nd. mineralization	5.E-08*
17			112			2		
18			111			0		3.E-11
19			110			0		
						2		3.E-11
						1	60'10" fracture	

Hole Size: HQ 3.75" (95mm) OD

Datum: Geodetic

Drill Date: June 22, 2000

Sheet: 1 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: A754-2-29
Project: Angle Wells Installations
Client: Canadian Waste Systems
Location: Richmond Landfill, Napanee, Ont.

Drilled By: Downing Drilling
Drill Method: Diamond Drilling

Well ID: M77 Angle Hole

File: cwsm77d.log
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency (per meter)	Comments	K (m/sec)
19			109			1	64'1" frac. 2nd. mineral.	
20			108			2		1.E-07
21			107			0		
22			106			1		
23			105			1		3.E-11
24		***Limestone*** Light grey lithographic fossiliferous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones approximately 6" thick.	104			3		
25			103			1		3.E-11
26			102			2		
27			101			2	87'3" clay lense 2" thick, stiff, moist	
28			100			1		
29			99			0		9.E-09
30			98			1		
31		End of Borehole	97			0		
32			96					
33			95					
34			94					
35			93					
36			92					
37			91					
38			90				* Duplicate test	

Hole Size: HQ 3.75" (95mm) OD

Datum: Geodetic

Drill Date: June 22, 2000

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: C-B3618-00

Project: 2004 Drilling Program

Client: Waste Management

Location: Richmond Landfill

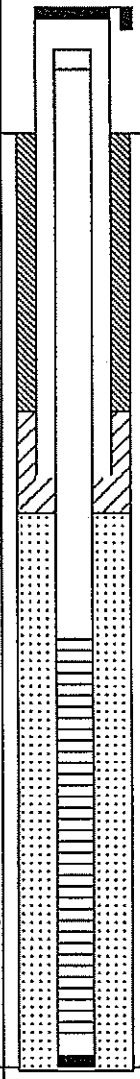
Well ID: M80-2

Log File: B3618-M80-2
Tem. File: WESA-Bedrock

Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (m)	Elevation (m)	Description	Stratigraphy	Fractures	Well	Comments
ft / m: -3 / -1	123.3	Ground Surface				
1 – 23 (ft); 2 – 6 (m)		***OVERBURDEN*** Brown and Grey Clay Till				6" Steel protective casing with locking cap Quick Grout Bentonite Seal inside and outside casing to surface 3/8" Bentonite Holeplug 2" Schedule 40 PVC riser pipe
15 (ft); 4 (m)	118.6	***LIMESTONE BEDROCK*** Grey Limestone				10' Scedule 40 Slot 10 PVC Screen #3 Silica Sand Filter pack
21 (ft); 6 (m)	116.7	End of Borehole				



Drilled By: Chalk Well Drilling

Drill Method: Air Rotary

Drill Date: October 6, 2004

Hole Size: 6"

Datum: Elevation TOC - 124.260

Project No: C-B3618-00

Project: 2004 Drilling Program

Client: Waste Management

Location: Richmond Landfill

Well ID: M81

Log File: B3618-M81
Tem. File: WESA-Bedrock

Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (m)	Elevation (m)	Description	Stratigraphy	Fractures	Well	Comments
ft / m -3 / -1	125.0	Ground Surface				
1 – 23	125.0	***OVERBURDEN*** Brown and Grey Clay Till				6" Steel protective casing with locking cap Quick Grout Bentonite Seal inside and outside casing to surface 2" Schedule 40 PVC risor pipe 3/8" Bentonite Holeplug 10' Scedule 40 Slot 10 PVC Screen #3 Silica Sand Filter pack
2 / 4 / 6	120.0	***LIMESTONE BEDROCK*** Grey Limestone				
	118.2	End of Borehole				

Drilled By: Chalk Well Drilling

Hole Size: 6"

Drill Method: Air Rotary

Datum: TOC Elevation - 125.792

Drill Date: October 6, 2004

Sheet: 1 of 1

Project No: C-B3618-00

Project: 2004 Drilling Program

Client: Waste Management

Location: Richmond Landfill

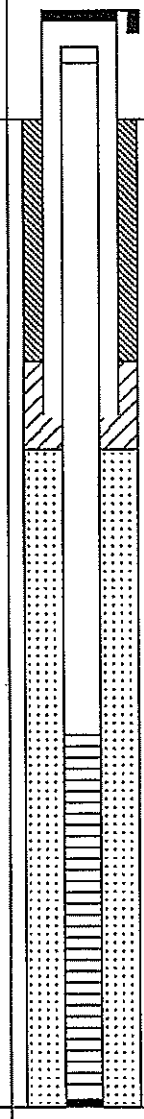
Well ID: M82-2

Log File: B3618-M82-2
Tem. File: WESA-Bedrock

Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (m)	Elevation (m)	Description	Stratigraphy	Fractures	Well	Comments
ft / m: -3 / -1	122.3	Ground Surface				
1		***OVERBURDEN*** Brown Clay				6" Steel protective casing with locking cap
3	121.1					Quick Grout Bentonite Seal inside and outside casing to surface
5		***LIMESTONE BEDROCK*** Grey Limestone				
7 / 2						3/8" Bentonite Holeplug
9						2" Schedule 40 PVC risor pipe
11						
13 / 4						
15						10' Scedule 40 Slot 10 PVC Screen
17	117.1	-water bearing fracture				#3 Silica Sand Filter pack
19 / 6						
21						
23	115.0					
25		-water bearing fracture				
8	114.2					
27		End of Borehole				



Drilled By: Chalk Well Drilling

Drill Method: Air Rotary

Drill Date: October 7, 2004

Hole Size: 6"

Datum: Elevation TOC - 123.100

Project No: K-A756

Project: Drilling Program

Client: Waste Management

Location: Richmond Landfill

Well ID: M86

Log File: M86
Tem. File: WESA-Bedrock

Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (m)	Elevation (m)	Description	Stratigraphy	Fractures	Well	Comments
ft / m: -3 / -1	123.2	Ground Surface				
1		***OVERBURDEN*** Brown Clay				Portland Cement with bentonite at surface and inside casing
	122.5					
3		***LIMESTONE BEDROCK*** Grey Limestone				3/8" Bentonite Holeplug
5						Schedule 40 PVC risor pipe
7 / 2						5' of schedule 40 Slot 10 PVC screen
9						#3 Silica sand filterpack
11	119.3					
13 / 4		End of Borehole				

Drilled By: Chalk Well Drilling

Drill Method: Air Rotary

Drill Date: October 8, 2004

Hole Size: 6"

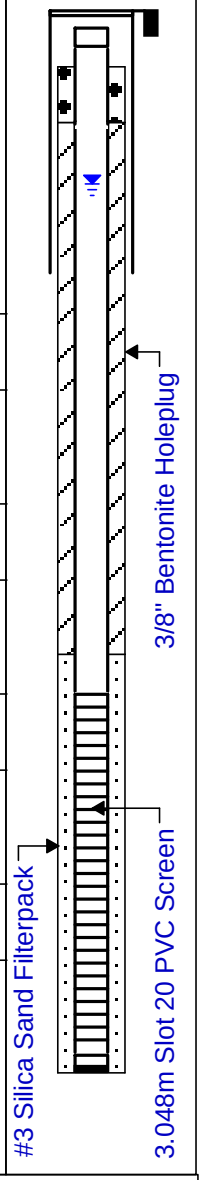
Datum: Elevation TOC - 124.024

Log of Borehole: M87-2

WESA
A Better Environment For Business

Project No.: A756-8
Project: Empey Hill Drilling
Client: WM - Richmond
Location: Richmond Landfill
Enclosure: W/L 2.36 m TPVC
Logged By: B.M.

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Description	Elevation (m)	Number	Type	Recovery	N-Value	Monitor Details
		Ground Surface	125.25					
0 – 1		Grassy surface underlain by Brown TOPSOIL and Silty TILL with gravel. (auger observation)	123.73					
1 – 2		Brown Silty TILL with small gravel. Tight, Dry.	122.20	1		8	25	
2 – 3		Brown Silty TILL with small gravel. Trace sand. Possibly trace clay. Tight, Dry.	120.68	2		20	63	
3 – 4		Brownish Grey Silty Clay TILL with gravel. Trace sand. Bottom 2" brownish grey Sandy TILL. Tight, Dry.	119.15	3		20	52	
5 – 6		Grey Silty CLAY with trace fine sand. Trace small gravel upper 2". Tight, Moist.	118.54	4		6	50	
6 – 7		Auger Sample Grey Silty CLAY with sand and trace gravel. Wet, Sticky.	117.63					
7 – 8		**Auger Refusal on Bedrock at 7.62m**						



Drilled By: CME 75 Track
Drill Method: Hollow Stem Auger
Drill Date: June 9, 2005

Hole Size: 8"
Datum: TOC Elevation 1126.207 masl
Northing: 4902490
Easting: 334966

Sheet: 1 of 1

Project No: K-A756-5

Project: 2006 Angle Well Installations

Client: Waste Management

Location: Napanee, Ontario

Well ID: M91-1 Angle Hole

Easting: 4902730
Northing: 334798
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth* (ft / m)	Stratigraphy	Description	Elev.* (masl)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
0 ft / 0 m		Ground Surface	129.80					
0 – 27 ft / 0 – 8 m		***Silty Sand Till*** Light brown, silty sand Till, encountering boulders at 6.5m.					M91-1 elev. 130.40m TPVC steel protective casing with locking cap 50mm PVC riser within bentonite grout seal	
27 ft / 8 m			121.45					
27 – 33 ft / 8 – 10 m		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones.			20 – 60 %	7	bottom of HW casing	1.4E-06

Drilled By: Downing Drilling
Drill Method: Diamond Drill
Hole Size: HW(4.5")/HQ3(3.78")
Drill Date: Sept. 25,26, 2006

Drill Angle: 60 degrees from horiz.
Azimuth: 344 degrees clockwise from north
Datum: m.a.s.l.
Checked By: FAR

WESA
A Better Environment For Business

* Depth and Elevation corrected to vertical

Project No: K-A756-5

Project: 2006 Angle Well Installations

Client: Waste Management

Location: Napanee, Ontario

Well ID: M91-1 Angle Hole

Easting: 4902730
Northing: 334798
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth*	Stratigraphy	Description	Elev.* (masl)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
34–68	11–20	- 10.3m (33.8') weathered fracture	119.50			4		
						4		1.0E-11
		-12m (39.4') clay seam	117.79			5		2.03E-08
		-14m (46') fracture	115.78			5		
		-14.6m (48') fracture	115.17			1		1.0E-11
		-16.5m (54') wide fracture	113.34			3		
						4	#1 silica sand	1.0E-11
						2		
		-20.3m (66.7') weathered fracture	109.47			4		1.0E-07

Drilled By: Downing Drilling
Drill Method: Diamond Drill
Hole Size: HW(4.5")/HQ3(3.78")
Drill Date: Sept. 25,26, 2006

Drill Angle: 60 degrees from horiz.
Azimuth: 344 degrees clockwise from north
Datum: m.a.s.l.
Checked By: FAR

* Depth and Elevation corrected to vertical

WESA
A Better Environment For Business

Project No: K-A756-5

Project: 2006 Angle Well Installations

Client: Waste Management

Location: Napanee, Ontario

Well ID: M91-1 Angle Hole

Easting: 4902730
Northing: 334798
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth*	Stratigraphy	Description	Elev.* (masl)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
69–100 / 21–30							50mm slot 20 PVC screen within a #3 silica sand pack	
						5		
						1	#1 silica sand	1.0E-11
						3		
			103.89			6		4.0E-09
85–86 / 26		-25.4-26.7m (83-87.5') fracture, vertical fracture						
			102.37			2	20% solids bentonite grout	
		-27.4m (90') weathered fracture						
						3		1.0E-11
						3		
100 / 30			99.16					
101–103 / 31		End of Borehole						

Drilled By: Downing Drilling
Drill Method: Diamond Drill
Hole Size: HW(4.5")/HQ3(3.78")
Drill Date: Sept. 25,26, 2006

Drill Angle: 60 degrees from horiz.
Azimuth: 344 degrees clockwise from north
Datum: m.a.s.l.
Checked By: FAR

* Depth and Elevation corrected to vertical

WESA
A Better Environment For Business

Project No: K-A756-5

Project: 2006 Vertical Well Installations

Client: Waste Management

Location: Napanee, ON

Well ID: M94-2

Easting: 4903527
Northing: 335486

Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (m)	Elevation (m)	Description	Stratigraphy	Fractures	Well	Comments
ft / m						
-2 / 0	124.31	Ground Surface				
0 – 6 / 0 – 2		***Silty Sand Till*** Light brown, silty sand Till, encountering boulders at 6.5m.				15cm protective steel casing casing s/u 0.74m M94-2 elev. 125.05m TOC bentonite gravel seal
6 – 20 / 2 – 6	122.18	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale parting.				50mm slot 20 PVC screen within #3 silica sand pack
22	117.91	End of Borehole				

Drilled By: MPI Drilling Ltd.
Drill Method: Air Hammer
Drill Date: Oct.24, 2006
Hole Size: 10cm/4"

Datum: m.a.s.l.
Checked by: FAR

Project No: K-A756-5

Project: 2006 Angle Well Installations

Client: Waste Management

Location: Napanee, Ontario

Well ID: M95-1 Angle Hole

Easting: 4902910
Northing: 334742
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth* (ft / m)	Stratigraphy	Description	Elev.* (masl)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
0 / 0		Ground Surface	123.42					
0–4 / 0–1		***Silty Sand Till*** Light brown, silty sand Till, with cobbles and boulders.	122.11				M95-1 elev. 124.13m TOC steel protective casing with locking cap	
4–13 / 1–4		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occasional coarse crystalline zones. -1.1-2.9m(5.2-9.5') highly fractured	120.07				- 1.6m bottom of HW casing	
13–16 / 4–5		-3.4-4.9m(11.2-16') highly fractured	119.21					6.0E09
16–20 / 5–6								2.0E-08
20–29 / 6–9							50mm PVC riser within bentonite grout seal	3.0E-07
29–32 / 9								

Rock Quality Designation: 20 % 60

Fracture Frequency/Run: 4, 12, 8, 6, 3, 2, 4

Drilled By: Downing Drilling
Drill Method: Diamond Drill
Hole Size: HW(4.5")/HQ3(3.78")
Drill Date: Oct.4,5, 2006

Drill Angle: 60 degrees from horiz.
Azimuth: 19 degrees clockwise from north
Datum: m.a.s.l.
Checked By: FAR

* Depth and Elevation corrected to vertical

WESA
A Better Environment For Business

Project No: K-A756-5

Project: 2006 Angle Well Installations

Client: Waste Management

Location: Napanee, Ontario

Well ID: M95-1 Angle Hole

Easting: 4902910
Northing: 334742
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth*	Stratigraphy	Description	Elev.* (masl)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency/Run	Comments	K (m/sec)
33 – 10						2		
34								
35								
36 – 11			112.23					4.0E-07
37		- 11.2m(36.7) vertical fracture				6		
38								
39 – 12								
40								
41								
42 – 13						3	#1 silica sand	
43								
44								5.0E-06
45								
46 – 14						4		
47								
48			108.48					
49 – 15		-14.9m (49') broken rock						
50								
51						6		
52			107.57					
53 – 16		-15.8m (52')fracture, lost water circulation for the remainder of hole.					50mm slot 20 PVC screen within a #3 silica sand pack	2.0E-05
54			106.78					
55		-16.6m (54.6') vertical fracture	106.41			7		
56 – 17		-17m (55.8') broken rock						
57								
58							#1 silica sand	
59 – 18						3		
60								2.0E-06
61								
62 – 19								
63						2		
64								
65								
66 – 20								
67								

Drilled By: Downing Drilling
Drill Method: Diamond Drill
Hole Size: HW(4.5")/HQ3(3.78")
Drill Date: Oct.4,5, 2006

Drill Angle: 60 degrees from horiz.
Azimuth: 19 degrees clockwise from north
Datum: m.a.s.l.
Checked By: FAR

* Depth and Elevation corrected to vertical

WESA
A Better Environment For Business

Project No: K-A756-5

Project: 2006 Angle Well Installations

Client: Waste Management

Location: Napanee, Ontario

Well ID: M95-1 Angle Hole

Easting: 4902910
Northing: 334742
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth*	Stratigraphy	Description	Elev.* (masl)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
68–100	21–30		92.80		5			3.0E-07
					5			
					3			6.0E-08
					1		20% solids bentonite grout	
					1			5.0E-08
					2			
					1			1.0E-11
					3			
101–102	31	End of Borehole						

Drilled By: Downing Drilling
Drill Method: Diamond Drill
Hole Size: HW(4.5")/HQ3(3.78")
Drill Date: Oct.4,5, 2006

Drill Angle: 60 degrees from horiz.
Azimuth: 19 degrees clockwise from north
Datum: m.a.s.l.
Checked By: FAR

* Depth and Elevation corrected to vertical

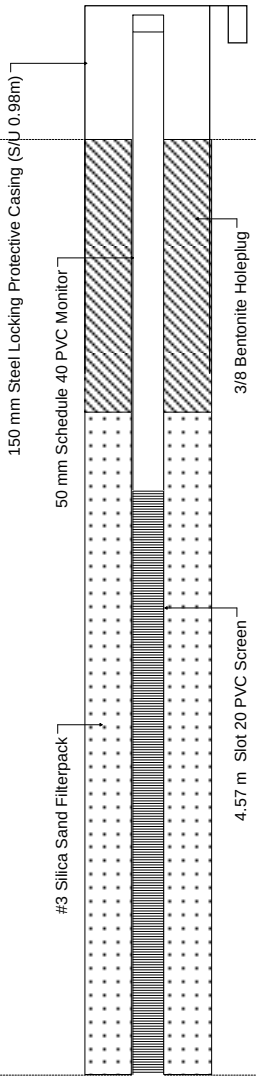
WESA
A Better Environment For Business

Water and Earth Sciences Associates Ltd.
The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7

Well ID: M96

Project No.: KB5691-10
Client: Waste Management - Richmond
Location: Napanee, Ontario
Northing: 4903158
Easting: 335774
Project Manager: Phil Tibble

SUBSURFACE PROFILE				SAMPLE		
Depth (ft / m)	Symbol	Description	Elevation	Number	Type	Well Completion Details
-3		Ground Surface	129.609			
2		CLAY *TILL*				
7			126.256			
12		Sandy *CLAY*	125.403			
17 / 5		Limestone *BEDROCK*				
		Soft Zone (5.79 - 6.1 m)	123.818			
22			122.294			
		End of Borehole				



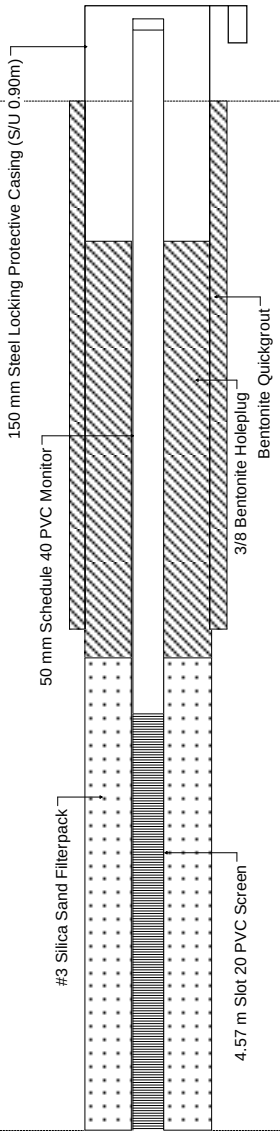
Drilled By: Chalk Well Drilling
Drill Method: 6" Air Hammer
Drill Date: May 26, 2008
Hole Size: 6"
Datum: Elevation TOC - 130.589
Template: Water Supply Well - Kingston
Sheet: 1 of 1

Water and Earth Sciences Associates Ltd.
The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7

Well ID: M97

Project No.: KB5691-10
Client: Waste Management - Richmond
Location: Napanee, Ontario
Northing: 4902551
Easting: 335059
Project Manager: Phil Tibble

SUBSURFACE PROFILE				SAMPLE		
Depth (ft / m)	Symbol	Description	Elevation	Number	Type	Well Completion Details
-3		Ground Surface	126.653			
2		Brown CLAY *TILL* Dry				
7						
12			122.691			
17 / 5		Grey CLAY *TILL* Saturated				
22						
27			118.423			
32 / 10		Limestone *BEDROCK*				
37			115.375			
		End of Borehole				



Drilled By: Chalk Well Drilling
Hole Size: 6"
Drill Method: 10" Tricone / 6" Air Hammer
Datum: Elevation TOC - 127.553
Drill Date: May 26, 2008
Template: Water Supply Well - Kingston
Sheet: 1 of 1

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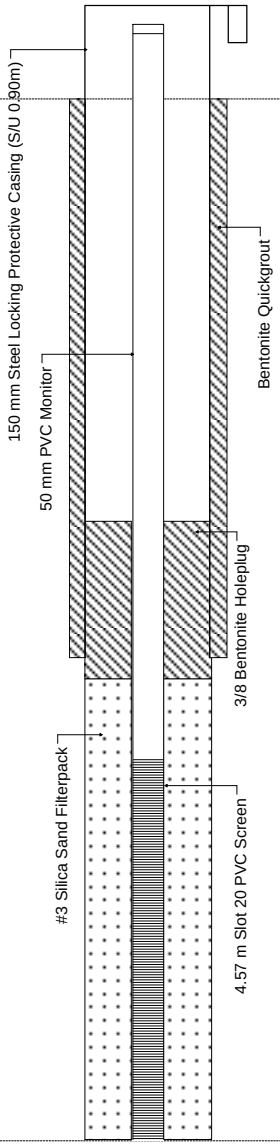
Water and Earth Sciences Associates Ltd.
The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7

Well ID: M98

Project No.: KB5691-10
Client: Waste Management - Richmond
Location: Napanee, Ontario

Northing: 4902730
Easting: 334976
Project Manager: Phil Tibble

SUBSURFACE PROFILE				SAMPLE		
Depth (ft / m)	Symbol	Description	Elevation	Number	Type	Well Completion Details
-4		Ground Surface	130.225			
1		Brown CLAY *TILL*				
			128.396			
6		Brown *SAND* and *GRAVEL*	128.091			
		Brown *CLAY TILL* with Boulders				
			126.872			
11 / 4		Grey *CLAY TILL* Saturated				
16						
21						
26 / 9						
			120.776			
31		Limestone *BEDROCK*				
36						
			117.728			
41		End of Borehole				



Drilled By: Chalk Well Drilling
Hole Size: 6"
Drill Method: 10" Tricone, 6" Air Hammer
Datum: Elevation TOC - 131.125
Drill Date: May 27, 2008
Template: Water Supply Well - Kingston
Sheet: 1 of 1

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Water and Earth Sciences Associates Ltd.
The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7

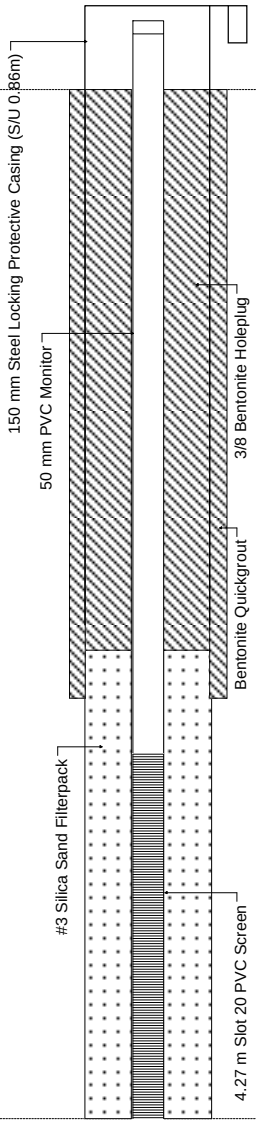
Well ID: M99-2

Project No.: KB5691-10 ***Northing:*** 4902646

Client: Waste Management - Richmond ***Easting:*** 334869

Location: Napanee, Ontario ***Project Manager:*** Phil Tibble

SUBSURFACE PROFILE				SAMPLE		
Depth (ft / m)	Symbol	Description	Elevation	Number	Type	Well Completion Details
-3		Ground Surface	130.511			
2		*SAND and GRAVEL. Some Clay*				
27		Flowing *SAND*	122.281			
32 / 10		Limestone *BEDROCK. Soft*	120.757 120.453			
37		Limestone *BEDROCK*				
42		End of Borehole	117.618			



Drilled By: Chalk Well Drilling ***Hole Size:*** 6"

Drill Method: Cable Tool ***Datum:*** Elevation TOC - 131.371

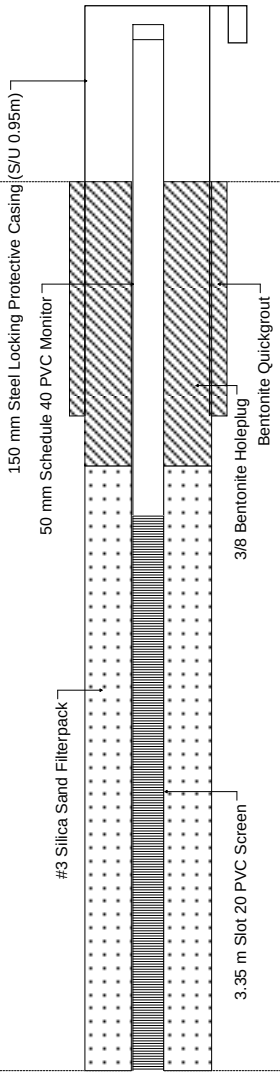
Drill Date: June 4, 2008 ***Template:*** Water Supply Well - Kingston ***Sheet:*** 1 of 1

Water and Earth Sciences Associates Ltd.
The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7

Well ID: M101

Project No.: KB5691-10
Client: Waste Management - Richmond
Location: Napanee, Ontario
Northing: 4903015
Easting: 334949
Project Manager: Phil Tibble

SUBSURFACE PROFILE				SAMPLE		
Depth (ft / m)	Symbol	Description	Elevation	Number	Type	Well Completion Details
-3		Ground Surface	124.351			
2		Brown *CLAY* Wet	122.827			
7		Brown *CLAY TILL* Wet	122.035			
12		Limestone *BEDROCK*	119.017			
17		End of Borehole				



Drilled By: Chalk Well Drilling
Drill Method: 6" Air Hammer
Drill Date: May 28, 2008
Hole Size: 6"
Datum: Elevation TOC - 125.301
Template: Water Supply Well - Kingston
Sheet: 1 of 1

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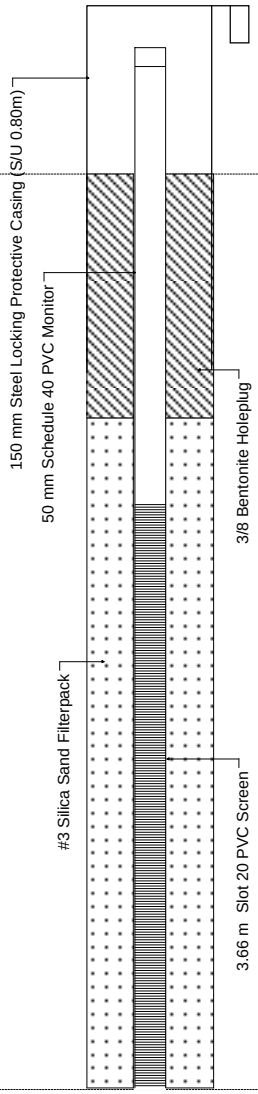
Water and Earth Sciences Associates Ltd.
The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7

Well ID: M102

Project No.: KB5691-10
Client: Waste Management - Richmond
Location: Napanee, Ontario

Northing: 4902919
Easting: 334836
Project Manager: Phil Tibble

SUBSURFACE PROFILE				SAMPLE		
Depth	Symbol	Description	Elevation	Number	Type	Well Completion Details
ft / m						
-3		Ground Surface	124.715			
2		Brown *CLAY*	123.191			
7		Brown *CLAY TILL*	122.033			
12		Limestone *BEDROCK*	118.985			
17 / 5		End of Borehole				



Drilled By: Chalk Well Drilling
Drill Method: 6" Air Hammer
Drill Date: May 28, 2008

Hole Size: 6"
Datum: Elevation TOC - 125.515
Template: Water Supply Well - Kingston

Sheet: 1 of 1

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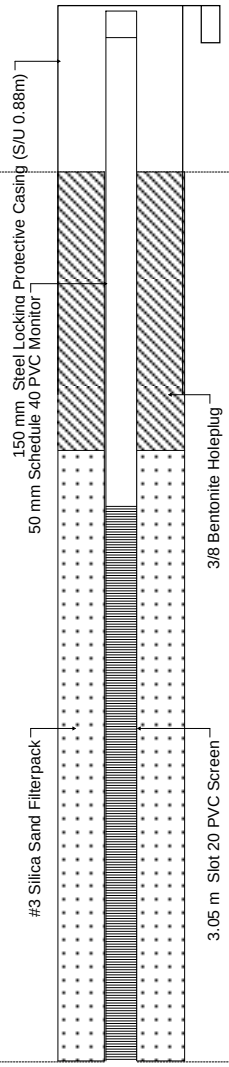
Water and Earth Sciences Associates Ltd.
The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7

Well ID: M103

Project No.: KB5691-10
Client: Waste Management - Richmond
Location: Napanee, Ontario

Northing: 4903101
Easting: 335021
Project Manager: Phil Tibble

SUBSURFACE PROFILE				SAMPLE		Well Completion Details
Depth (ft / m)	Symbol	Description	Elevation	Number	Type	
-3		Ground Surface	124.416			
2		Brown *CLAY TILL*				
7		Limestone *BEDROCK*	122.313			
12			119.539			
17 / 5		End of Borehole				



Drilled By: Chalk Well Drilling
Drill Method: 6" Air Hammer
Drill Date: June 17, 2008

Hole Size: 6"
Datum: Elevation TOC - 125.296
Template: Water Supply Well - Kingston

Sheet: 1 of 1

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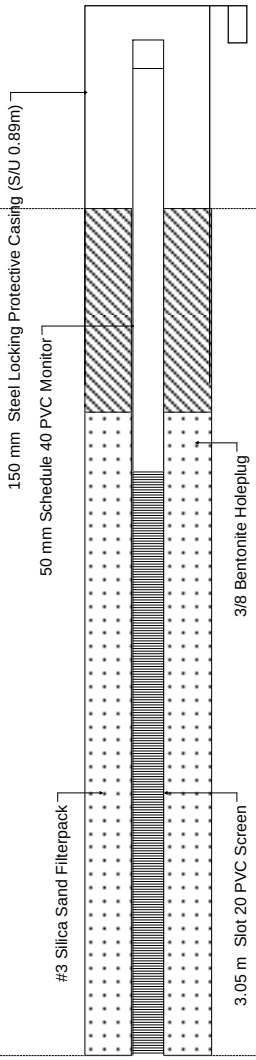
Water and Earth Sciences Associates Ltd.
The Woolen Mill, 4 Cataraqui Street
Kingston, Ontario, Canada K7K 1Z7

Well ID: M104

Project No.: KB5691-10
Client: Waste Management - Richmond
Location: Napanee, Ontario

Northing: 4903152
Easting: 335150
Project Manager: Phil Tibble

SUBSURFACE PROFILE				SAMPLE		
Depth (ft / m)	Symbol	Description	Elevation	Number	Type	Well Completion Details
-3		Ground Surface	123.572			
2		Brown *CLAY TILL*	122.048			
7		Limestone *BEDROCK*	119.152			
12		End of Borehole				
5						



Drilled By: Chalk Well Drilling
Drill Method: 6" Air Hammer
Drill Date: June 17, 2008

Hole Size: 6"
Datum: Elevation TOC - 124.462
Template: Water Supply Well - Kingston

Sheet: 1 of 1

Project No: K-B5691-11

Project: Spring 2009 Drilling Program

Client: Waste Management

Location: Richmond Landfill

Well ID: PW3/M105

Easting: 335620
Northing: 4902778
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-2 ft / m		Ground Surface	126.81				- PW3/M105 Elev. 127.48m TOC TOC s/u 0.67m	
0 – 2 ft		***Silty Sand Till*** Light brown, moist to wet, silty sand till with trace clay, cobbles and boulders.	126.00			2	Hollow stem augered to refusal 4'1""(1.24m) HW casing grouted into bedrock 5'3" (1.6m)	
2 – 4 ft			124.00			16	- clay seam 9'10" - 10' (2.99-3.05m)	1.0E-06
4 – 6 ft			122.00			9		4.7E-07
6 – 8 ft		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	120.00			9		4.4E-07
8 – 10 ft			118.00			7		
10 – 12 ft			116.00			7	- 33'3" (10.1m) weathered fracture	8.3E-06
12 – 14 ft			114.00			6	- 40' (12.2m) weathered shale fracture - 40'6" (12.34m) broken rock layer	
14 – 16 ft			112.00			4	- 47'7" (14.5m) weathered fracture	8.7E-09
16 – 18 ft						0		
18 – 20 ft						1		

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78" (96mm)
Drill Date: March 30,31, 2009

Drill Angle: Vertical (90)
Azimuth: n.a.
Datum: NAD 83 Zone 18A
Checked By: D.H.

WESA
A Better Environment For Business

Project No: K-B5691-11

Project: Spring 2009 Drilling Program

Client: Waste Management

Location: Richmond Landfill

Well ID: PW3/M105

Easting: 335620
Northing: 4902778
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
51							- Bentonite grout 20% solids	
53	16					0		
55			110.00					1.0E-05
57						0		
59	18							
61			108.00				3.05 (10') x 51mm dia. slot 10 PVC screen within #3 silica sand pack	6.0E-05
63						2		
65	20							
67			106.00					
69						1		1.6E-08
71		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.						
73	22					0		
75			104.00					3.6E-04
77								
79	24					3	- 78'2" (22m) weathered fracture	
81			102.00					
83						0		
85	26						- Bentonite gravel seal	
87								
89			100.00			1		3.8E-04
91	28							
93						2		
95			98.00					1.7E-07
97						0		
99	30	End of Borehole						

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78" (96mm)
Drill Date: March 30,31, 2009

Drill Angle: Vertical (90)
Azimuth: n.a.
Datum: NAD 83 Zone 18A
Checked By: D.H.

WESA
A Better Environment For Business

Project No: K-B9132

Project: EMP Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M106

Easting: 335330
Northing: 4902550
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
0 / 0		Ground Surface	123.97				- Elev. M106 124.67m TOC - TOC s/u 0.70m	
0 / 0		***Fill*** Grey, moist, sand and gravel fill.	124.00					
4 / 1		***Silty Sand Till*** Light brown, moist to wet, silty sand till with a trace of clay, cobbles and boulders.	122.00				- Pressure grout mixture of cement and bentonite from 0-5 ft. (0-1.5m) - HW casing pressure grouted with cement 5 ft. - 15.83ft. (1.5-4.82m). - Hollow stem augered to refusal 14.5 ft. (4.42m).	
14 / 4			120.00					
16 / 5						3	- Set HW casing 1'4" into bedrock to a depth of 15.83' (4.82m).	
18 / 5						9	- 17'7" - 18'8"(17.58 - 18.66m) thin high angle fracture with secondary mineralization	4.32E-07
20 / 6			118.00					
24 / 7						7	- 23'4" (7.19m) weathered fracture.	1.30E-08
26 / 8			116.00					
28 / 9						2		
30 / 9						1		1.04E-08
32 / 10		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	114.00					
36 / 11						3		6.89E-07
38 / 12			112.00					
42 / 13						2	- 42'5" - 42'10" (12.93 - 13.05m) high angle fracture with partial secondary mineralization.	
46 / 14			110.00					1.05E-08
48 / 15						0		
52 / 16			108.00					
54 / 16						1		
56 / 17								

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78" (96mm)
Drill Date: August 16, 17, 2010

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: D.H.

WESA
A Better Environment For Business

Project No: K-B9132

Project: EMP Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M106

Easting: 335330
Northing: 4902550
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
58–62			106.00			1	- 59'4"(18.08m) weathered shale fracture with thin mud seam.	
62–64	19							3.78E-05
64–66						3		
66–68			104.00					
68–70	21					1	- Bentonite grout 20% solids	
70–72								
72–74			102.00			1		
74–76	23							
76–78						1		
78–80			100.00					
80–82						1		
82–84	25	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.					- 3.05m (10') slot 10 PVC screen within #3 silica sand pack	1.52E-05
84–86								
86–88			98.00			2		
88–90	27							
90–92								
92–94			96.00			0	- 93'5" - 95'3" (28.47-29.03m) light grey brown, very fine homogeneous, chert layer.	3.83E-07
94–96	29							
96–98						1		
98–100			94.00					
100–102								
102–104	31					0	- Beatonite gravel seal	
104–106								
106–108			92.00					
108–110	33					1		
110–112								
112–114			90.00			0		
114–116	35	End of Borehole						

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78" (96mm)
Drill Date: August 16, 17, 2010

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: D.H.

WESA
A Better Environment For Business

Project No: K-B9132

Project: EMP Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M107

Easting: 335651
Northing: 4902655
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2 / 0		Ground Surface	127.98				- Elev. M107 128.71m TOC - TOC s/u 0.73m	
0 / 2 / 4 / 6 / 8 / 10 / 12 / 14 / 16 / 18 / 20 / 22 / 24 / 26 / 28 / 30 / 32 / 34 / 36 / 38 / 40 / 42 / 44 / 46 / 48 / 50 / 52 / 54 (1 / 3 / 5 / 7 / 9 / 11 / 13 / 15)		***Silty Sand Till*** Light brown, moist to wet, silty sand till with a trace of clay, cobbles and boulders.	128.00 126.00 124.00 122.00 120.00 118.00 116.00 114.00 112.00		20 – 60 %	11 11 8 6 8 8 7 10 10	- Pressure grout mixture of cement and bentonite from 0-5 ft. (0-1.5m) - HW casing pressure grouted with cement 5 ft. - 13.25ft. (1.5-4.04m). - Hollow stem augered to refusal 12 ft. (3.66m). - 12'7"-12'9" (3.83-3.89m) broken rock - Set HW casing 1'3" into bedrock to a depth of 13.25' (4.03m). - fracture, broken rock 16'*" (5.08m) - 17'2" (5.23m) broken rock, weathered shale fracture. - weathered fractured bedrock 16'-30' (4.87-9.14m) - 28'9" (8.76m) broken rock - 35'4"-35'9" (10.76-10.9m) high angle fracture with oxidation staining and secondary mineralization. - 38'7"-40'1" (11.76-12.22m) high angle fracture with secondary mineralization - 44'4" (13.5m) broken rock. - 46'5" (14.14m) high angle fracture, secondary mineralization - 55'2"-55'7" (16.81-16.94m) wide fracture, lost	6.95E-07 1.45E-06 2.54E-06 3.77E-07
		Limestone Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.						

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78" (96mm)
Drill Date: August 17, 18, 2010

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: D.H.

WESA
A Better Environment For Business

Project No: K-B9132
Project: EMP Drilling Program
Client: Waste Management
Location: Richmond Landfill, Napanee, ON

Well ID: M107

Easting: 335651
Northing: 4902655
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20, 60)	Fracture Frequency/Run	Comments	K (m/sec)
18			110.00			4	- 57'6" wide fracture with rounded weathered rock fragments.	3.36E-04
						5	- 63' 6" (19.35m) fracture above calcite filled vug.	
20			108.00					3.95E-09
						1	- Bentonite grout 20% solids	
22			106.00			1		1.34E-06
							- 76'4" (23.26m) weathered fracture	
24			104.00			2		1.54E-06
		Limestone Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.				3		
26			102.00				- 85'6" (26m) weathered fracture.	
						1	- 3.05m (10') slot 10 PVC screen within #3 silica sand pack	3.61E-05
28			100.00				- 92'2" (28m) weathered fracture.	
						1		3.29E-04
30			98.00			2	- Bentonite gravel seal	
						1		2.12E-04
32			96.00				- 105'5" (32.13m) top of very fine, chert layer	
						1	- water circulation did not return.	6.45E-09
34		End of Borehole	94.00					

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78" (96mm)
Drill Date: August 17, 18, 2010

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: D.H.

WESA
A Better Environment For Business

Project No: K-B9132

Project: EMP Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M108

Easting: 335792
Northing: 4902733
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2							- Elev. M108 128.37m TOC - TOC s/u 0.7m	
0		Ground Surface	128.00 127.67					
0 – 10 / 0 – 3		***Silty Sand Till*** Light brown, moist to wet, silty sand till with a trace of clay, cobbles and boulders.				7 5	- Pressure grout mixture of cement and bentonite from 0-5 ft. (0-1.5m) - HW casing pressure grouted with cement 5 ft. - 12ft. (3.65m). - Hollow stem augered to refusal 7'10" ft. (2.38m). - Set HW casing 4' into bedrock to a depth of 12' (3.65m).	
10 – 22 / 3 – 7			126.00 124.00 122.00			4 3		
22 – 30 / 7 – 9		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	120.00			3	- 28'6" (8.68m) broken rock	
30 – 36 / 9 – 11			118.00			0		
36 – 42 / 11 – 13			116.00			2	- 41' (12.4m) broken rock	
42 – 50 / 13 – 15			114.00			2 0		3.37E-07
50 – 54 / 15			112.00			4	- 54'-54'11" (16.4-16.74m) high angle fracture	6.84E-07

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78" (96mm)
Drill Date: August 19, 20, 2010

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: D.H.

WESA
A Better Environment For Business

Project No: K-B9132

Project: EMP Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M108

Easting: 335792
Northing: 4902733
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
56			110.00			0		
58	18							1.43E-08
60							- 61'-61'5" (18.75m) high angle fracture	
62								
64			108.00			3	- Bentonite grout 20% solids	
66	20							1.99E-07
68						0		
70								
72	22		106.00			1		
74								1.03E-06
76								
78			104.00			3		
80	24	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.					- 80'7"-80'9" (24.56-24.61m) broken rock and mud seam.	
82							- 3.05m (10') slot 10 PVC screen within #3 silica sand pack	2.67E-05
84			102.00			2		
86	26						- 84'10" (25.86m) weathered fracture.	
88						1	- 88'5" (26.95m) weathered fracture	
90								2.94E-04
92	28		100.00			0		
94								
96								
98	30		98.00			0	- 99' (30.17m) pyrite intrusion.	
100								
102							- Bentonite gravel seal	
104	32		96.00			0		2.63E-09
106								
108						0		
110		End of Borehole	94.00					
112	34							

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78" (96mm)
Drill Date: August 19, 20, 2010

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: D.H.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M109-1

Easting: 335405
Northing: 4902844
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2 / 0		Ground Surface	126.62				MOE Well tag #A109371 - Elev. M109-1 127.42m TOC - Elev. M109-1 127.28m TPVC - TOC s/u 0.8m	
0 – 4 / 1		***Fill*** Brown, moist to wet, fine to medium grained sand with some gravel	126.00					
4 – 10 / 1 – 3		***Fill*** Brown, wet, sand and gravel.					- Bentonite gravel backfill 0-5 ft. (0-1.5m)	
10 – 14 / 3		***Fill*** Grey, wet, crushed rock.	124.00				- HW casing pressure grouted with cement 5-18'8" (1.5-5.7m)	
14 – 16 / 5		***Clayey Sand*** Light brown, wet, clayey sand.	122.00				- Hollow stem auger refusal 14'2" (4.3m)	
16 – 18 / 5						10	- Set HW casing 4'6" into rock to a depth of 18'8"(5.7m)	
18 – 22 / 5 – 7						2		1.E-07
22 – 24 / 7			120.00			1		
24 – 26 / 7								5.E-07
26 – 28 / 7 – 9								4.E-07
28 – 30 / 9			118.00			4		
30 – 34 / 9						2	- 34'1" (10.4m) weathered fracture.	3.E-09
34 – 36 / 11		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	116.00					
36 – 38 / 11						5	- 39'1"(11.9m) and 39'4" (11.98) weathered rounded burrow fragments within fracture.	
38 – 42 / 11 – 13			114.00					3.E-07
42 – 44 / 13						0		
44 – 48 / 13 – 15			112.00			3	- 49'1"(14.96m) fracture	4.E-07
48 – 54 / 15 – 17			110.00			3		
54 – 58 / 17						1		8.E-007

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 3,4,7, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M109-1

Easting: 335405
Northing: 4902844
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
60			108.00					
62	19					2	- 10ft. (3m) slot 10 PVC screen within 3m silica sand pack.	7.E-06
64								
66								
68			106.00			1	- 67' (20.42m) fracture with weathered broken rock.	
70	21						- 71'3" (21.7m)fracture.	7.E-06
72						6		
74			104.00					
76	23							
78						4	- 78'7" (24m) thin mud seam before fracture with broken rock.	3.E-06
80								
82	25		102.00					
84						2	- 84'9" (25.8m) mud seam witin broken shale pating.	1.E-06
86								
88	27	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	100.00			1	- bentonite gravel seal	
90								
92								7.E-09
94			98.00			0		
96	29							
98						0	- 97'8" - 100' (29.76 - 30.48m) light grey, microcrystalline chert, with trace stylolites.	
100								9.E-09
102	31		96.00					
104						0		
106								
108	33		94.00					1.E-08
110						0		
112								2.E-06
114	35		92.00			0		
116		End of Borehole						
118								
120			90.00					

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 3,4,7, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M109-2

Easting: 335407
Northing: 4902839
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2 / 0		Ground Surface	126.70				MOE Well tag #A101284 - Elev. M109-2 127.49m TOC - Elev. M109-2 127.44m TPVC - TOC s/u 0.79m	
0–4 / 1		Gravel Fill	126.00					
4–10 / 1–3		Crushed Limestone Fill	124.00				- Well casing pressure grouted with cement 0-17' (0-5.18m)	
10–14 / 3–5		Clay Till	122.00					
16–54 / 5–15		Limestone Bedrock	120.00 118.00 116.00 114.00 112.00				- Bentonite gravel backfill 0-31'5"(0-9.6m) - 10ft. (3m) slot 10 PVC screen within 3m silica sand pack. - Bentonite gravel backfill	4.E-06 3.E-06 6.E-06 8.E-06 4.E-06
54		End of Borehole	110.00					

Drilled By: Chalk Well Drilling Ltd.
Drill Method: Air Rotary
Hole Size: 6" (150mm)
Drill Date: March 31, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M110-1

Easting: 335543
Northing: 4902883
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2 / 0		Ground Surface	126.82				MOE Well tag #A109372 - Elev. M110-1 127.55m TOC - Elev. M110-1 127.49m TPVC - TOC s/u 0.73m	
0 – 10 / 0 – 3		***Sandy Silt*** Brown, moist to wet, sandy silt with some gravel.	126.00 124.00				- Bentonite gravel backfill 0-5 ft. (0-1.5m) - HW casing pressure grouted with cement 5-13'4" (1.5-4.06m) - Hollow stem auger refusal 10'3" (3.1m)	
10 – 16 / 3 – 5			124.00 122.00			6 4	- 13' (3.96m) mud seam within weathered - Set HW casing 2'10" into rock to a depth of - 14'5" 14' 11" weathered fractures.	5.E-07
16 – 22 / 5 – 7			122.00 120.00			13 3	- 18'7" (5.66m) weathered fracture. - 19'10" (6.04m) mudseam	8.E-08
22 – 30 / 7 – 9			120.00 118.00			1 0		2.E-08
30 – 36 / 9 – 11		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	118.00 116.00			3	- 39'9"-39'11" (12.11-12.16m) mud seam with weathered shale layer.	6.E-06
36 – 42 / 11 – 13			116.00 114.00			2		2.E08
42 – 48 / 13 – 15			114.00 112.00			1	- 47'2"-49'9" (14.37-15.16m) thin re-cemented high angle fracture.	
48 – 54 / 15 – 17			112.00 110.00			0	- 55'10"-58'4" (17.01-17.77m) thin re-cemented high angle fracture.	2.E-08

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 7-9, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M110-1

Easting: 335543
Northing: 4902883
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
58						0		6.E-06
60								
62	19		108.00			2	- 63'2" weathered fracture	
64								
66								1.E-05
68	21		106.00			1	- 10ft 3.0m) slot 10 PVC screen within 3m silica sand pack.	
70								
72						0		
74			104.00					1.E-05
76	23							
78						2	- 79'5"-79'6" (24.29m) mud seam	
80								
82	25	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	102.00			0	- Bentonite gravel seal	1.E-05
84								
86								
88	27		100.00			0		3.E-08
90								
92								
94	29		98.00			0		2.E-08
96								
98						0	- 98'5"-100'(30m) light greyish brown, mycrocrystalline, chert like.	
100								
102	31		96.00			0	- limestone cuttings.	1.E-08
104								
106								
108	33		94.00			0		1.E-08
110								
112		End of Borehole						
114	35		92.00					
116								

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 7-9, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M111-1

Easting: 335250
Northing: 4902774
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2		Ground Surface	128.21				MOE Well tag #A109373 - Elev. M111-1 128.95m TOC - Elev. m111-1 128.80m TPVC - TOC s/u 0.74m	
0 / 0		***Sandy Silt*** Granular fill overlying light brown sandy silt.	128.00					
10 / 3		***Sandy Silt Till*** Light brown, to grey, sandy silt till, with a trace of clay and cobbles.	126.00 124.00 122.00				- Bentonite gravel backfill 0-5 ft. (0-1.5m) - HW casing pressure grouted with cement 5-28'3" (1.5-8.61m)	
26 / 8		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	120.00 118.00 116.00 114.00 112.00 110.00			2 9 3 0 3 0 1 1	- Hollow stem auger refusal 25'6" (7.77m) - 27' (8.22m) fracture with broken rock. - Set HW casing 2'9" into rock to a depth of 28'3" (8.61m). - 32'3" (9.83m) weathered fracture. - 44'10" (13.66)Fracture zone, washed out mud seam.	4.E-08 4.E-08 3.E-07 4.E-08 4.E-08

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 9,10, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M111-1

Easting: 335250
Northing: 4902774
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
64–66						0		
66–68	20		108.00			0		9.E-08
68–70								
70–72						0		
72–74	22		106.00					1.E-07
74–76							-77'2"(23.52m) fracture.	
76–78						1		
78–80	24		104.00					9.E-08
80–82						0		
82–84								
84–86	26		102.00			0		3.E-07
86–88								
88–90		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.						
90–92						0		
92–94	28		100.00			1	- 92'8" (28.24m) thin weathered fracture.	
94–96								
96–98							- 10ft. (3.0m) slot 10 PVC screen within 3m silica sand pack.	1.E-06
98–100	30		98.00			0		
100–102							- 102'7" (31.26m) pyrite intrusion.	
102–104							- 102'9"-106' (31.3m) light greyish brown, mycrocrystalline, chert like.	
104–106	32		96.00			0		4.E-08
106–108								
108–110						0		
110–112	34		94.00					2.E-07
112–114						0	- Bentonite gravel seal.	
114–116								
116–118	36		92.00			0		2.E-07
118–120								
120–122								
122–124						0		1.E-07
124–126	38		90.00					
126–128		End of Borehole						

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 9,10, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M112-1

Easting: 335274
Northing: 4902692
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2		Ground Surface	126.00 / 125.69				MOE Well tag #A109374 - Elev. M112-1 126.38mTOC - Elev. M112-1 126.31m TPVC - TOC s/u 0.73m	
0 – 16 / 1 – 5		***Sandy Silt*** Light brown, moist to wet, sandy silt.	124.00 – 120.00			7	- Bentonite gravel backfill 0-5 ft. (0-1.5m) - HW casing pressure grouted with cement 5-18'7" (1.5-5.661m) - Hollow stem auger refusal 16'11" (5.15m) - Set HW casing 1'8" into rock to a depth of 18' 7" (5.66m). - 18' (5.48m) fracture zone.	3.E-07
16 – 36 / 5 – 11		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	120.00 – 118.00			5	- 25'11" (7.9m) weathered broken shale seam.	4.E-08
			118.00 – 116.00			2	- 29'8" (9.04m) weathered fracture.	
			116.00 – 114.00			0		4.E-08
						3	- 38'1" (11.6m) weathered fracture. - 38'5"-38'8" (11.7-11.78m) mud seam with rock fragments, weathered burrowed surface.	2.E-06
36 – 48 / 11 – 15			114.00 – 112.00			0		
						3	- 48'9"-50' (14.86-15.24) high angle fracture.	2.E-07
48 – 58 / 15 – 17			112.00 – 108.00			1	- 52' (15.85m) fracture above re-mineralized high angle fracture.	2.E-07
						1		

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 11, 14, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M112-1

Easting: 335274
Northing: 4902692
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
60–62								3.E-07
62–64 (19)						2		
64–66			106.00					
66–68						1	- 67'-67'10" (20.42-20.67m) high angle fracture.	4.E-08
68–70 (21)								
70–72			104.00			0		
72–74								4.E-08
74–76 (23)								
76–78			102.00			0		
78–80								
80–82						0		1.E-07
82–84 (25)			100.00					
84–86		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.				1	- 10ft. (3.0m) slot 10 PVC screen within 3m silica sand pack	4.E-06
86–88								
88–90 (27)			98.00			0		
90–92								
92–94							- 96'1" pyrite intrusion above light greyish brown, microcrystalline , chert like.	9.E-08
94–96 (29)			96.00			0		
96–98								
98–100						0		
100–102 (31)			94.00					4.E-08
102–104						0		
104–106								
106–108							- Bentonite gravel seal.	
108–110 (33)			92.00			0		
110–112								
112–114								4.E-08
114–116 (35)								
116–118		End of Borehole	90.00					
118–120								

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 11, 14, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M114-1

Easting: 335437
Northing: 4902530
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2 / 0		Ground Surface	124.41				MOE Well tag #A109377 - Elev. M114-1 125.36m TOC - Elev. M114-1 125.30m TPVC - TOC s/u 0.95m	
0 – 4 / 1		***Sandy Silt*** Brown, moist to wet, sandy silt overlying sandy silt till.	124.00				- Hollow stem auger refusal 6'2" (1.88m) - HW casing pressure grouted with cement 4'-8'11" (1.22-2.72m).	
6 – 10 / 2 – 3			122.00			5	- Set HW casing 2'9" into bedrock to a depth of 8'11" (2.72m). - Mud seams 8'4", 9'8", and 10'.	2.E-07
12 – 14 / 4						11	- intensely fractured zone 10'10"- 15'5".	
16 / 5			120.00				- 15'5" (4.7m) mud seam.	2.E-09
18						7	- intensely fractured zone 15'10"- 20'10". - fracture	
20 – 24 / 6 – 7			118.00					2.E-09
24		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.				3		
26 – 28 / 8			116.00			0		4.E-12
30 / 9								
32 – 34			114.00			0		
36 / 11							- 36' (10.97m) fracture. - 36'6"-36'9" (11.12-11.2m) broken rock, trace mud.	3.E-08
38						4		
40 – 42 / 12 – 13			112.00					
44						1		3.E-09
46 – 48 / 14			110.00					
50 / 15						0		
52								3.E-10

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 23, 24, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M114-1

Easting: 335437
Northing: 4902530
Field Personnel: B.A.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
54–56			108.00			0		
56–58	17					0		1.E-08
58–60			106.00					
60–62						0		
62–64	19							4.E-11
64–66			104.00			0		
66–68								
68–70	21					0		4.E-07
70–72			102.00					
72–74						0		
74–76	23	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.					- weathered fracture.	
76–78						1		
78–80			100.00				- 81' (24.7m) weathered fracture.	4.E-07
80–82	25					1		
82–84								
84–86								4.E-10
86–88			98.00			0	- 88'11" (27.1m) pyrite intrusion above light grey, microcrystalline, chert like rock.	
88–90	27							
90–92								
92–94			96.00			4	- 92'11" and 93' weathered limesone layer - 93'6" - 96'6" (28.42- 29.42m) microcrystalline texture - 95'4" (29.06m) mud seam.	
94–96	29							2.E-05
96–98								
98–100			94.00			0	- 10ft. (3.0m) slot 10 PVC screen within 3m silica sand pack	
100–102	31							
102–104						0		4.E-12
104–106							- Bentonite gravel seal	
106–108		End of Borehole	92.00					

Drilled By: Aardvark Drilling Inc.
Drill Method: Diamond Drilling
Hole Size: HQ3 3.78 (96mm)
Drill Date: February 23, 24, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504

Project: 2011 Hydrogeo Drilling Program

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M114-2

Easting: 335438
Northing: 4902527
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2							MOE Well tag #A109142 - Elev. M114-2 125.36m TPVC - TOC s/u 0.95m	
0		Ground Surface	124.41					
0		Topsoil, Sand and Gravel						
2		Coarse soil Silt/Clay	124.00				- bentonite gravel seal 0-4'6" (0-1.37m)	
4 (1)		Clay/Silt						
6		Clay/Silt						
8		Limestone Bedrock	122.00				- 10ft. (3m) slot 10 PVC screen within 3m silica sand pack.	
10 (3)		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Auger/Air Hammer
Hole Size: 4" (100mm)
Drill Date: February 10, 2011

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA
A Better Environment For Business

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M121

Easting: 335529
Northing: 4902337
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2 / 0		Ground Surface	120.97				MOE Well tag #A130074 - Elev. M121 121.78m TOC - Elev.121 121.73m TPVC - TOC (HW) s/u 0.81m	
0 / 2 / 4 / 1		Brown, sandy silty Clay.	121.00 120.00				- Hollow stem auger refusal 4' (1.22m)	
6 / 8 / 10 / 3			119.00 118.00				- HW casing pressure grouted with cement to 9' (2.74m)	
12 / 14 / 16 / 5			117.00 116.00					
18 / 20 / 22 / 7		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	115.00 114.00					
24 / 26 / 28 / 9			113.00 112.00				- Bentonite pressure grouted to surface.	
30 / 32 / 34 / 11			111.00 110.00					
36 / 38 / 40 / 13			109.00 108.00					
42 / 44 / 46 / 15			107.00 106.00					3.E-08
48 / 50								

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 17, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M121

Easting: 335529
Northing: 4902337
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency/Run	Comments	K (m/sec)
53			105.00					9.E-08
55								
57	17		104.00					
59			103.00					
61								3.E-08
63	19		102.00					
65			101.00					
67								
69	21		100.00					
71			99.00					
73								
75	23	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	98.00					9.E-08
77								
79			97.00					
81								
83	25		96.00				- 10ft. (3.0m) slot 10 PVC screen within 3m silica sand pack.	1.E-06
85			95.00					
87								
89	27		94.00					
91			93.00					2.E-07
93								
95	29		92.00					
97								
99			91.00				- Bentonite gravel seal.	7.E-08
101								
103	31		90.00					
105		End of Borehole	89.00					

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 17, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M123

Easting: 335905
Northing: 4902479
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2							MOE Well tag #A130073 - Elev. M123 123.60m TOC - Elev. M123 123.54m TPVC - TOC (HW) s/u 0.68m	
0		Ground Surface	122.92					
0		Brown, sandy silty Clay.	123.00					
2 / 1			122.00				- Hollow stem auger refusal 1'6" (0.46m)	
6			121.00					
8 / 10 / 3			120.00				- HW casing pressure grouted with cement to 8' (2.44m)	
12			119.00					
16 / 5			118.00					8.9E-09
18			117.00					
22 / 7		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	116.00					2.3E-08
26			115.00					
28 / 30 / 9			114.00				- Bentonite pressure grouted seal.	2.4E-08
34			113.00					
36 / 11			112.00					3.5E-07
38			111.00					
42 / 13			110.00					4.7E-08
46			109.00					
48			108.00					
50 / 15								

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 23, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-00-08

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M123

Easting: 335905
Northing: 4902479
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
53			107.00					7.3E-07
55	17		106.00					
57			105.00					1.0E-06
59			104.00					
61	19		103.00				- water bearing fracture 63'4"(19.32m)	1.8E-07
63			102.00					
65			101.00					2.2E-07
67	21		100.00					
69		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	99.00				- 10ft. (3.0m) slot 10 PVC screen wothin 3M silica sand pack.	4.2E-04
71			98.00					
73	23		97.00					1.3E-07
75			96.00				- water bearing fracture 87'9" (26.75m)	
77			95.00					
79	25		94.00				- Bentonite gravel seal.	3.7E-07
81			93.00					
83			92.00					2.3E-06
85	27							
87								
89								
91	29							
93								
95								
97	31							
99								
101		End of Borehole	91.00					
103								
105								

Drilled By: Aardvark Drilling Inc.
Drill Method: Rotary Tri-cone
Hole Size: 3.78" (96mm)
Drill Date: May 23, 2012

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M167

Easting: 336266
Northing: 4902624
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2							MOE Well tag #A133065 - Elev. M167 120.68m TOC - Elev. M167 120.62m TPVC - TOC s/u 0.70m	
0		Ground Surface	119.98					
0		Brown-grey, silty Clay with gravel.	120.00					
2 / 1			119.00				- Hollow stem auger to 5' (1.5m)	
4							- 4" (10mm) steel casing pressure grouted with cement to 5' (1.5m)	
6			118.00				- fractures 7', 7.5', 10' and 14' (2.13, 2.28, 3.05 and 4.26m)	
8								
10 / 3			117.00					
12								1.E-07
14			116.00					
16 / 5			115.00				- fractures 17' and 20' (5.18 and 6.1m)	
18								
20			114.00					
22 / 7		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	113.00					1.E-07
24								
26			112.00				- fracture 27' (8.23m)	
28								
30 / 9			111.00					
32								
34			110.00				- 20% soliids bentonite grout seal	1.E-06
36 / 11			109.00				- fractures 35'6", 36' 39'6" and 44' (10.8, 11, 12 and 13.4m)	1.E-06
38								
40			108.00					
42 / 13			107.00					
44								
46			106.00					1.E-08
48								
50 / 15			105.00				- moderately wide fracture 51' (15.55m)	

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 6, 11, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M167

Easting: 336266
Northing: 4902624
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99 101	17 19 21 23 25 27 29	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	104.00 103.00 102.00 101.00 100.00 99.00 98.00 97.00 96.00 95.00 94.00 93.00 92.00 91.00 90.00		20 60		- moderately wide water bearing fracture 57' (17.37m) - Bentonite gravel seal - water bearing fracture 71' (21.64m) - fracture 78' (23.77m) - moderately wide fracture 79' (24.08m) - 3.0m (10ft.) slot 10 PVC screen with 3M silica sand pack - fracture 84' (25.6m) - Bentonite gravel seal	3.E-08 4.E-07 1.E-04 1.E-08 3.E-07
101 103 105	31	End of Borehole	89.00 88.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 6, 11, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™ a BluMetric™ company

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M168

Easting: 336063
Northing: 4902714
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2							MOE Well tag #A133059 - Elev. M168 126.29m TOC - Elev. M168 126.21m TPVC - TOC s/u 1.0m	
0		Ground Surface	125.29					
0 – 2		Light brown, fine to medium grained, silty Clay with gravel.	125.00				- Hollow stem auger to 4'6" (1.37m)	
4 / 1			124.00				- 6" tri-cone to 6'6" (1.98m) and cemented grouted 4" steel casing.	
8			123.00				- fractures 8', 10', 13', 14'6", 15, and 17' (2.43, 3.05, 3.96, 4.42, 4.57 and 5.18m)	
10 / 3			122.00					
12 – 14			121.00					5.E-09
16 / 5			120.00					
18							- moderately wide fracture 18' (5.49m) - fracture 19' (5.79m)	
20 – 22			119.00					
24 / 7		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	118.00				- fractures 24' and 24'6" (7.31 and 7.47m)	2.E-09
26 – 28			117.00					
30 / 9			116.00				- moderately wide fracture 30' (9.14m) - fracture 31' (9.45m)	
32 – 34			115.00					
36 / 11			114.00					5.E-07
38 – 40			113.00				- 20% solids bentonite grout seal	
42 / 13			112.00				- fractures 43' and 46' (13.1 and 14m)	
44 – 46			111.00					
48 / 15								4.E-09
50			110.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 6, 12, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M168

Easting: 336063
Northing: 4902714
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
53			109.00					
55	17		108.00					
57							- moderately wide fracture 58'6" (17.83m)	4.E-09
59			107.00					
61								
63	19		106.00					
65								
67			105.00					
69	21						- fracture 68' (20.72m)	
71			104.00					7.E-08
73								
75	23	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	103.00				- fracture 75' (22.86m)	
77			102.00					
79							- Bentonite gravel seal	
81			101.00					9.E-06
83	25							8.E-06
85			100.00				- fracture 84' (25.6m)	
87			99.00					
89	27							
91			98.00				- 3.0m (10ft) slot 10 PVc screen within 3M silica sand pack	
93			97.00					3.E-08
95	29							6.E-08
97			96.00					
99			95.00				- moderately wide fracture 99' (30.17m)	
101	31						- Bentonite gravel seal	
103			94.00					
105		End of Borehole	93.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 6, 12, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M170

Easting: 335889
Northing: 4902865
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2		Ground Surface	127.51				MOE Well tag #A077021 - Elev. M170 128.21m TOC - Elev M170 elev. 128.14m TPVC - TOC s/u 0.70m	
0 / 2 / 4 / 1		Brown, wet, clay till.	127.00 126.00					
6 / 8 / 10 / 3			125.00 124.00				- Hollow stem auger to 9'9" (2.97m) - 4" (100mm) steel casing pressure grouted with cement to 9' 9" (2.97m)	
12 / 14 / 16 / 5			123.00 122.00				- fracture 14' (4.27m)	
18 / 20 / 22 / 7		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	121.00 120.00				- moderately wide fracture 20'6" (6.24m) - fractures 23' and 24' (7.01 and 7.32m)	2.E-09
24 / 26 / 28 / 9			119.00 118.00				- fractures 28' and 30' (8.53 and 9.14m) - 20% solids bentonmnite gravel seal	1.E-09
30 / 32 / 34 / 11			117.00 116.00				- moderately wide fracture 33'6" (10.21m)	
36 / 38 / 40 / 42 / 13			115.00					1.E-05
44 / 46 / 48 / 15			114.00 113.00				- moderately wide water bearing fracture 44' (13.41m) - moderately wide fracture 46' (14.02m)	
50 / 52			112.00				- fracture 50' (15.24m)	2.E-09

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 14, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-11

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M170

Easting: 335889
Northing: 4902865
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
55			111.00					
57			110.00					
59	18		109.00					
61								3.E-08
63			108.00				- moderately wide water bearing fracture 64' (19.5m)	
65	20		107.00					
67								
69			106.00				- Bentonite gravel seal	
71							- fracture 72' (21.95m)	
73	22		105.00					1.E-09
75								
77		***Limestone***	104.00					
79	24	Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.						
81			103.00				- fracture 80' (24.38m)	
83							- 3.0m (10ft) slot 10 PVC screen within 3M silica sand pack	
85	26		102.00				- moderately wide fracture 85' (25.9m)	6.E-07
87								7.E-07
89			101.00					
91			100.00					
93	28						- fracture 93' (28.3m)	
95			99.00					
97			98.00					3.E-08
99	30						- Bentonite gravel seal	3.E-08
101			97.00					
103							- fracture 102' (31.08m)	
105	32		96.00					
107			95.00					
109		End of Borehole	94.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: March 7, 14, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-12

Project: South Property Investigation

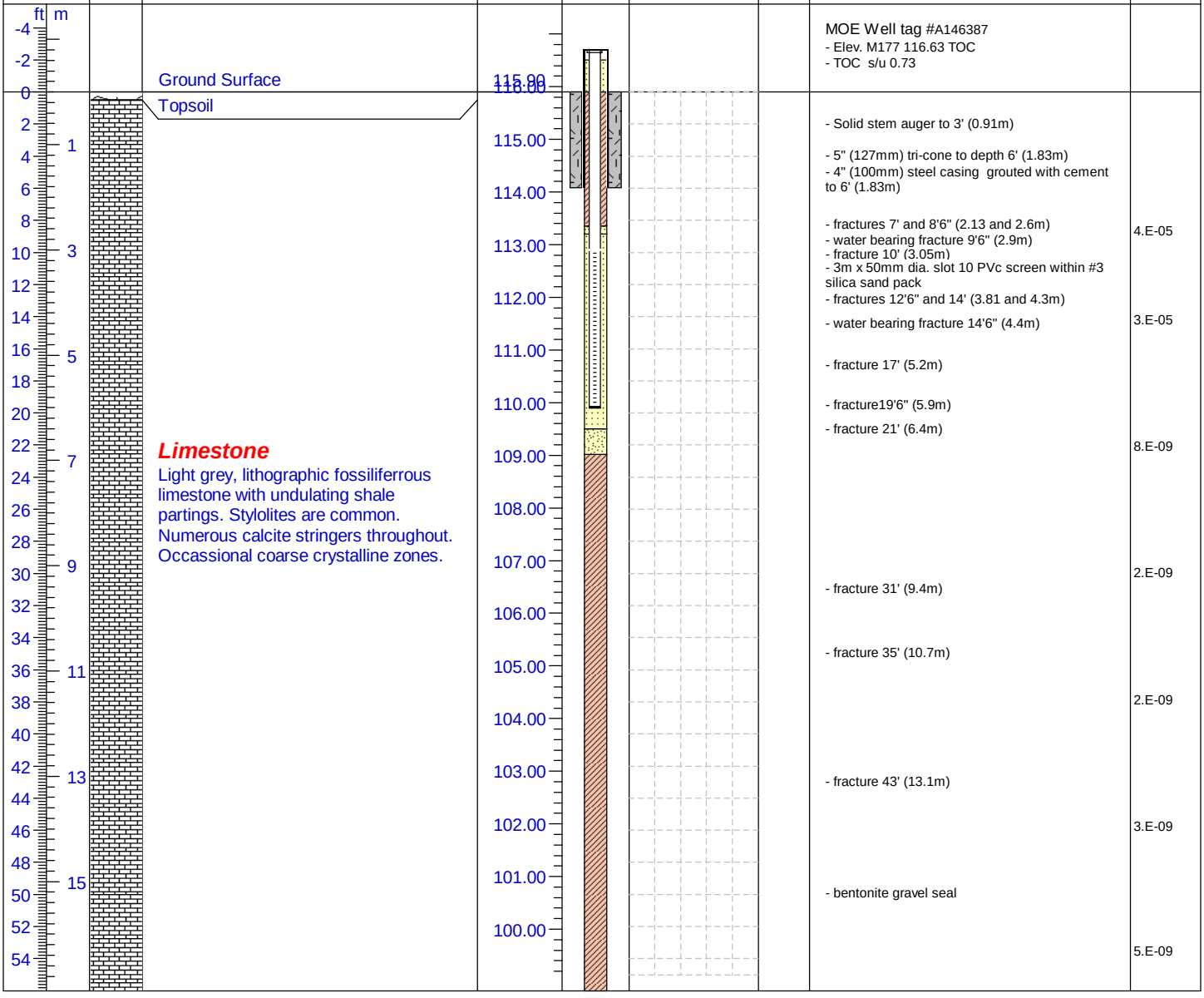
Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M177

Easting: 335784
Northing: 4902084
Field Personnel: M.L.

SUBSURFACE PROFILE



Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: November 13, December 5, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M177

Easting: 335784
Northing: 4902084
Field Personnel: M.L.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
57–113		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	98.00 to 83.00				- fracture 61' (18.6m) - bentonite gravel seal - fracture 81' (24.7m) - fracture 82'6" (25.1m) - bentonite gravel seal	5.E-09 1.E-08 1.E-08 2.E-08 4.E-08 4.E-08 6.E-08 6.E-08
111–113	34	End of Borehole	82.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: November 13, December 5, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™ a BluMetric™ company

Project No: K-B9504-19

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178R-2

Easting: 336008
Northing: 4902233
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
0 / 0		Ground Surface	117.00 116.52				MOE Well tag # A175231 - Elev. M178R-2 117.24 m TOC - Elev. M178R-2 117.20 m TPVC - TOC s/u 0.72m	
0 / 0 – 4 / 1		***Sandy Clay*** Brown, cobbles at bedrock surface	116.00					
4 / 1 – 36 / 9		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	115.00 114.00 113.00 112.00 111.00 110.00 109.00 108.00 107.00 106.00				-10" dia. (254mm) tri-cone to depth 43'6" (13.25m) - 6" dia. (152mm) steel casing grouted with cement to 43'6" (13.25m) - water bearing fractures 11'6", 12' (3.5, 3.65m) - fracture 14' (4.26m) - bentonite gravel seal - fracture 28' (8.53m)	

Drilled By: Aardvark Drilling Ltd.
Drill Method: Mud Rotary Tri-cone
Hole Size: 6" (152mm)
Drill Date: Aug. 19, 21, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-19

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178R-2

Easting: 336008
Northing: 4902233
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
38				105.00				- fracture 37' (11.28m)	
40	12								
42				104.00				- #1 Silica sand pack	
44				103.00					
46	14								4.5E-06
48				102.00				- water bearing fracture 47' (14.3m)	
50				101.00					
52	16							- water bearing fracture 52' (15.8m)	8.5E-05
54			***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	100.00				3.0m x 50mm Slot 10 PVC screen within #3 silica sand pack.	
56									
58				99.00					
60	18								4.5E-08
62				98.00					
64				97.00				- water bearing fracture 64' (19.5m)	
66	20							- fracture, artesian, sulfur odour present 65'6" (20m)	2.5E-02
68				96.00					2.0E-03
70				95.00				- bentonite gravel seal	
72	22								
74			End of Borehole	94.00					
76									

Drilled By: Aardvark Drilling Ltd.
Drill Method: Mud Rotary Tri-cone
Hole Size: 6" (152mm)
Drill Date: Aug. 19, 21, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-19

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178R-4

Easting: 336002
Northing: 4902232
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2			117.00				MOE Well tag # A175229 - Elev. M178R-4 117.34 m TOC - Elev. M178R-4 117.30 m TPVC - TOC s/u 0.80m	
0		Ground Surface	116.52				- Water level elev. 116.55m recorded Nov. 20, 2015	
2 / 1		***Sandy Clay*** Brown, cobbles at bedrock surface	116.00					
4			115.00				-10" dia. (254mm) tri-cone to depth 8'8" (2.64m) - 6" dia.(152mm) steel casing grouted with cement to 8'8" (2.64m)	
6								
8			114.00				- bentonite gravel seal	
10 / 3							- #1 Silica sand pack - water bearing fractures 10'6", 11' (3.2, 3.35m)	
12		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	113.00					6.2E-03
14			112.00				1.9m x 50mm Slot 10 PVC screen within #3 silica sand pack.	2.3E-03
16 / 5							- water bearing fracture 16' (4.9m)	1.4E-03
18			111.00				- fracture 18' (5.5m)	
20							- fracture 20' 9 (6.1m)	
22 / 7			110.00					
		End of Borehole						

Drilled By: Aardvark Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 6" (152mm)
Drill Date: Aug. 15,17, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: 160143-11

Project: Complementary CAZ Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M178R-5

Easting: 335997
Northing: 4902232
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2							MOE Well tag # A193460 - Elev. M178R-5 117.33 m TPVC - TOC s/u 0.84m	
			117.00					
0		Ground Surface	116.49				- Water level elev. 116.51m recorded Apr. 21, 2017	
2			116.00				- 4" steel protective casing - bentonite gravel seal	
4 / 1		***Sandy Clay*** Brown, trace gravel at bedrock surface						
			115.00					
6		***Limestone*** (2.29m) water bearing fracture.					1.22m x 50mm Slot 10 PVC screen within #3 silica sand pack.	
8		Auger refusal (2.44m) End of Borehole	114.00					

Drilled By: GET Drilling Ltd.
Drill Method: Solid Flight Augers
Hole Size: 6" (152mm)
Drill Date: November 15, 2016

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-12

Project: South Property Investigation

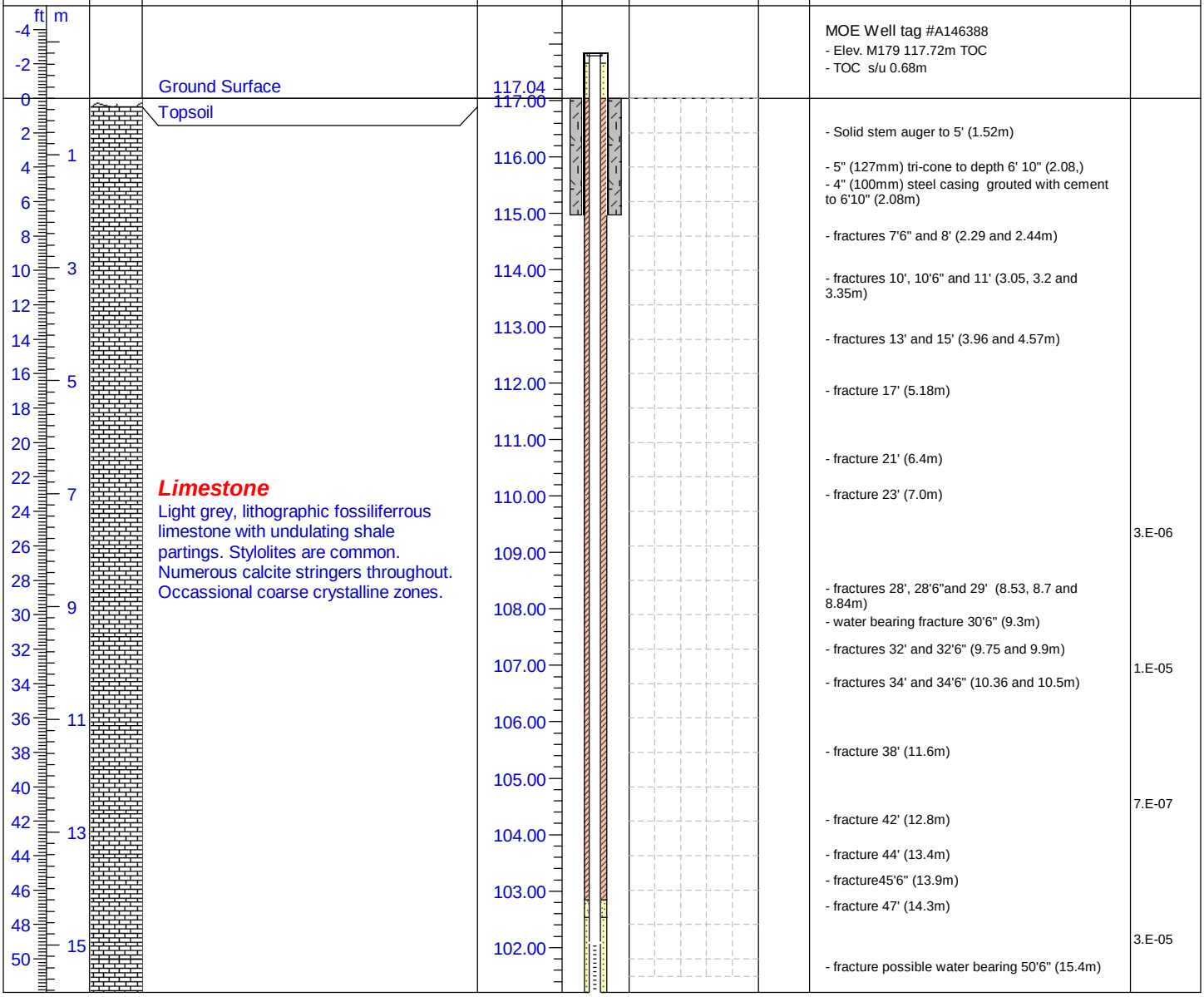
Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M179

Easting: 336338
Northing: 4902356
Field Personnel: B.M.

SUBSURFACE PROFILE



Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: November 11, 13, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-12

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M179

Easting: 336338
Northing: 4902356
Field Personnel: B.M.

SUBSURFACE PROFILE

Depth (m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
53			101.00				- fractures 53' and 53'6" (16.2 and 16.3m) - 3m x50mm dia. slot 10 PVC screen within #3 silica sand pack	
55								
57	17		100.00				- fracture 57' (17.4m)	3.E-05
59			99.00					
61								
63	19		98.00				- fracture possible water bearing, sulphur odour - fracture 64' (19.5m)	
65			97.00					9.E-06
67								
69	21		96.00					
71								
73			95.00					2.E-07
75	23	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	94.00				- fracture 75' (22.9m)	
77								
79			93.00					4.E-08
81	25		92.00				- fracture 81' (24.7m)	3.E-08
83								
85			91.00				- bentonite gravel seal	
87								
89	27		90.00					4.E-08
91							- fracture 91' (27.7m)	
93			89.00					
95	29		88.00				- fracture 95' (29m)	4.E-08
97								3.E-08
99			87.00					
101	31		86.00					
103								
105		End of Borehole	85.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: November 11, 13, 2013

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD 83 Zone 18
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M185-1

Easting: 336175
Northing: 4902152
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
							MOE Well tag # A163300 - Elev. M185 117.33 m TOC - TOC s/u 0.76m	
0 / 0		Ground Surface	117.00 116.57					
0 / 0		Topsoil overlaying brown clay.						
2 / 1			116.00					
4 / 1							- 5.75" (146mm) tri-cone to depth 6'6" (1.98m) - 4" (100mm) steel casing grouted with cement to 6'6" (1.98m)	
6 / 2			115.00					
8 / 2								
10 / 3			114.00					
12 / 4								
14 / 4			113.00					
16 / 5							- fracture 16'5" (5m)	
18 / 5			112.00					
20 / 6							- bentonite gravel seal	2.E-08
22 / 7		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	111.00					
24 / 7								
26 / 8			110.00				- fracture 26'2" (8m)	
28 / 9								1.E-09
30 / 9			109.00					
32 / 10							- fracture 32'9" (10m)	
34 / 10			108.00				- fracture 34'5" (10.5m)	
36 / 11							- fracture 36' (11m)	
38 / 12			107.00					
40 / 12							- fracture 39'5" (12m)	7.E-09
42 / 13			106.00					
44 / 13								
46 / 14			105.00					
48 / 15								
50 / 15			104.00				- fracture trace water 49'2" (15m)	1.E-06
52 / 16							- fracture 50'9" (15.5m)	
			103.00					
			102.00					
			101.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 17, 18, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M178-1 Elev. 116.65m TOC
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M185-1

Easting: 336175
Northing: 4902152
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency/Run	Comments	K (m/sec)
55			100.00					
57							- bentonite gravel seal	
59	18		99.00					1.E-06
61			98.00					
63								
65	20		97.00				- water bearing fracture 64'7" (19.7m) - fracture 65'7" (20m)	
67								
69			96.00					1.E-07 1.E-07
71	22		95.00					
73								
75			94.00				- fracture 75'6" (23m)	
77		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.						
79	24		93.00					3.E-08
81								
83			92.00					
85	26		91.00					
87			90.00					3.E-08
89								
91	28		89.00					
93								
95			88.00				- fracture 94'9" (28.9m)	
97			87.00					4.E-08
99	30						- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	
101			86.00					2.E-08
103			85.00					
105	32							
107			84.00					
109		End of Borehole	83.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 17, 18, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M178-1 Elev. 116.65m TOC
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M185-2

Easting: 336175
Northing: 4902152
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2							MOE Well tag # A163304 - Elev. M185 117.38 m TOC - TOC s/u 0.70m	
0		Ground Surface	117.00 116.65					
0		Topsoil overlaying brown clay.						
2 / 1			116.00					
4			115.00				- 5.75" (146mm) tri-cone to depth 7' (2.11m) - 4" (100mm) steel casing grouted with cement to 7' (2.11m)	
6								
8			114.00					
10 / 3			113.00					
12								
14			112.00					
16 / 5							- bentonite gravel seal	
18			111.00					
20							- water bearing fracture 20' (6.1m))	
22 / 7			110.00				- water bearing fracture 23' (6.1m)	
24								
26		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	109.00					
28								
30 / 9			108.00					
32			107.00				- fracture 32'9" (10m)	
34								
36 / 11			106.00					
38								
40			105.00					
42 / 13			104.00					
44								
46			103.00				- water bearing fracture 47' (14.3m)	
48 / 15			102.00				- 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack	
50								
52			101.00					
54			100.00					
56 / 17		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: August 28, 29, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M178-1 Elev. 116.65m TOC
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M186

Easting: 336502
Northing: 4902641
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2							MOE Well tag # A163301 - Elev. M186 121.34 m TOC - TOC s/u 0.76m	
0		Ground Surface	121.00 120.58					
0		Topsoil with brown clay.						
2 / 4 / 6 / 8 / 10 / 12 / 14 / 16 / 18 / 20 / 22 / 24 / 26 / 28 / 30 / 32 / 34 / 36 / 38 / 40 / 42 / 44 / 46 / 48 / 50 / 52 / 54 / 56		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	120.00 119.00 118.00 117.00 116.00 115.00 114.00 113.00 112.00 111.00 110.00 109.00 108.00 107.00 106.00 105.00 104.00				- 5.75" (146mm) tri-cone to depth 4'6' (1.37m) - 4" (100mm) steel casing grouted with cement to 4'6" (1.37m) - bentonite gravel seal - fracture 24'7" (7.5m) - fracture 25'3" (7.7m) - fracture trace water 31'1" (9.5m) - 3m x 50mm dia. slot 10 PVC screen within #3 silica sand pack - fracture 39'5" (12m) - fracture 49'2" (15m) - fracture 54'6" (16.6m)	1.E-09 1.E-09 1.E-07 4.E-09 2.E-08 4.E-08

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 17, 19, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M166 Elev. 123.19m TOC
Checked By: P.T.

WESA™
a BluMetric™ company

Project No: K-B9504-14

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M186

Easting: 336502
Northing: 4902641
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
59–117		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	102.00 to 86.00				- bentonite gravel seal - fracture 83'6" (25.5m) - fracture 85'3" (26m) - bentonite gravel seal	7.E-09 6.E-10 1.E-08 2.E-09 6.E-09 1.E-08
19, 21, 23, 25, 27, 29, 31, 33, 35								
115–117		End of Borehole	86.00 to 85.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: June 17, 19, 2014

Drill Angle: Vertical
Azimuth: n.a.
Datum: M166 Elev. 123.19m TOC
Checked By: P.T.

WESA™ a BluMetric™ company

Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M187

Easting: 335607
Northing: 4901972
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1		Ground Surface	115.76				MOE Well tag # A163222 - Elev. M187 116.31 m TOC - Elev. M187 116.20 m TPVC - TOC s/u 0.55m	
1		***Clay*** Brown, some silt and gravel. - 0.5m gravel till.	115.00					
3							- 5.75" dia. (146mm) tri-cone to depth 8'6" - 4" dia. (100mm) steel casing grouted with cement to 8'6" (2.59m)	
5								
7 / 2			114.00					
9			113.00				- fracture 10'6" (3.2m)	
11								
13 / 4			112.00				- fractures 13'6", 14', 15' (4.1,4.3, 4.6m)	
15								
17			111.00				- fracture 16'5 (5m)	
19 / 6			110.00					
21							- fracture 21' (6.4m)	
23			109.00					
25		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	108.00					
27 / 8							- bentonite gravel seal	
29			107.00					
31								
33 / 10			106.00				- fractures 33'6", 37', 37'8", 38'4" (10.2,11.3, 11.5, 11.7m)	
35			105.00					
37								
39 / 12			104.00				- fractures 39'5", 40'8", 41'8" (12,12.4, 12.7m)	
41								
43			103.00					
45 / 14			102.00					
47							- fracture 47'7" (14.5m)	
49			101.00					
51			100.00				- fractures 50'6", 51'9", 52'6" (15.4, 15.8, 16m)	

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan 27, Feb. 2, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M187

Easting: 335607
Northing: 4901972
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (% 20 60)	Fracture Frequency/Run	Comments	K (m/sec)
54			99.00					
56	17							
58			98.00				- fracture 57'5" (17.5m)	
60								
62	19		97.00				- bentonite gravel seal	
64							- Water level elev. 96.17m recorded Nov. 20, 2015	
66			96.00					
68	21							
70			95.00					
72								
74			94.00					
76	23	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	93.00					
78								
80			92.00				- #1 Silica sand pack	
82	25							
84			91.00					
86								
88	27		90.00				- water bearing fracture 86'3" (26.3m)	
90								
92			89.00				3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack.	
94								
96	29		88.00				- fracture 92'6" 28.2m)	
98								
100			87.00					
102	31							
104			86.00					
			85.00				- bentonite gravel seal	
			84.00					
106		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan 27, Feb. 2, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-18

Project: South Property Investigation

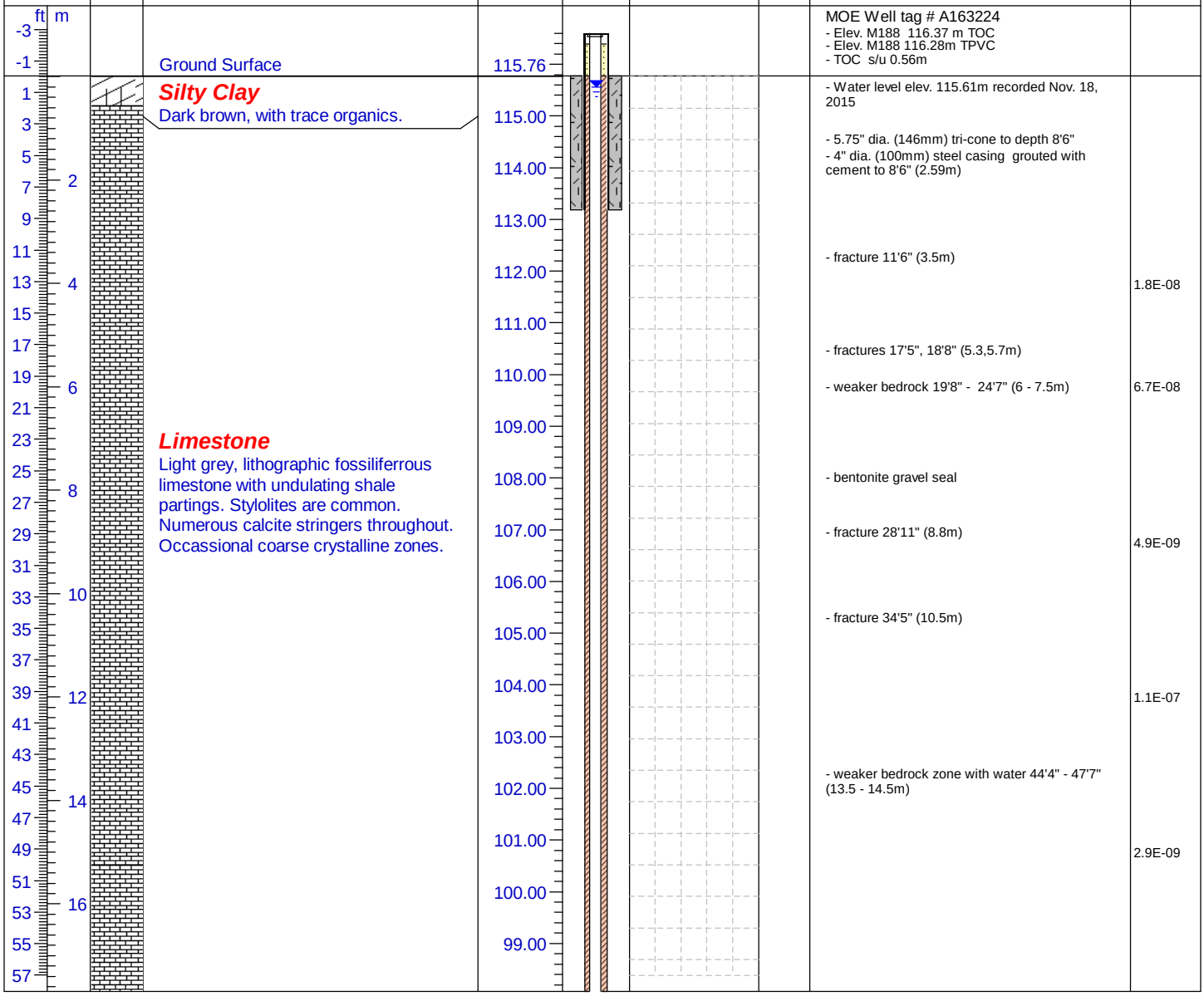
Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M188-1 (was M188)

Easting: 335979
Northing: 4902069
Field Personnel: B.McC.

SUBSURFACE PROFILE



Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan 28, Feb. 4, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M188-1 (was M188)

Easting: 335979
Northing: 4902069
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
59–107	19–33	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	98.00–83.00				- fracture 60'4" (18.4m) - bentonite gravel seal - fracture 70'11" (21.6m) - #1 Silica sand pack - #1 silica sand - water bearing fracture 100' (30.5m) 3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack.	4.1E-09 6.5E-09 3.8E-09 2.2E-08 7.1E-06 4.8E-06
109–117	33–35	End of Borehole	82.00–80.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan 28, Feb. 4, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: 160143-11

Project: Complementary CAZ Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M188-2

Easting: 335978
Northing: 4902068
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1			116.00				- Elev. M188-2 116.53 m TPVC - TOC s/u 0.82m	
		Ground Surface	115.71					
1		***Silty Clay*** Dark brown, with trace organics.					- Water level elev. 115.75 m recorded Apr. 21, 2017 - 4" dia. (100mm) protective steel casing	
3			115.00				- bentonite gravel seal	
5							- 5.25" dia. (133mm) tri-cone to depth 11' (3.35m) -weak bedrock5' (1.52m)	
7 (2)		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	114.00				2.43m x 50mm Slot 10 PVC screen within #3 silica sand pack.	
9			113.00				- weak bedock 10' and 10'6" (3.05, 3.2m)	
11		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 5.25" (133mm)
Drill Date: November 14, 2016

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M190

Easting: 336274
Northing: 4902275
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
							MOE Well tag # A163225 - Elev. M190 118.00 m TOC - Elev. M190 117.90m TPVC - TOC s/u 0.68m	
0 ft / 0 m		Ground Surface	117.90				- Surface elev. 117.90m	
2 ft		***Clay*** Brown, some silt.						
4 ft / 1 m		***Sand Till*** Grey, some gravel.	117.00				- Water level elev. 115.81m recorded Nov. 20, - 5.75" dia. (146mm) dia. tri-cone to depth 8'6" - 4" dia. (100mm) steel casing grouted with cement to 8'6" (2.59m)	
6 ft			116.00					
8 ft								
10 ft / 3 m			115.00					
12 ft							- fracture 13'1" (4m)	
14 ft			114.00				- fracture 14'10" (4.5m) Centralizer	
16 ft / 5 m			113.00					
18 ft								
20 ft			112.00					1.1E-09
22 ft								
24 ft / 7 m			111.00				- fracture 22'7" (6.9m)	
26 ft		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	110.00					
28 ft							- bentonite gravel seal	
30 ft / 9 m			109.00				- fracture 29'6" (9m)	2.9E-08
32 ft								
34 ft			108.00					
36 ft / 11 m			107.00					
38 ft								
40 ft			106.00					2.4E-05
42 ft								
44 ft / 13 m			105.00				- #1 Silica sand pack	
46 ft							- water bearing fracture 44'4" (13.5m)	
48 ft			104.00				Centalizer	
50 ft / 15 m			103.00					2.5E-03
52 ft							3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack. - water bearing fracture 51'6" (15.7m)	
			102.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan. 27, Feb.5, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M190

Easting: 336274
Northing: 4902275
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
54			101.00					
56	17							
58			100.00					3.1E-06
60								
62	19		99.00				- fracture 61'5" (18.7m)	
64								
66			98.00					
68								
70	21		97.00					5.9E-09
72								
74			96.00					
76	23	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	95.00				- fracture 74'10" (22.8m)	
78								3.0E-06
80			94.00					
82	25							
84			93.00					
86								
88	27		92.00					1.3E-06
90								
92			91.00				- bentonite gravel seal	
94								
96	29		90.00					
98								7.9E-09
100			89.00					1.3E-08
102	31							
104			88.00					
106								
108		End of Borehole	87.00					
			86.00					
			85.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan. 27, Feb.5, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M191

Easting: 336332
Northing: 4902802
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1		Ground Surface	122.81				MOE Well tag # A163226 - Elev. M191 123.31 m TOC - Elev. M191 123.21m TPVC - TOC s/u 0.50m	
1 / 3 / 5 / 7 / 2 / 9 / 11 / 13 / 4 / 15 / 17 / 19 / 6 / 21 / 23 / 25 / 27 / 8 / 29 / 31 / 33 / 10 / 35 / 37 / 39 / 12 / 41 / 43 / 45 / 14 / 47 / 49 / 51 / 53 / 16 / 55 / 57		***Clay*** Dark to light brown, some silt trace organics. ***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	122.00 121.00 120.00 119.00 118.00 117.00 116.00 115.00 114.00 113.00 112.00 111.00 110.00 109.00 108.00 107.00 106.00		20 – 60 %		- 5.75" dia. (146mm) tri-cone to depth 8'9" - 4" dia. (100mm) steel casing grouted with cement to 8'9" (2.67m) - fracture trace water 13' (4m) - fractures 16'9", 17'8" (5.1, 5.4m) - weaker bedrock 19' - 19'8" (5.8 - 6m) - fracture 22' (6.7m) - bentonite gravel seal - fracture 44' (13.4m) - fracture 52'2" (15.9m)	4.5E-07 4.0E-07 3.5E-08 3.5E-09 4.8E-09 3.7E-09 3.7E-11

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan. 27, Feb. 6, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-18

Project: South Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M191

Easting: 336332
Northing: 4902802
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
59–107	19–31	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	105.00–91.00				- bentonite gravel seal	3.4E-09
							- fracture 73'2" (22.3m)	7.7E-09
							- fracture 80'4" (24.5m)	7.1E-09
							- fracture 84'4" (25.7m)	
							- #1 silica sand	1.5E-08
							3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack.	2.0E-06
								8.3E-07
107–117	33–35	End of Borehole	90.00–88.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Jan. 27, Feb. 6, 2015

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-18

Project: Martin Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M192

Easting: 335976
Northing: 4902826
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1		Ground Surface	127.37				MOE Well tag # A163239 - Elev. M192 128.085 m TOC - Elev. M192 127.98m TPVC - TOC s/u 0.72m	
1 / 3 / 5 / 7 / 2 / 9 / 11 / 13 / 4 / 15 / 17 / 19 / 6 / 21 / 23 / 25 / 8 / 27 / 29 / 31 / 33 / 10 / 35 / 37 / 39 / 12 / 41 / 43 / 45 / 14 / 47 / 49 / 51 / 53 / 16 / 55 / 57		***Silt and Sand*** Topsoil over laying brown, moist to wet, some clay, trace gravel. - some coarse gravel, wet. ***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	127.00 126.00 125.00 124.00 123.00 122.00 121.00 120.00 119.00 118.00 117.00 116.00 115.00 114.00 113.00 112.00 111.00 110.00				- 8" dia. (203mm) HSA to depth 9'8" (2.94m) - 4" dia. (100mm) steel casing grouted with cement to 9'8" (2.94m) - w/l elev. 121.92m recorded March 4, 2016 - fracture or weak rock 7m - bentonite gravel seal - fractures 8.2 and 8.5m - weaker bedrock or fracture 10.5m - water bearing fracture 12.44m. - fracture or weaker rock 13.5m	7.E-10 5.E-06 2.E-09

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Dec. 4, 10, 2015, Feb. 22, 2016

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

Project No: K-B9504-18

Project: Martin Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M192

Easting: 335976
Northing: 4902826
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%, 20–60)	Fracture Frequency/Run	Comments	K (m/sec)
59–117	19–35	***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	109.00–93.00				- bentonite gravel seal - #1 silica sand - fracture or weaker rock 24m. - fracture or weak rock 24.5m - fracture or weak rock 26m 3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack. - bentonite gravel seal	2.E-08 2.E-09 2.E-09 5.E-06 7.E-06 9.E-09
113–117	35	End of Borehole	93.00–92.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Dec. 4, 10, 2015, Feb. 22, 2016

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-18

Project: Martin Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M193

Easting: 336082
Northing: 4902896
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Comments	K (m/sec)
-3 / -1		Ground Surface	127.52	MOE Well tag # A163240 - Elev. M193 128.17 m TOC - Elev. M193 127.07m TPVC - TOC s/u 0.65m	
1 / 3		Grey Clay	127.00		
5 / 7 / 2		***Silty Sand Till*** Brown, damp to moist, some well graded gravel.	126.00 125.00	- 8" dia. (203mm) HSA to depth 14' (4.27m) - 4" dia. (100mm) steel casing grouted with cement to 14' (4.27m)	
9 / 11 / 13 / 4			124.00 123.00		
15 / 17 / 19 / 6			122.00 121.00	- fracture or weak rock 5m. - fracture 5.5m - w/l elev. 122.03m recorded March 4, 2016	
21 / 23 / 25 / 8		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	120.00	- bentonite gravel seal	
27 / 29 / 31 / 33 / 10			119.00 118.00	- weaker bedrock or fracture 8.4m. - water bearing fracture 8.6	2.E-09
35 / 37 / 39 / 12			117.00 116.00	- #0 silica sand	2.E-09
41 / 43 / 45 / 14			115.00 114.00	- fracture or weaker rock 14m.	
47 / 49 / 51 / 16			113.00 112.00	- fracture 14.5m. 3.0m x 38mm Slot 10 PVC screen within #3 silica sand pack.	8.E-07
53 / 55 / 57			111.00 110.00		

Well Construction

Rock Quality Designation (%: 20, 60)

Fracture Frequency/Run

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Dec. 4, 9, 2015, Feb. 22, 2016

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: K-B9504-18

Project: Martin Property Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M193

Easting: 336082
Northing: 4902896
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
60			109.00					2.E-09
62	19						- bentonite gravel seal	
64			108.00					
66								
68			107.00					
70	21						- fracture or weaker rock 21m.	4.E-09
72			106.00					
74								
76	23		105.00					
78								4.E-09
80			104.00					
82	25							
84		***Limestone***	103.00					
86		Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.					- fracture or weak rock 26.5m.	
88	27		102.00					4.E-09
90								
92			101.00					
94								
96	29		100.00				- fracture or weak rock 29.5m.	
98								
100			99.00					
102	31						- fracture or weaker rock 31.5m.	
104			98.00				- bentonite gravel seal	
106								1.E-09
108	33		97.00				- water bearing fracture 33m.	
110								
112			96.00				- fracture or weaker rock 34m.	
114	35							
116			95.00					
118		End of Borehole	94.00					
			93.00					
			92.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Tri-cone
Hole Size: 3.87" (98mm)
Drill Date: Dec. 4, 9, 2015, Feb. 22, 2016

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: P.T.

BluMetric™ Environmental

Project No: 180150-02

Project: Complementary CAZ Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M200

Easting: 335796
Northing: 4902060
Field Personnel: B.Mc.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1		Ground Surface	116.00 / 115.40				MOE Well tag # A228384 - Elev. M200 116.02m TPVC - s/u 0.62m	
1 / 3 / 5 / 7 / 9 / 11		**Clay** Brown. **Limestone** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	115.00 / 114.00 / 113.00				- 150mm solid flight auger to 0.91m - 100sqmm steel casing with bentonite gravel seal - Fracture trace water 1.37m - Fracture trace water 1.82m - 1.5m x 50mm slot 10 PVc screen within #3 silica sand pack - weak bedrock, water bearing fractures, sulfur odour 2.44 - 3.05m	
13		End of Borehole	112.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Air Hammer
Hole Size: 5" (127mm)
Drill Date: April 17, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: M.C.

BluMetric™ Environmental

Project No: 180150-02
Project: Complementary CAZ Investigation
Client: Waste Management
Location: Richmond Landfill, Napanee, ON

Well ID: M201-DP

Easting: 335828
Northing: 4901991
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
ft / m					20 – 60			
-4 / -2			116.00				- Elev. M201-DP 116.20m TOC - TOC s/u 0.99m	
0		Ground Surface	115.21					
2		***Till*** Brown, clayey Sand.	115.00				- bentonite gravel seal	
4 / 1			114.00				- 0.5m x 32mm Steel screen	
6		End of Borehole						

Drilled By: BluMetric Environmental Inc.
Drill Method: Drive Point
Hole Size: 1.25" (32mm)
Drill Date: April 18, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: M.C.

Project No: 180150-02

Project: Complementary CAZ Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M202

Easting: 335929
Northing: 4902013
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1		Ground Surface	117.00 / 116.48				MOE Well tag # A228379 - Elev. M202 117.22m TPVC - s/u 0.75m	
1 / 3 / 5 / 7 / 9 / 11		Overburden ***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones. End of Borehole	116.00 / 115.00 / 114.00 / 113.00				- 150mm solid flight auger to 1.37m - 100sqmm steel casing with bentonite gravel seal - weak bedrock, multiple fractures, trace water 1.68 - 2.29m - weak bedrock 2.37m - weak bedrock zones 2.5 - 2.74m - weak bedrock 3.05m	

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Air Hammer
Hole Size: 5" (127mm)
Drill Date: April 18, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: M.C.

BluMetric™ Environmental

Project No: 180150-02
Project: Complementary CAZ Investigation
Client: Waste Management
Location: Richmond Landfill, Napanee, ON

Well ID: M203

Easting: 335708
Northing: 4902128
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1		Ground Surface	118.18				MOE Well tag # A228386 - Elev. M203 118.91m TPVC - s/u 0.73m	
1 / 3 / 5 / 7 / 9		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	118.00 117.00 116.00				- 150mm solid flight auger to 1.07m - 100sqmm steel casing with bentonite gravel seal - weak bedrock 2.13m - 1.5m x 50mm slot 10 PVc screen within #3 silica sand pack - fracture trace water 2.59m	
11		End of Borehole	115.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Air Hammer
Hole Size: 5" (127mm)
Drill Date: April 18, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: M.C.

BluMetric™ Environmental

Project No: 180150-02
Project: Complementary CAZ Investigation
Client: Waste Management
Location: Richmond Landfill, Napanee, ON

Well ID: M204

Easting: 335912
Northing: 4902187
Field Personnel: B.Mc.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1		Ground Surface	116.06				MOE Well tag # A228385 - Elev. M204 m TPVC - s/u 0.86m	
1 / 3		***Sandy Clay*** Brown, wet to saturated.	116.00 115.00				- 150mm solid flight auger to 1.5m - 100sqmm steel casing with bentonite gravel seal	
5 / 2 / 7		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	114.00				- weak bedrock 2.19m	
9 / 11 / 13 / 4			113.00 112.00				- 1.5m x 50mm slot 10 PVc screen within #3 silica sand pack - weak bedrock trace water 4.11 - 4.42m	
15		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Air Hammer
Hole Size: 5" (127mm)
Drill Date: April 17, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: F.R.

BluMetric™ Environmental

Project No: 180150-02

Project: Complementary CAZ Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M205

Easting: 336078
Northing: 4902129
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1							MOE Well tag # A228367 - Elev. M205 116.58m TPVC - s/u 0.75m	
		Ground Surface	116.00 115.83					
1 / 3		***Sandy Clay*** Brown, wet to saturated.	115.00				- 150mm solid flight auger to 1.07m - 100sqmm steel casing with bentonite gravel seal	
5 / 2 / 7		***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	114.00				- weak bedrock, fracture, water bearing 2.07m - water bearing fracture 2.59m	
9 / 11			113.00				- 1.5m x 50mm slot 10 PVc screen within #3 silica sand pack - fracture trace water 3.17m - water bearing fracture 3.29m	
13 / 4		End of Borehole	112.00					

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Air Hammer
Hole Size: 5" (127mm)
Drill Date: April 17, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: M.C.

BluMetric™ Environmental

Project No: 180150-02
Project: Complementary CAZ Investigation
Client: Waste Management
Location: Richmond Landfill, Napanee, ON

Well ID: M206

Easting: 335939
Northing: 4902329
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-3 / -1		Ground Surface	119.00 118.89				MOE Well tag # A228368 - Elev. M206 119.70m TPVC - s/u 0.82m	
1 / 3 / 5 / 7 / 9 (2)		Overburden ***Limestone*** Light grey, lithographic fossiliferrous limestone with undulating shale partings. Stylolites are common. Numerous calcite stringers throughout. Occassional coarse crystalline zones.	118.00 117.00 116.00				- 150mm solid flight auger to 1.07m - 100sqmm steel casing with bentonite gravel seal - weak bedrock, fracture, water bearing 2.13m - 1.5m x 50mm slot 10 PVc screen within #3 silica sand pack	
11		End of Borehole						

Drilled By: GET Drilling Ltd.
Drill Method: Rotary Air Hammer
Hole Size: 5" (127mm)
Drill Date: April 17, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: F.R.

BluMetric™ Environmental

Project No: 180150-02
Project: Complementary CAZ Investigation
Client: Waste Management
Location: Richmond Landfill, Napanee, ON

Well ID: M206-DP

Easting: 335960
Northing: 4902295
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
0		Ground Surface	118.00 117.79				- Elev. M206-DP 118.95m TOC - TOC s/u 1.16m	
0 – 4		Overburden.	117.00				- bentonite gravel seal - 0.5m x 32mm Steel screen	
6		End of Borehole	116.00					

Drilled By: BluMetric Environmental Inc.
Drill Method: Drive Point
Hole Size: 1.25" (32mm)
Drill Date: April 24, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: M.C.

Project No: 180150-02

Project: Complementary CAZ Investigation

Client: Waste Management

Location: Richmond Landfill, Napanee, ON

Well ID: M207-DP

Easting: 336138
Northing: 4902190
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
-4 / -2			117.00				- Elev. M207-DP 117.71m TOC - TOC s/u 1.35m	
0		Ground Surface	116.36					
0			116.00				- bentonite gravel seal	
2 / 1		Overburden, brown, clayey.					- 0.5m x 32mm Steel screen	
4		End of Borehole	115.00					

Drilled By: BluMetric Environmental Inc.
Drill Method: Drive Point
Hole Size: 1.25" (32mm)
Drill Date: April 24, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: M.C.

Project No: 180150-02
Project: Complementary CAZ Investigation
Client: Waste Management
Location: Richmond Landfill, Napanee, ON

Well ID: M209-DP

Easting: 335840
Northing: 4901958
Field Personnel: B.McC.

SUBSURFACE PROFILE

Depth (ft / m)	Stratigraphy	Description	Elevation (m)	Well Construction	Rock Quality Designation (%)	Fracture Frequency/Run	Comments	K (m/sec)
0		Ground Surface	116.20				- Elev. M209-DP 117.38m TOC - TOC s/u 1.17m	
0 – 8	1	Overburden, brown, clayey.	116.00 – 114.00				- bentonite gravel seal - 0.5m x 32mm Steel screen	
		End of Borehole						

Drilled By: BluMetric Environmental Inc.
Drill Method: Drive Point
Hole Size: 1.25" (32mm)
Drill Date: May 4, 2018

Drill Angle: Vertical
Azimuth: n.a.
Datum: NAD83
Checked By: M.C.

BluMetric Environmental Inc.

1682 Woodward Drive
Ottawa, Ontario
Canada K2C 3R8
Tel: 613.839.3053
Fax: 613.839.5376
ottawa@blumetric.ca

4 Cataraqui Street
The Tower, The Woolen Mill
Kingston, Ontario
Canada K7K 1Z7
Tel: 613.531.2725
Fax: 613.531.1852
kingston@blumetric.ca

209 Frederick Street
Unit 3B
Kitchener, Ontario
Canada N2H 2M7
Tel: 519.742.6685
kitchener@blumetric.ca

825 Milner Avenue
Toronto, Ontario
Canada M1B 3C3
Tel: 877.487.8436
toronto@blumetric.ca

410 Falconbridge Road
Unit 6
Sudbury, Ontario
Canada P3A 4S4
Tel: 705.525.6075
Fax: 705.525.6077
sudbury@blumetric.ca

PO Box 36
Shebandowan, Ontario
Canada P0T 2T0
Tel: 807.707.1687
thunderbay@blumetric.ca

4-41 de Valcourt Street
Gatineau, Quebec
Canada J8T 8G9
Tel: 819.243.7555
Fax: 819.243.0167
gatineau@blumetric.ca

276 Saint-Jacques Street
Suite 818
Montreal, Quebec
Canada H2Y 1N3
Tel: 514.844.7199
Fax: 514.841.9111
montreal@blumetric.ca

4916 – 49th Street
Yellowknife, NT
Canada X1A 1P3
Tel: 867.873.3500
Fax: 867.873.3499
yellowknife@blumetric.ca

202b Strickland Street
Whitehorse, Yukon
Canada Y1A 2J8
Tel: 867.689.8465
whitehorse@blumetric.ca

www.blumetric.ca