January 7, 2022
Project Number: 210166-05

Ricki Allum, Assessment Officer
Rick Li, Senior Waste Engineer
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: Addendum to Amendment to Environmental Compliance Approval No. A371203
MECP Reference #3258-C93K73

To Ricki Allum and Rick Li,

The following is an addendum to the Environmental Compliance Approval (ECA) amendment application submitted on November 23, 2021, with supporting documentation for a further 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 addendum package has been prepared in consultation with WM and is being provided on their behalf.

The previous application (MECP Reference #3258-C93K73) included the following attachments (which have not been included in this addendum package):

- Figure 1 – Properties Included in the Proposed (CAZ)
- Attachment A – ECA Application Form (November 23, 2021)
- Attachment B – MECP Confirmation of Delineation
- Attachment C – Proof of Legal Name
- Attachment D – Copy of Notification Letter and Distribution List (November 23, 2021)
- Attachment E – Proposed Post-Closure Environmental Monitoring Plan (BluMetric, 2021)

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

The purpose of the original application was to incorporate a contaminant attenuation zone (CAZ) (see MECP Reference #3258-C93K73 - CAZ, Figure 1) and an updated environmental monitoring plan (EMP) (see MECP Reference #3258-C93K73 – EMP, Attachment E) into ECA No. A371203. The application for amendment was submitted on November 23, 2021, in accordance with Condition 8.5(e) of ECA No. A371203 that required WM to submit the application within 90 days of receipt of the MECP Confirmation of Delineation letter (see MECP Reference #3258-C93K73 – Attachment B).

Following submittal, a pre-consultation meeting with the MECP was held on December 14, 2021, and included the following participants:

- MECP: David Arnott/Victor Castro/Kyle Stephenson/Katrina Chrzanowska
- WM: Bill McDonough/Chris Prucha/Noah Wayt
- BluMetric Environmental Inc: Francois Richard/Michael Duchene

The purpose of the pre-consultation meeting was to discuss further the recommendation described in the MECP confirmation letter (MECP Reference #3258-C93K73 – Attachment E) to secure groundwater rights to the property to the east of the site or establish an engineered system to ensure hydraulic control of off-site migration of landfill leachate impacted groundwater in the intermediate bedrock flow zone. As such, a conceptual design has been prepared for the inclusion of a hydraulic control system (HCS). Following this meeting, it was determined that the HCS conceptual design should be incorporated into the previously submitted application to amend ECA No. A371203, and as such this addendum seeks approval to do so.

Also on December 14, 2021, the MECP provided acknowledgment and confirmation regarding the existing application, along with a request for additional information/ documentation. Following the pre-consultation meeting, it was deemed appropriate to reply to the request following preparation of this addendum package such that specific request could include the HCS as well. All other requests were provided to the MECP via email on December 21, 2021.

The following attachments are included in this addendum package:

- Attachment A – Revised ECA Application Form (January 6, 2022)
- Attachment B – Copy of Revised Notification Letter and Distribution List (January 6, 2022)
- Attachment C - Conceptual Design for Southeast Hydraulic Control System (HCS) (BluMetric, January 6 2022)

Of note, a separate amendment application will be submitted simultaneously to this addendum to incorporate the additional flow resulting from the proposed HSC into ECA No. 1688-8HZNJG, dated January 10, 2012, and issued to WM for the leachate collection and disposal facility and stormwater management facility to service the Site.

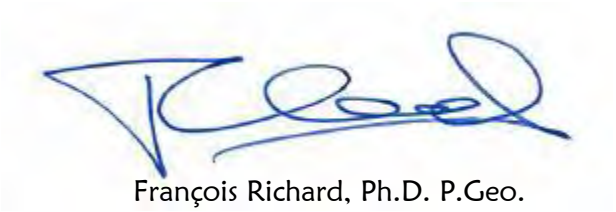
In addition to the previously requested changes, WM is requesting the addition of the HCS as follows:

ECA Section and Condition	Change Requested and Rationale
TBD	Hydraulic Control System (HCS) to include: • Three groundwater extraction wells open in the intermediate bedrock flow zone; • Discharge pipe from the extraction wells to existing Stormwater Pond No. 3; and • Controls and monitoring including water levels in each extraction well and measurement of cumulative groundwater extraction rate. The objective is to hydraulically control off-site migration of landfill leachate impacted groundwater in the intermediate bedrock flow zone, while minimizing the volume of extracted groundwater (as delineated from extensive hydrogeological investigations based on the extents of primary leachate indicator 1,4-dioxane).

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.

S'rana Scholes, B.A.Sc., P.Eng.
Senior Environmental Engineer
sscholes@blumetric.ca
(519) 588-3000



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

ATTACHMENT A

Ontario

Ministry of the Environment and Climate Change

Environmental Compliance Approval Application

Table of Contents

  Disponible en français

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); update the environmental monitoring plan (EMP) for the site; and to incorporate a hydraulic control system (HCS).

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 of original application). 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 of original applicaiton), and a proposed updated environmental monitoring plan (EMP) (Attachment F of original application).

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.

Addendum submitted to incorporate a hydraulic control system (HCS) conceptual design (Attachment B of addendum application. The HCS will include:

- Three groundwater extraction wells open in the intermediate bedrock flow zone;
- Discharge pipe from the extraction wells to existing Stormwater Pond No. 3; and
- Controls and monitoring including water levels in each extraction well and measurement of cumulative groundwater extraction rate.

The objective is to hydraulically control off-site migration of landfill leachate impacted groundwater in the intermediate bedrock flow zone, while minimizing the volume of extracted groundwater (as delineated from extensive hydrogeological investigations based on the extents of primary leachate indicator 1,4-dioxane).

✓ 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
1688-8HZNJG	2012/01/10

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

Pre-consultation meeting with the MECP was held on December 14, 2021, and included the following participants:

- MECP: David Arnott/Victor Castro/Kyle Stephenson/Katrina Chrzanowska
- WM: Bill McDonough/Chris Prucha/Noah Wayt
- BluMetric Environmental Inc: Francois Richard/Michael Duchene

✓ 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 *
	1271	Beechwood Road

Additional Civic Addresses

Unit Number	Street Number	Street Name
	1252	Beechwood Road
	1250	Beechwood Road
	1206	Beechwood Road
	1144	Beechwood Road
	1264	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	0

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		☐ Yes ☐ No		☐
Director's approval for Policy 2 Deviation		☐ Yes ☐ No		☐
Application Fee	Required	☐ Yes ☑ No	$1,400 fee submitted on Dec. 16, 2021	☐
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	N/A	☐ 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.	☐
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
Copy of Revised Notification Letter and Distribution List	Attachment B	☐
Conceptual Design for Southeast Hydraulic Control System (HCS)	Attachment C	☐
		☐
		☐

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)
	2022/01/07

✓ 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)
	2022/01/07

✓ 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

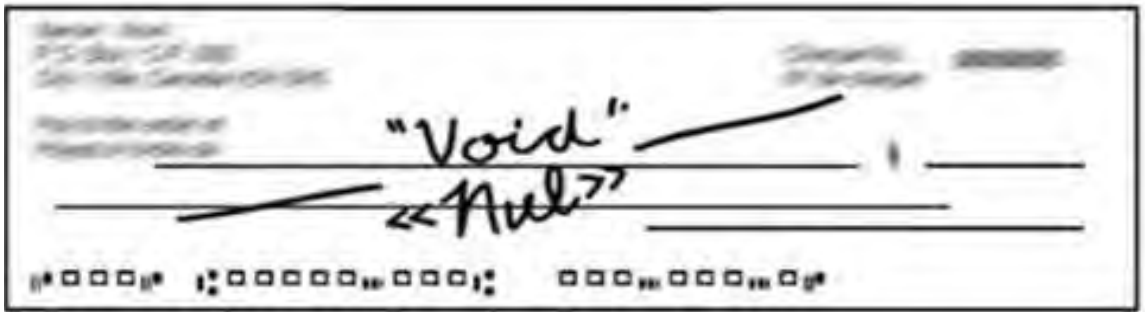
Credit Card Information (if paying by VISA or MasterCard)

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); update the environmental monitoring plan (EMP) for the site; and to incorporate a hydraulic control system (HCS).

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 of original application). 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 of original applicaiton), and a proposed updated environmental monitoring plan (EMP) (Attachment F of original application).

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.

Addendum submitted to incorporate a hydraulic control system (HCS) conceptual design (Attachment B of addendum application. The HCS will include:

- Three groundwater extraction wells open in the intermediate bedrock flow zone;
- Discharge pipe from the extraction wells to existing Stormwater Pond No. 3; and
- Controls and monitoring including water levels in each extraction well and measurement of cumulative groundwater extraction rate.

The objective is to hydraulically control off-site migration of landfill leachate impacted groundwater in the intermediate bedrock flow zone, while minimizing the volume of extracted groundwater (as delineated from extensive hydrogeological investigations based on the extents of primary leachate indicator 1,4-dioxane).

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

January 6, 2022

Dear Resident:

Please note that this notification letter is an updated version to the letter that was sent to you on Nov. 23, 2021. It has been updated to include the email address provided by the Ministry (see below) and the inclusion of a Hydraulic Control System (HCS).

WM has submitted an 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, a proposed post-closure environmental monitoring plan (EMP), and the inclusion of a Hydraulic Control System (HCS).

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.
- Proposed for inclusion: New Condition describing the HCS

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
Email: wasteproposalcomments@ontario.ca

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

ATTACHMENT C

FINAL REPORT

CONCEPTUAL DESIGN
FOR SOUTHEAST HYDRAULIC CONTROL SYSTEM

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: 210166-06
6 January 2022

FINAL REPORT

CONCEPTUAL DESIGN FOR SOUTHEAST HYDRAULIC CONTROL SYSTEM

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

Project Number: 210166-06

6 January 2022

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION

A hydraulic control system (HCS) may be required in the southeast portion of the Waste Management (WM) Richmond Landfill property. The objective is to hydraulically control off-site migration of landfill leachate impacted groundwater in the intermediate bedrock flow zone, while minimizing the volume of extracted groundwater.

The groundwater impacted by landfill leachate in the intermediate bedrock flow zone has been delineated from extensive hydrogeological investigations based on the extents of primary leachate indicator 1,4-dioxane.

This document presents the proposed conceptual design developed to achieve the stated objective, with targets and design specifications developed from the field testing completed between 2018 and 2021, as outlined in **Appendix A** where aquifer testing results from evaluations of the proposed HCS are summarized.

2. HYDRAULIC EVALUATION

The hydrogeological site conceptual model (SCM) for the site has been developed based on extensive investigations conducted at the site and is summarized in BluMetric (2019) and references therein. The impacted groundwater area that has been delineated within the intermediate bedrock groundwater flow zone downgradient from the waste mound is shown on **Figure 1** of **Appendix A**. The area of impacted groundwater extends off-site onto the proposed Contaminant Attenuation Zone (CAZ) located to the south of Beechwood Road[1], as well as onto the property located to the east of the southeastern portion of the landfill property. The proposed design for the HCS was developed to hydraulically control further off-site migration onto the adjacent property.

Drilling of potential extraction wells and preliminary evaluation of the proposed HCS including analytical modelling was completed in 2018 (BluMetric, 2018, included as **Appendix B**). This involved the installation of four test wells in the south-east area of the site: M212-PW, M213-PW, M214-PW and M215-PW (see **Figure 1**). The wells are cased across the overburden and shallow bedrock and open in the intermediate bedrock flow zone where the impacted groundwater has been delineated. Testing was completed to determine the potential yield of each of the extraction wells individually, and to determine the local hydraulic properties within the intermediate bedrock groundwater flow zone in the southeast portion of the WM property.

[1] Application to amend Environmental Compliance Approval No. A371203 submitted to Ministry of the Environment, Conservation and Parks Approvals Branch on November 23, 2021.

Analytical groundwater modelling demonstrated the feasibility of an engineered system to mitigate further off-site migration of groundwater by inducing hydraulic control in the area along the groundwater flow path in the intermediate bedrock flow zone, towards the east/southeast in this area of the site (BluMetric, 2018).

Complementary aquifer testing was conducted in 2021 where the three most productive extraction wells, M212-PW, M214-PW and M215-PW, were pumped over a total period of 57 hours between August 31 and September 2, 2021, and groundwater elevations recorded in nearby monitoring wells. Details of the test and results are included in **Appendix A**. Analysis of the data confirmed that effective hydraulic control can be achieved in the southeastern portion of the landfill property through continuous pumping at the three extraction wells. Maximum drawdown during the long-term pumping test was observed after 49 hours of continuous pumping (combined discharge rate of 15 L/min or 21.8 m^3/day (4 usgpm)) at the three extraction wells (0.65 to 2.44 m relative to pre-pumping (static) conditions) and all observation wells (0.13 to 0.95 m from static levels). Pumping rates were then reduced by 50% (combined discharge rate of 7.6 L/min or 10.9 m^3/day (2 usgpm)) and maintained for the remainder of the test.

Quasi-steady state under dynamic (pumping) conditions, with stable yet slightly reducing drawdown in the three extraction wells, was achieved after 57 hours of continuous pumping. Based on these results, the target discharge rate for long-term operation of the HCS was established at 7.6 L/min (10.9 m^3/day, 2 usgpm)).

Furthermore, analytical groundwater quality results from the combined discharge sampled at the end of the long-term pumping test confirmed that groundwater quality collected from the extraction system is expected to meet the proposed discharge limits in surface water (see **Appendix A** for details).

3. CONCEPTUAL DESIGN OF HYDRAULIC CONTROL SYSTEM

3.1 OVERVIEW

Figure 2 shows the southeast portion of the site highlighting the proposed HCS. The HCS will include the following components:

1. Three groundwater extraction wells open in the intermediate bedrock flow zone;
2. Discharge pipe from the extraction wells to existing Stormwater Pond No. 3; and
3. Controls and monitoring including water levels in each extraction well and measurement of cumulative groundwater extraction rate.

3.1.1 Extraction Wells

Three existing extraction wells, M212-PW, M214-PW and M215-PW will be used for the permanent extraction system. The conceptual design for the extraction wells is shown on **Figure 3**, while details of the extraction wells are provided in **Table 1**. All wells have a 6.25" diameter casing through overburden and extend between 3.21 and 4.89 m below top of the upper bedrock. As a result, the extraction wells are isolated from the shallow groundwater flow zone comprised of the saturated overburden and upper portion of the bedrock.

Table 1: Summary of Groundwater Extraction Wells

Extraction Well	Easting	Northing	Ground Surface (masl)	Top of Bedrock (masl)	Bottom of Well (masl)	Depth to Top of Bedrock (m)	Depth to Bottom of Well (m)	Depth to Bottom of Casing (m)
M212-PW	335891	4902773	128.36	125.47	93.5	2.89	34.86	6.1
M214-PW	335883	4902829	127.25	125.42	93.4	1.83	33.85	6.1
M215-PW	335822	4902889	127.64	126.43	94.4	1.21	33.24	6.1

The groundwater extraction wells will be operated to maintain the initial target drawdowns shown in **Table 2**. Actual target drawdowns will be adjusted and optimized following system commissioning to maintain effective hydraulic control while minimizing discharge volumes.

Table 2: Target Groundwater Extraction Rate and Drawdown at Extraction Wells

Extraction Well	Static Groundwater Level Aug. 31 2021 *(m below REF)*	Maximum Drawdown After 48 Hrs of Pumping *(m below static)*	Target* Groundwater Extraction Rate *(L/min (usgpm))*	Target* Drawdown *(m below static)*
M212-PW	10.11	0.65	3.8 (1.0)	0.75
M214-PW	8.91	2.44	1.9 (0.5)	2
M215-PW	9.18	1.99	1.9 (0.5)	2

* Initial target – to be optimized during system commissioning

Pressure transducers and submersible groundwater extraction pumps will be installed in each of the three extraction wells to monitor the water level and control the pump discharge. Pitless adapters will be installed in the existing casing to maintain the discharge line below frost. A localized control panel at each extraction well will be installed to control the operations of the pump and transmit data to equipment that will be housed in existing Pumping Station PS3 (see **Figure 2**) for remote monitoring of the system.

The system will be designed and installed to operate year-round.

3.1.2 Discharge Forcemain

All three extraction wells will feed into a common forcemain which will discharge into Stormwater Pond No. 3. The forcemain will be installed a minimum 1.8 m below grade except in areas where the bedrock is encountered at a depth less than 1.8 m, where insulation will be added for freeze protection.

The forcemain will discharge onto the existing rip rap at the inlet to Stormwater Pond No. 3. The section of the forcemain adjacent to the discharge where the depth is less than 1.8 m will be heat traced.

A sample port and flow monitor will be installed either inside heated Pumping Station PS3 (Option 1) or downgradient of M215-PW in a maintenance hole (Option 2) (see **Figure 2**). The final location will be determined during detailed design. If the sample port and flow meter is installed in a maintenance hole, sample ports will be configured to provide access without entering the maintenance hole and the flow rates will be transmitted electronically. Heat tracing will be used to prevent freezing.

3.1.3 Controls, Power and Communications

Each extraction well pump will be operated by an individual controller located in a weatherproof enclosure adjacent to the well. Input from the pressure transducer will be used to control the pump. Power to each of the extraction wells will be supplied by an underground line from the electrical panel in Pumping Station PS3. Communications back to Pumping Station PS3 will be via either buried cable or wireless and integrated into the communications for Pumping Station PS3. This will enable continuous measurement of the groundwater level in each of the extraction wells (i.e., drawdown), combined flow rate, and operational status. Remote notification will alert operators to issues with the system.

3.1.4 Water Quality

Four groundwater samples were collected from the combined discharge from the three extraction wells (M212-PW, M214-PW and M215-PW) during the long-term pumping test, between the start of pumping until just before the pumps were turned off (water samples were collected after 2, 24, 48 and 56 hours of continuous pumping). The results were analyzed for general and inorganic parameters, metals, and volatile organic compounds and are included in the aquifer test memo in **Appendix A**.

The concentrations of all analyzed parameters were below the Provincial Water Quality Objectives (PWQO) except for phosphorus (first and third samples), boron (all four samples) and zinc (initial sample only). The concentration of boron in all four samples collected was stable at 1 mg/L and exceeded the interim PWQO of 0.2 mg/L; however the Canadian Water Quality Guideline for the protection of aquatic life (CCME 2009[2]) for boron of 1.5 mg/L is considered most appropriate for use here and is proposed as the compliance limit.

The concentration of 1,4-dioxane, the primary leachate indicator for the Richmond landfill site, in the samples collected throughout the pumping test ranged from 0.0063 mg/L to 0.0094 mg/L, which is below the PWQO of 0.02 mg/L.

3.2 Stormwater Pond No. 3 Design and Discharge

Stormwater Pond No. 3 was constructed in 2009 and consists of a series of three inter-connected individual ponds. The discharge from the proposed HCS will enter the furthest upstream location in Stormwater Pond No. 3. Groundwater from the HCS will flow through the forebay for the eastern pond, through the eastern pond, under the site access road, through the forebay for the west pond then the west pond (see **Figure 1**).

The overflow weir with an outlet structure is located at the west side of the western pond. The outlet structure includes an inlet catch basin connected to a 300 mm pipe running through the overflow weir. There is a discharge valve on the 300 mm pipe. Discharge from the overflow weir with the outlet structure flows west through a ditch then south to the property boundary at Beechwood Road. The flow in the ditch from Stormwater Pond No. 3 along with other ditches from other areas of the site flow through a culvert under Beechwood Road and continues within Beechwood Ditch. Surface water sampling location S8R is located at the upstream (north) end of the culvert under Beechwood Road.

The flow in Beechwood Ditch on the south side of Beechwood Road generally flows south and west to the municipal ditches located alongside Deseronto Road. However, flow from Beechwood Ditch to the municipal ditches located alongside Deseronto Road is generally not observed and it has been determined that the flow in Beechwood Ditch spreads out in the open field in this area (see **Figure 1**).

[2] CCME 2009, *Canadian Water Quality Guidelines for the Protection of Aquatic Life (Boron)*. https://ccme.ca/en/res/boron-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf

3.3 DISCHARGE TO STORMWATER POND NO. 3

The total daily flow from the HCS into the pond is anticipated to be 10.9 m^3/day (2 usgpm). Stormwater Pond No. 3 is designed for the 1:100-year storm event and a flow of 247,104 m^3/day (2.86 m^3/s) (WSP, 2008). The additional flow anticipated from the HCS discharge (less than 0.005% of the pond design flow) is not significant.

The concentrations of all the parameters analyzed in the final sample collected at the end of the long-term pumping tests were below the PWQO, except for boron with concentrations below the Canadian Water Quality Guideline for the protection of aquatic life (1.5 mg/L) which is a more relevant guideline compared to the Interim PWQO and is proposed for use as a compliance limit.

The maximum concentration of 1,4-dioxane from the aquifer test was 9.4 µg/L (**Appendix A**), which is consistent with the most recent concentrations (e.g., BluMetric, 2022) from samples collected from impacted groundwater monitoring wells located southeastern portion of the site within the radius of influence of the proposed HCS (M70-2, M105, M107, M108, M168, M170 and M192).

A mass balance approach was used to estimate the concentration of 1,4-dioxane anticipated in the discharge from Stormwater Pond No. 3. The discharge flow rate from Stormwater Pond No. 3 is not measured and it would be difficult to obtain an accurate estimate of the annual flow through the pond with a hydrological model since the design of the pond was based on a single event. For 2009, 2010 and 2011, the pond was operated in batch mode by closing the discharge valve and confirming the quality of the stormwater before the valve was opened and the stored water released. A total of 76,528 m^3 was released in 2011 (Genivar, 2012). This annual volume was used in the mass balance to estimate the predicted concentration of 1,4-dioxane in the discharge from Stormwater Pond No. 3. The equation for the mass balance is:

$$C_3 = \frac{C_1V_1 + C_2V_2}{V_1 + V_2}$$

Where:

C_1 = concentration of 1,4-dioxane in the stormwater pond
V_1 = annual volume of water discharged from stormwater pond
C_2 = concentration of 1,4-dioxane in the extracted groundwater
V_2 = annual volume of groundwater extracted
C_3 = predicted concentration of 1,4-dioxane in the effluent from the stormwater pond
V_3 = annual volume of water discharged including groundwater = $V_1 + V_2$

The mass balance calculation is shown in **Table 3**.

Table 3: Estimation of Anticipated Concentration of 1,4-Dioxane in Discharge from Stormwater Pond No. 3.

Total volume pumped from Stormwater Pond No. 3 in 2011	76,528 m^3
1,4-dioxane concentration in Stormwater Pond No. 3 (prior to discharge of groundwater)	0 µg/L
Annual volume of groundwater from the HCS	3,979 m^3
1,4-dioxane concentration from the HCS	9.4 µg/L
Predicted 1,4-dioxane concentration in discharge from Stormwater Pond No. 3	0.46 µg/L

The predicted concentration of 1,4-dioxane in the effluent from Stormwater Pond No. 3 based on a mass balance approach is estimated at 0.46 µg/L, which is over 40 times less than the PWQO of 20 µg/L and less than 50% of the current site-specific groundwater reasonable use limit of 1 µg/L (see Environmental Monitoring Plan (EMP), BluMetric, 2016).

Natural temporal variations in groundwater elevations, influenced by seasonal or event-based increases or reductions in recharge from precipitation and snowmelt, are expected to cause fluctuations in the total discharge volumes and water quality from the HCS. For example, increased groundwater recharge during and shortly after spring freshet generally results in higher groundwater elevations in hydraulically active monitoring wells. Thus, increased pumping rates from the HCS, and lower constituent concentrations because of the increased dilution in the extracted groundwater from higher recharge, are expected as the system operates to maintain the target drawdown. As a result, it is anticipated that effluent concentrations from Stormwater Pond No. 3 should remain relatively constant despite the temporal fluctuations in the HCS discharge rates and water quality.

MECP has proposed to adopt the 1,4-dioxane groundwater RUL as the compliance limit for the surface water released from the pond system. The RUL for 1,4-doxane is currently 1 µg/L, but may be updated in the future (e.g. when the Ontario Drinking Water Standard (ODWS) value gets established necessitating a recalculation of the RUL). For example, should the recently established (Health Canada, 2021[3]) maximum acceptable concentration (MAC) in drinking water of 0.050 mg/L (50 µg/L) be adopted as the ODWS, the resulting RUL for 1,4-dioxane calculated using Ontario Guideline B-7 would be 0.0125 mg/L (12.5 µg/L).

[3] Health Canada 2021, *Guidelines for Canadian Drinking Water Quality, Guideline Technical Document, 1,4-Dioxane, published March 2021.* https://www.canada.ca/content/dam/hc-sc/documents/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-1-4-dioxane/1-4-dioxane-pdf-eng.pdf

Based on the information provided, both the quantity and quality of the combined discharge to Stormwater Pond No. 3 from the three extraction wells (M212-PW, M214-PW and M215-PW) that will be used for the proposed HCS are acceptable.

3.3.1 Operation of Stormwater Pond No. 3

Stormwater Pond No. 3 will be operated continuously with samples collected from the sampling station located along Beechwood Road immediately downstream from Stormwater Pond No. 3 (S8R) as per ECA No. A371203 (see **Figure 1**). If the concentration of 1,4-dioxane is less than the RUL, the gate valve will remain open to discharge the pond water. Operation of the HCS will continue while water is being discharged from the pond as it is expected that the concentration of 1,4-dioxane being extracted will remain stable.

The gate valve on the discharge from the pond will be closed and the system operated in batch mode if the concentration of 1,4-dioxane in samples from surface water monitoring location S8R exceeds the RUL. A grab sample will be collected from Stormwater Pond No. 3 and analyzed for 1,4-dioxane to ensure the concentration is below the RUL before opening the gate valve and resuming continuous flow operation.

4. CONTINGENCY MEASURES

Contingency measures will include:

1. If the concentration of 1,4-dioxane in Stormwater Pond No. 3 exceeds the RUL when sampled with the pond filled to 75% capacity, the gate valve will be closed. Stormwater Pond No. 3 will be resampled and allowed to drain once the concentration of 1,4-dioxane decreases below the RUL;
2. Additional optimization of the HCS by reducing the individual pumping rates from some or all extraction wells to reduce total discharge from the system while ensuring that hydraulic control is maintained will be evaluated. Hydraulic control will be confirmed by contouring and interpolating groundwater elevations from monitoring wells included in the HCS performance monitoring network (see Section 5);
3. If necessary, discharge from the HCS may be temporarily redirected to the leachate holding tank for off-site disposal as permitted under the Conditions of ECA No. A371320, until 1,4-dioxane concentrations in Stormwater Pond No. 3 are confirmed to be below the RUL and normal continuous flow operations can resume; and

4. If it is determined that it is not possible to achieve the RUL for 1,4-dioxane on the discharge from Stormwater Pond No. 3, negotiations with the owner of the neighboring property will be conducted to purchase the property or groundwater rights required to extend the CAZ, or negotiations with the MECP to adjust the 1,4-dioxane limit will take place.

5. PERFORMANCE MONITORING

The following monitoring program is proposed to ensure that the hydraulic control system operates as intended, both in terms of groundwater elevations and discharge water quality. The objectives of the HCS monitoring program are to:

1) Optimize HCS operation (target drawdown and discharge rate in each extraction well) following system commissioning;
2) Ensure that the desired hydraulic control is maintained by contouring groundwater drawdown around extraction wells; and
3) Monitor discharge water quality from the HCS and prior to off-site discharge at the outlet.

The proposed monitoring program is provided below.

5.1 GROUNDWATER ELEVATION MONITORING

Data loggers capable of continuous water level measurements will be installed in extraction wells (M212-PW, M214-PW and M215-PW) as well as in monitoring wells M52-2, M105, M107, M108, M168, M170, M192 and M193.

Groundwater elevations will be recorded every 12 hours and interpolated on a weekly basis for a period of one month following commissioning of the system. The frequency will be decreased to once per month for a period of one year, and quarterly after the first year of operation.

5.2 DISCHARGE MONITORING

The combined discharge volume from the extraction wells will be recorded continuously using a flow meter and totalizer and reviewed on a weekly basis for a period of one month following commissioning of the system. This short-term compilation and review frequency will allow for adjustments to optimize drawdown and flow and will then be decreased to once per month for a period of one year, and to quarterly after the first year of operation.

Water samples will be collected from the combined discharge collected from the extraction wells and analyzed for 1,4-dioxane. The sampling frequency will be on a weekly basis for a period of one month following commissioning of the system. The frequency will be decreased to once per month for a period of one year, and quarterly after the first year of operation.

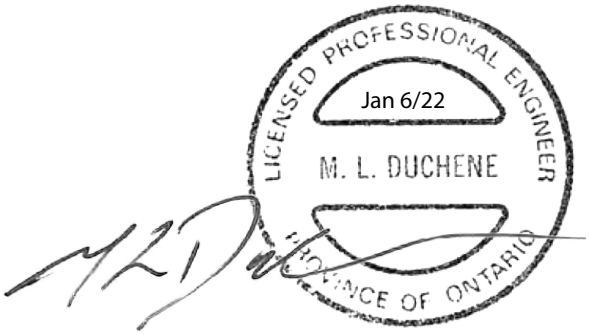
5.3 Reporting and Review of System and Monitoring Program

Results from the system performance monitoring will be evaluated and reported on a quarterly basis for the first year following commissioning of the system, and on an annual basis after the first year of operation. The reports will include interpolated groundwater elevations during the period since the last report, analytical water quality results as well as recommendations regarding modifications to the system operation and monitoring program, as appropriate.

6. CLOSING

We trust that the information provided is satisfactory. Do not hesitate to contact the undersigned if you have questions or require additional details.

Report Prepared by:
BluMetric Environmental Inc.



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

Michael Duchene, M.A.Sc., P.Eng.
Senior Engineer

7. REFERENCES

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

BluMetric, 2018: *Preliminary Purge Well System Evaluation, Waste Management Richmond Landfill Site*, BluMetric Environmental Inc., Memorandum dated October 15, 2018.

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

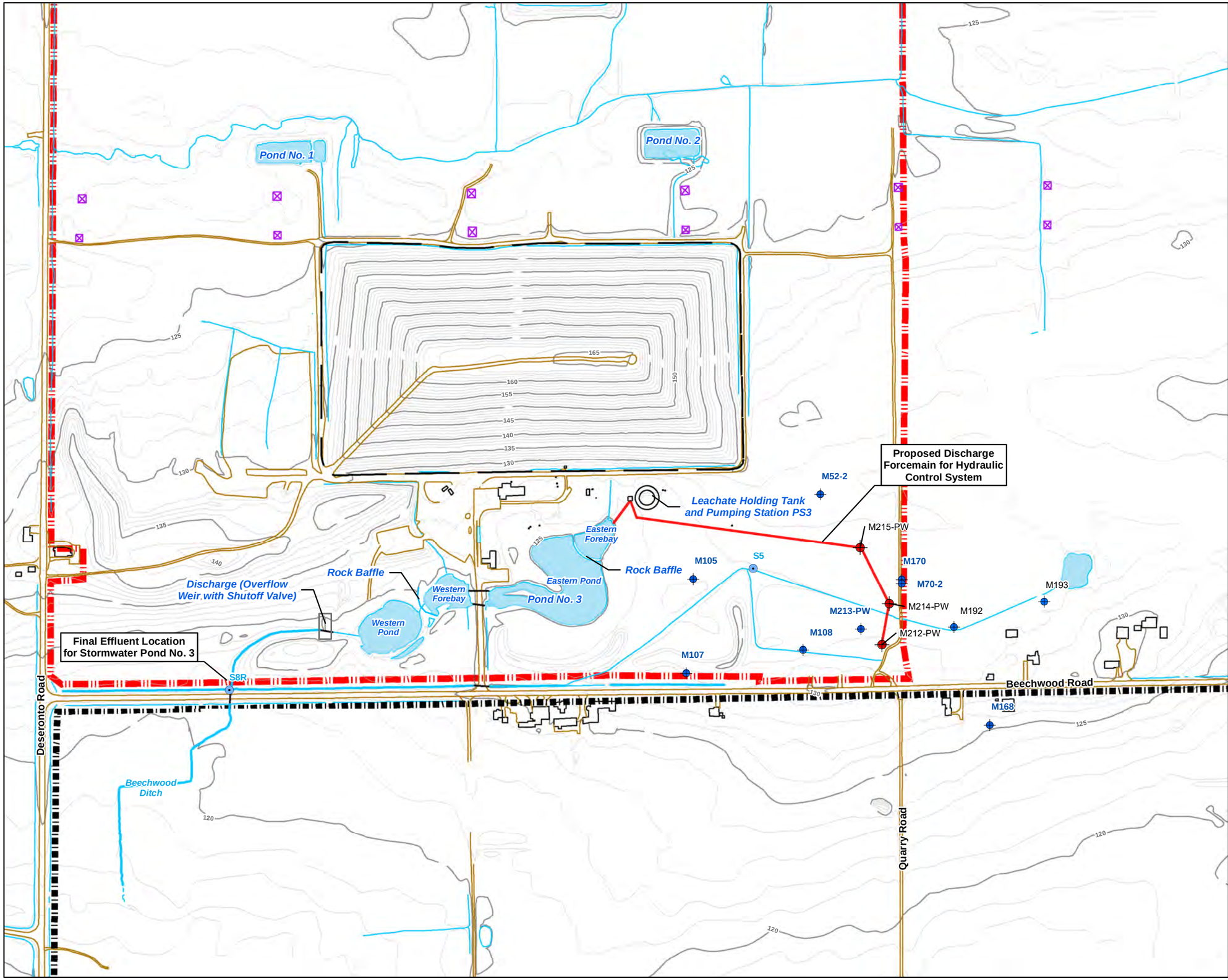
BluMetric, 2022: *Fall 2021 Semi-Annual Monitoring Report, Waste Management Richmond Landfill Site*, BluMetric Environmental Inc., Report dated January 2022.

Henderson Paddon, 2008, Design Brief, Stormwater Management Pond No. 3 Upgrade, Existing Richmond Landfill, Napanee, Ontario, Henderson Paddon & Associates Limited, Project 8570G, April 2008.

Genivar, 2012, Richmond Sanitary Landfill Site 081-12459-00, Monitoring Report No. 25, Part of Lots 1, 2, and 3, Concession IV, Township of Richmond, County of Lennox and Addington, GENIVAR Inc., Project No. 081-12459-00 (8570), March 22, 2012

.

FIGURES



LEGEND

- Test Well
- Surface Water Sampling Location
- Monitoring Well
- Proposed CAZ Boundary
- Landfill Footprint
- Waterbody
- Building
- Hydro Tower
- Road
- Watercourse
- Culvert
- Proposed Forcemain
- Elevation Contour (5 m)
- Elevation Contour (1 m)
- Property Boundary

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

N W E S

0 20 40 80 120 160
Meters

1:5,000

CLIENT

WM

PROJECT

Waste Management Richmond Landfill - Hydraulic Containment System

TITLE

Site Plan

BluMetric™ Environmental

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4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
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Web: http://www.blumetric.ca

PROJECT #	DATE
210166-05	January 06, 2022

DRAWN	CHECKED	FIG NO.	REV
GM	MC	01	0

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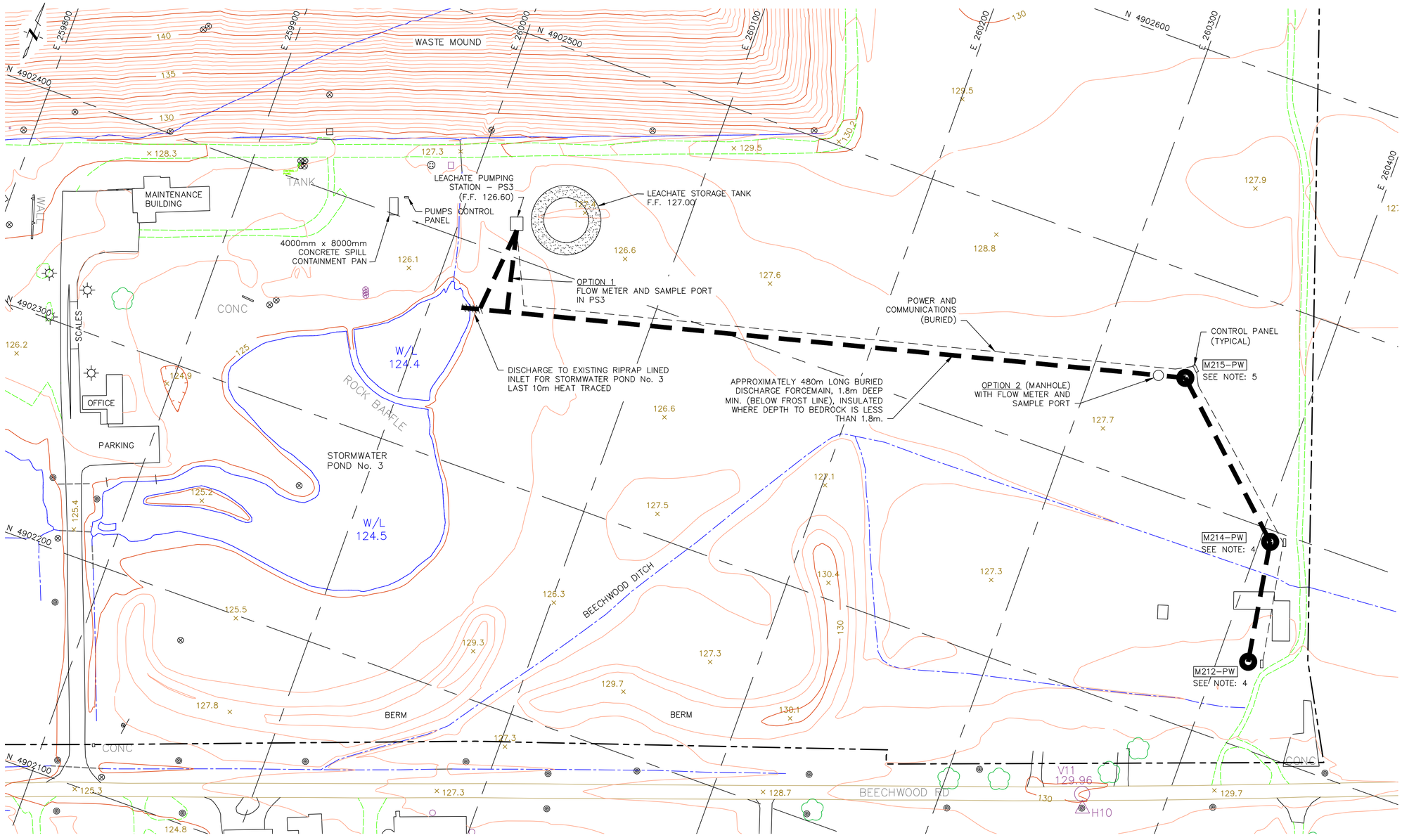

PLAN VIEW
SCALE: 1:1000

PUMP	DESCRIPTION
M212–PW	OPEN IN BEDROCK 6.1m – 34.9mbgs TARGET PUMPING RATE = 3.8 L/min.
M214–PW	OPEN IN BEDROCK 6.1m – 33.8mbgs TARGET PUMPING RATE = 1.9 L/min.
M215–PW	OPEN IN BEDROCK 6.1m – 33.2mbgs TARGET PUMPING RATE = 1.9 L/min.

NOTE: SEE FIGURE 2 FOR EXTRACTION WELL DETAILS

FIGURE 3	TYPICAL BEDROCK EXTRACTION WELL
DRAWING No.	REFERENCE DRAWINGS

PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION

KEY MAP

GENERAL NOTES:

1. ALL DIMENSIONS ARE METRIC AND SHOWN IN METRES (UNLESS NOTED OTHERWISE).
2. NORTHINGS AND EASTINGS ARE IN METRES.
3. ELEVATIONS ARE IN METRES, RELATIVE TO THE LOCAL DATUM. CONTOURS ARE IN 0.5 METRE INTERVALS.
4. A WEATHERPROOF ENCLOSURE WILL BE INSTALLED AT EACH OF M212–PW AND M214–PW WELLS. IT WILL CONTAIN THE PUMP CONTROLLER AND A SLAVE DATA LOGGER. THE DATA LOGGER CHECKS AND RECORDS THE PUMP CONTROLLER STATUS AND SENDS THIS INFORMATION TO THE MASTER DATA LOGGER.
5. A WEATHERPROOF ENCLOSURE WILL BE INSTALLED AT M215–PW WELL. THIS WILL CONTAIN THE PUMP CONTROLLER AND THE MASTER DATA LOGGER. THE MASTER DATA LOGGER WILL BE USED TO RECORD THE FLOW METER MEASUREMENTS AND THE STATUS OF THE PUMP CONTROLLER (WORKING OR NOT). THIS LOGGER ALSO COMMUNICATES WITH THE LOGGERS INSTALLED AT M212–PW AND M214–PW TO CHECK THEIR STATUS. IN CASE OF A PROBLEM, THIS LOGGER WILL SEND A MESSAGE VIA A CELLULAR MODEM CONNECTED TO IT.

LEGEND:

- LIMIT OF DEVELOPMENT
- PROPOSED BURIED DISCHARGE FORCEMAIN
- PROPOSED BURIED POWER AND COMMUNICATIONS
- EXISTING ACCESS ROAD (GRAVEL)
- EXISTING ACCESS ROAD (PAVED)
- EXISTING CULVERT
- EXISTING DITCH CENTRELINE
- EXISTING GROUND SURFACE CONTOURS, 2.5m MAJOR INTERVALS
- EXISTING SPOT ELEVATION
- EXISTING HYDRO POLE
- EXISTING LIGHT STANDARD
- VERTICAL CONTROL MONUMENT
- HORIZONTAL CONTROL MONUMENT

0 20 40 60 80
METRES 1:1000
THIS SCALE TO BE USED TO OBTAIN APPROXIMATE DIMENSIONS FOR INFORMATION

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
A2	ISSUED FOR INTERNAL REVIEW	21/12/07	DRR	
A1	ISSUED FOR INTERNAL REVIEW	21/11/25	DRR	

CLIENT
WASTE MANAGEMENT

PROJECT
RICHMOND LANDFILL
CONCEPTUAL DESIGN
HYDRAULIC CONTROL SYSTEM

TITLE
SOUTH EAST PORTION
SITE PLAN

BluMetric Environmental
The Tower – The Woolen Mill, 4 Cataraqui St., Kingston, Ontario K7K 1Z7
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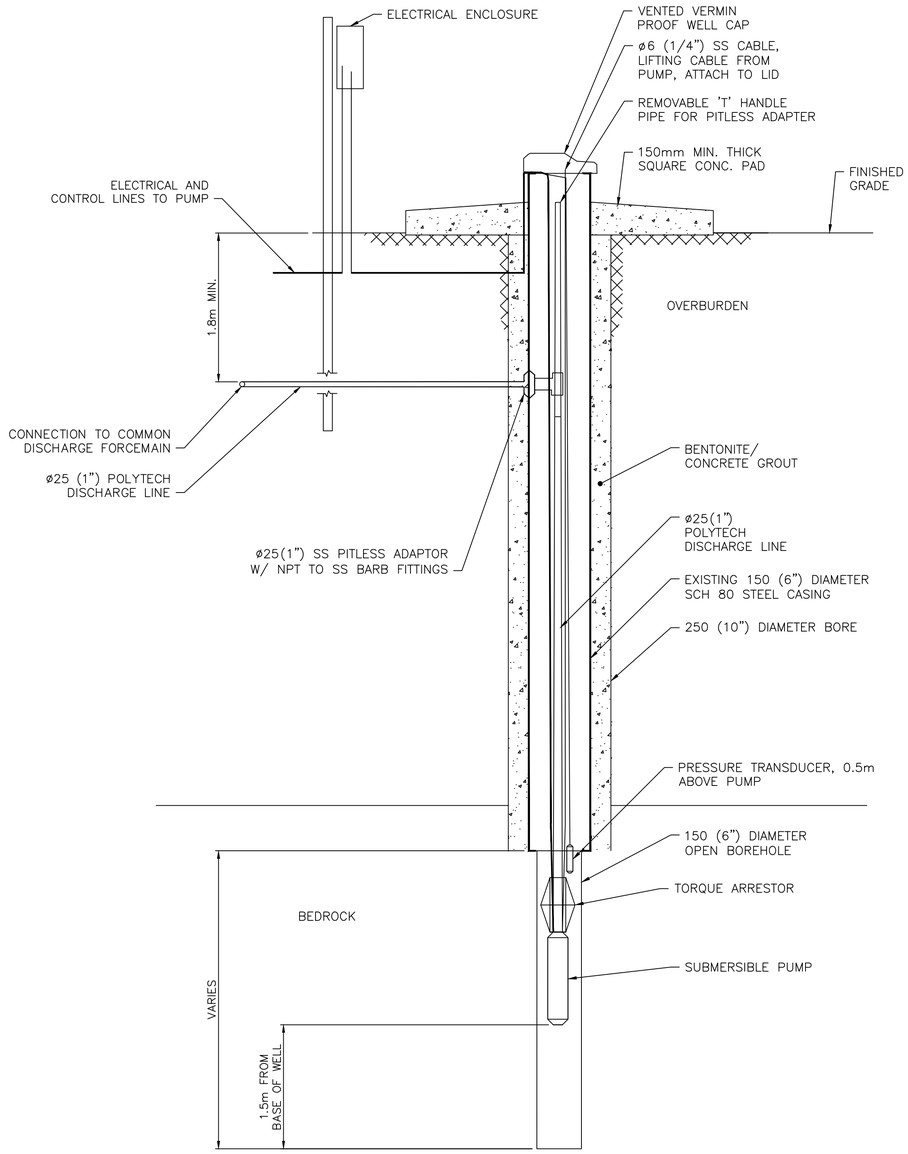
PROJECT #	DATE	SCALE
210166	2021-11-23	1 : 1000

DRAWN	CHECKED	APPROVED	DWG NO.	EIS NO.	REV.
DRR	FR		FIGURE 2	N/A	A2



SECTION VIEW
SCALE: NTS

NOTES:

1. ALL DIMENSIONS ARE METRIC AND SHOWN IN MILLIMETRES (UNLESS NOTED OTHERWISE).

DRAWING No.	REFERENCE DRAWINGS

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
A2	ISSUED FOR INTERNAL REVIEW	21/12/07	DRR	
A1	ISSUED FOR INTERNAL REVIEW	21/11/25	DRR	

REFERENCES

CLIENT

WASTE MANAGEMENT

PROJECT

RICHMOND LANDFILL
CONCEPTUAL DESIGN
HYDRAULIC CONTROL SYSTEM

TITLE

SOUTH EAST PORTION
TYPICAL BEDROCK EXTRACTION WELL

PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION

BluMetric Environmental
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PROJECT #	DATE	SCALE
210166	2021-11-23	NTS

DRAWN	CHECKED	APPROVED	DWG NO.	ES NO.	REV
DRR	FR		FIGURE 3	N/A	A2

APPENDIX A

Hydraulic Control System Complementary Evaluation

MEMORANDUM

DATE:	January 6, 2022
TO:	Chris Prucha, Bill McDonough and Jim Forney (WM)
FROM:	Matthew DeGeer and Francois Richard (BluMetric)
PROJECT NO:	210166-06
SUBJECT:	Hydraulic Control System Complementary Evaluation, WM Richmond Landfill, Town of Greater Napanee

OBJECTIVE

A hydraulic control system (HCS) may be required in the southeast portion of the Waste Management (WM) Richmond Landfill property. The objective is to establish hydraulically control in the intermediate bedrock flow zone to mitigate further off-site migration of landfill leachate impacted groundwater onto the property to the east of the southeast portion of the landfill property, while minimizing the volume of extracted groundwater.

Preliminary design scenarios were developed using aquifer properties derived from aquifer testing results using four test wells (M212-PW through M215-PW) drilled into bedrock and open to the formation across the intermediate bedrock flow zone (**Figure 1**). Results from preliminary aquifer testing (pumping test using M212-PW as pumping well) and analytical modelling confirmed the feasibility of an engineered system to prevent further off-site migration of groundwater. This will be achieved by inducing hydraulic control in the area along the groundwater flow path in the intermediate bedrock flow zone, towards the east/southeast in the southeastern portion of the site. Details and results from the preliminary aquifer testing conducted previously were provided in BluMetric (2018[1]).

Complementary field testing was conducted recently to confirm simulated results and to determine individual extraction well pumping rates required to create sufficient drawdown of hydraulic heads in the southeastern portion of the site where landfill leachate impacted groundwater has been delineated upgradient of the eastern property limit. Details regarding the methodology and results from the field testing program are described below.

[1] *Preliminary Purge Well System Evaluation, WM Richmond Landfill Town of Greater Napanee*, prepared by BluMetric Environmental Inc., October 15, 2018

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FIELD METHODOLOGY AND RESULTS

Aquifer testing was conducted between August 24 and September 6, 2021, consisting of a series of step tests with individual extraction wells pumping, followed by a short duration test with three extraction wells pumping simultaneously and finally a long-term aquifer test. All pumping and monitoring wells shown on **Figure 1** were equipped with Solinst Leveloggers (pressure transducers) several days before testing began and operated throughout the entire duration of the testing. Atmospheric pressure was also recorded during the testing period to allow for barometric compensation of the Solinst Levelogger data, and manual water levels were recorded at extraction and monitoring wells using an electronic water level tape.

Groundwater extracted from the pumping wells was discharged through a common forcemain equipped with a FLOMEC Series flowmeter and totalizer into a 1,000 L tank and pumped to a tanker for off-site disposal at the Napanee Wastewater Treatment facility.

Details and results from the aquifer tests are summarized below.

STEP TESTS

Test wells M213-PW, M214-PW, and M215-PW were individually step tested using Grundfos Redi-flo2 submersible pumps on August 24 and 25, 2021 to examine the response from pumping by monitoring water levels in test wells and monitoring wells, and to estimate the pumping rates required to achieve sufficient drawdown and stabilization of water levels within each of the wells. Water levels were recorded at nine monitoring wells (M105, M107, M108, M168, M193, M192, M70-2, M170, and M52-2) during each short duration pumping test. Pumping rates and water levels within the pumping and monitoring wells were recorded throughout the step tests and are summarized in **Table 1**.

Table 1: Summary of Step Tests

Pumping Well	Step Test Date	Initial Water Level (mbTOC)	Average Pump Rate (L/Min)	Duration (hr:min)	Approximate Extracted Volume (L)	Maximum Drawdown* (m)
M213-PW	25-Aug	9.65	9.5	2:20	1,135	10.42
M214-PW	24-Aug	8.76	9.7	3:15	1,900	6.64
M215-PW	25-Aug	7.00	9.1	2:40	1,400	6.64

* From manual water level readings

Results from the step tests confirmed direct hydraulic connection between extraction wells and most of the monitoring wells installed in the intermediate bedrock groundwater flow zone (**Figure 1**), where response to pumping was observed within seconds or minutes at several monitoring wells (M105, M107, M108, M168, M170 and M192). Unsurprisingly, no apparent response was observed at monitoring wells M52-2, M70-2 and M193, located to the east and southeast in an area where low permeability bedrock has been confirmed to be present through past hydrogeological investigations.

SHORT-TERM AQUIFER TEST

Three test wells (M212-PW, M214-PW and M215-PW) were pumped synchronously at a fixed flow rate on August 26, 2021, to further refine the target pumping rates for the long-term aquifer test. Initial flow rates between 3.7 and 4.2 L/min (1.0 and 1.1 usgpm) were imposed at the three extraction wells and maintained for a period of approximately 3.5 hours (see **Table 2**). Pumping rates were then increased at each of the test wells (between 8.7 and 10 L/min, 2.3 to 2.6 usgpm) and maintained for an additional period of approximately 3 hours. About 7,080 L of groundwater were extracted over the 6.5 hour of pumping. Water levels were recorded at nine monitoring wells during the short-term aquifer test (M105, M107, M108, M168, M193, M192, M70-2, M170 and M52-2) as well as test well M213-PW (not pumping). Flow rates and water levels in each of the pumping wells were also recorded.

A summary of the short-term aquifer test is provided in **Table 2**. Stabilization of groundwater levels in test and observation wells was not achieved during the short-term aquifer test. Maximum drawdown was similar at M214-PW and M215-PW, reaching 5.17 and 4.91 m, respectively, while the response to pumping was much smaller at M212-PW (0.50 m), confirming that the latter has a higher capacity compared to the other extraction wells. As was observed during previous hydraulic testing (BluMetric, 2018), a response was recorded within seconds or minutes at most monitoring wells, while negligible drawdown was measured at M52-2, M70-2 and M193.

Table 2: Summary of Short-Term Aquifer Test

Well	Initial Water Level (mbTOC)	Average Pumping Rate (L/Min)	Duration (min)	Approximate Extracted Volume (L)	Maximum Drawdown* (m)
M212-PW	10.05	3.74	210	786	0.50
		9.95	180	1,791	
M214-PW	8.84	3.47	205	711	5.17
		8.68	173	1,502	
M215-PW	9.10	4.19	200	839	4.91
		8.81	165	1,453	
M105	8.35	-	-	-	0.10
M107	9.60	-	-	-	0.11
M108	9.51	-	-	-	0.29
M168	7.41	-	-	-	0.26
M193	7.65	-	-	-	-0.02
M192	9.23	-	-	-	0.33
M70-2	8.51	-	-	-	0.05
M170	9.12	-	-	-	1.21
M52-2	9.21	-	-	-	-0.02
M213-PW	9.67	-	-	-	0.33

* From manual water level readings

LONG-TERM AQUIFER TEST

Groundwater was pumped for a period of approximately 57 hours from test wells M212-PW, M214-PW, and M215-PW between 10:00 am on August 31 to 07:04 pm on September 2, 2021.

The average pumping rate in extraction wells was initially set to a target value of 7.5 L/min (2 usgpm) at M212-PW and 3.8 L/min (1 usgpm) at M214-PW and M215-PW, for a combined discharge rate of 15 L/min (4 usgpm), and maintained for a period of about 49 hours before being reduced by 50% (combined discharge of 7.5 L/min or 2 usgpm) for the final 8 hours of pumping. A total of 49,367 L was extracted from the three pumping wells. **Table 3** summarizes the pumping rate and maximum observed drawdown observed as well as extracted groundwater volume at each of the pumping wells.

Table 3: Summary of Constant Discharge Aquifer Test Details

Pumping Well	Initial Water Level (mbTOC)	Average Flow Rate (L/Min)	Duration (hr:min)	Total Extracted Volume (L)	Maximum Drawdown* (m)
M212-PW	10.11	7.46	49:00	21,945	0.65
		3.87	8:00	1,856	
M214-PW	8.84	3.91	48:55	11,481	2.44
		2.19	7:57	1,044	
M215-PW	9.10	4.12	48:50	12,077	1.99
		2.03	7:54	964	

* From manual water level readings

Table 4 summarizes the initial (static) groundwater level and maximum drawdown observed after approximately 49 hours of continuous pumping at all observation wells during the constant discharge aquifer test.

Table 4: Summary of Observation Wells During Long-Term Aquifer Test

Borehole	Initial Water Level (mbTOC)	Maximum Drawdown* (m)
M52-2	9.24	0.13
M70-2	8.50	0.42
M105	8.45	0.35
M107	9.69	0.37
M108	9.57	0.50
M168	7.50	0.49
M170	9.20	0.95
M193	7.62	0.14
M192	9.29	0.53
M213-PW (not pumping)	9.72	0.54

* From manual water level readings

Pumping and observation well response curves to the aquifer test conducted at M212-PW, M214-PW, and M215-PW are presented in **Attachment A**. The following observations can be made from these graphs:

1) As expected, water levels in the three extraction wells (M212-PW, M214-PW and M215-PW) decreased quickly after the pumps were turned on, followed by a gradual slowdown in the drawdown as pumping continued; while the rate of decline in the water levels slowed down, steady conditions were not achieved at the end of the initial period of pumping (49 hours);
2) A very rapid and direct response was observed in water levels at test well M213-PW (not pumping) as well as in monitoring wells M105, M107, M108, M168, M170 and M192;
3) The water levels in monitoring well M70-2 showed an apparent but weak response to pumping, consistent with the fact that this monitoring well has poor permeability and is screened much shallower compared to adjacent well M170 where a response was observed immediately after pumping started, and the largest drawdown was recorded compared to all other monitoring wells;
4) Conversely, monitoring wells M52-2 and M193 demonstrated a fluctuation in water levels that appears to be mostly correlated with barometric pressure fluctuations, but no distinct response to pumping was observed at these locations located to the east and southeast where low permeability bedrock has been confirmed to exist;
5) Water levels stabilized quickly in the three extraction wells when the pumping rates were reduced by 50% after 48 hours (vertical blue line on the graphs), and remained relatively stable for an additional period of 8 hours;

6) Similarly, reduced drawdowns (higher water levels) were observed in the hydraulically active monitoring wells (M105, M107, M108, M168, M170 and M192) shortly after the pumping rates were reduced, and either stabilized or showed a slightly declining trend at some wells; and
7) All responsive wells started to recover towards their static (pre-pumping) elevations when pumping was shut down (dashed red line) after a total of 57 hours of pumping.

The interpolated maximum drawdowns, recorded in extraction and monitoring wells measured after about 48.5 hours of continuing pumping at a combined discharge rate of 15.5 L/min (4.1 usgpm), are shown on **Figure 2**. The results show continuous drawdown (i.e., overlapping areas of influence away from the pumping wells) across the impacted area immediately upgradient of the property adjacent to the southeastern portion of the landfill property. These results are generally consistent with simulated results obtained from Scenario 2 (BluMetric, 2018 Appendix D), with M212-PW, M214-PW and M215-PW pumping simultaneously.

GROUNDWATER DISCHARGE QUALITY

Four composite samples were collected throughout the hydraulic test, after approximately 2, 24, 48 and 56 hours of continuous pumping. Each composite sample comprised a mixture of groundwaters from pumping wells M212-PW, M214-PW and M215-PW. The samples were collected from an inline discharge valve located between the temporary storage tank and the storage tanker. All water samples were placed in bottles supplied and prepared by the laboratory for analysis, using the combined lists of groundwater and surface water parameters from the landfill Environmental Monitoring Plan (EMP). The samples were packed in coolers with ice and shipped by courier to the laboratory. All samples were analysed by Bureau Veritas Laboratory of Mississauga, ON, which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA).

Table 5 presents a summary of analytical results. Results are compared to Ontario Provincial Quality Objectives (PWQO), except for boron where the Council of Canadian Ministers of the Environment (CCME, 2009[2]) water quality guidelines for the protection of aquatic life limit of 1.5 mg/L was adopted for comparison, instead of the outdated Interim PWQO.

The concentrations of all analyzed parameters were below the PWQO (CCME guideline in the case of boron), except for phosphorus (first and third samples), and zinc (initial sample only). The concentration of 1,4-dioxane, the primary leachate indicator for the Richmond Landfill site, in the samples collected throughout the aquifer test ranged from 0.0063 mg/L to 0.0094 mg/L, which is below the PWQO of 0.02 mg/L. The concentrations of 1,4-dioxane from the samples collected at 24, 48 and 56 hours of pumping (0.0088, 0.0093 and 0.0094 mg/L) are consistent with the most recent concentrations from samples collected from impacted groundwater monitoring wells located in the southeastern portion of the site within the radius of influence of the proposed HCS (M70-2, M105, M107, M108, M168, M170 and M192).

[2] CCME 2009, *Canadian Water Quality Guidelines for the Protection of Aquatic Life (Boron)*. https://ccme.ca/en/res/boron-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf

Table 5: Combined Discharge Quality from Extraction Wells

Parameter	Units	PWQO*	Aug 31, 2021 11:45	Sep 1, 2021 10:15	Sep 2, 2021 10:00	Sep 2, 2021 18:00
Hours since pumping started (approx.):			*2*	*24*	*48*	*56*
General/Inorganic						
Alkalinity	mg/L		500	550	550	560
Ammonia	mg/L		2.63	1.96	1.82	1.87
Ammonia (unionized)	mg/L	0.02	0.0084	0.0086	0.0091	0.013
Biochemical Oxygen Demand	mg/L		2	4	5	8
Chemical Oxygen Demand	mg/L		13	18	15	15
Chloride	mg/L		350	230	220	210
Conductivity	µS/cm		1900	1700	1700	1700
Dissolved Organic Carbon	mg/L		3.6	4	4.1	3.9
Hardness	mg/L		370	340	360	350
Nitrate	mg/L		< 0.1	< 0.1	< 0.1	< 0.1
Nitrite	mg/L		< 0.01	< 0.01	< 0.01	< 0.01
Phenols	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Phosphorus (total)	mg/L	0.03	0.057	< 0.03	0.048	< 0.03
Sulphate	mg/L		24	14	11	12
Total Dissolved Solids	mg/L		955	890	805	865
Total Suspended Solids	mg/L		< 10	< 10	< 10	< 10
Metals						
Boron	mg/L	1.5*	1	1	0.97	1
Cadmium	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
Calcium	mg/L		75	66	76	73
Chromium (III)	mg/L	0.0089	< 0.005	< 0.005	< 0.005	< 0.005
Chromium (Total)	mg/L		< 0.005	< 0.005	< 0.005	< 0.005
Chromium (VI)	mg/L	0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cobalt	mg/L	0.0009	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper	mg/L	0.005	< 0.002	< 0.002	< 0.002	< 0.002
Iron	mg/L	0.3	0.3	0.1	< 0.1	< 0.1
Lead	mg/L	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Magnesium	mg/L		42	40	43	42
Manganese	mg/L		0.014	0.006	0.005	0.006
Nickel	mg/L	0.025	0.002	0.003	0.003	0.003
Potassium	mg/L		32	18	18	17
Sodium	mg/L		260	250	240	250
Zinc	mg/L	0.02	0.11	0.014	< 0.01	< 0.01
Naphthalene	mg/L		<0.00005	<0.00005	<0.00005	<0.00005

PWQO exceedances

* CCME (2009)

Parameter	Units	PWQO*	Aug 31, 2021 11:45	Sep 1, 2021 10:15	Sep 2, 2021 10:00	Sep 2, 2021 18:00
Hours since pumping started (approx.):			*2*	*24*	*48*	*56*
Volatile Organic Compounds (VOCs)						
1,1,1,2-Tetrachloroethane	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1,1-Trichloroethane	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,1,2,2-Tetrachloroethane	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1,2-Trichloroethane	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1-Dichloroethane	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,1-Dichloroethylene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,2-Dichlorobenzene (o)	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,2-Dichloroethane	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,3,5-Trimethylbenzene	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,3-Dichlorobenzene (m)	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,4-Dichlorobenzene (p)	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,4-Dioxane	mg/L	0.02	0.0063	0.0088	0.0093	0.0094
Benzene	mg/L		0.0001	< 0.0001	< 0.0001	< 0.0001
Chlorobenzene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chloroethane	mg/L		< 0.0002	< 0.002	< 0.002	< 0.002
Chloromethane	mg/L		< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cis-1,2-Dichloroethylene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dichloromethane	mg/L		< 0.0005	< 0.0005	< 0.0005	< 0.0005
Ethylbenzene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
m+p-Xylene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
o-Xylene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
Styrene	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
Tetrachloroethylene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
Toluene	mg/L		0.0047	0.00035	0.00021	< 0.0002
Total Xylenes	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
Trans-1,2-dichloroethylene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
Trichloroethylene	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vinyl Chloride	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002
Field Temperature	Celsius		15.7	12.9	12.3	13.3
pH (Field)	Unitless		6.96	7.19	7.27	7.39
PWQO exceedances						

*** CCME (2009)**

DISCUSSION AND CONCLUSION

Aquifer testing was completed in the southeastern portion of the landfill property, where leachate impacted groundwater has been delineated and extends onto a portion of the adjacent property to the east. Three test wells installed in the intermediate bedrock flow zone were used as pumping wells to evaluate the feasibility of establishing a hydraulic control system (HCS) designed to mitigate further off-site migration of landfill leachate impacted groundwater onto the property to the east.

The aquifer testing program consisted of step tests where extraction wells were pumped individually over a few hours to establish suitable pumping rates and target drawdowns in each well. A short term (6.5 hours) aquifer test was then conducted by pumping three extraction wells (M212-PW, M214-PW and M215-PW) simultaneously and monitoring groundwater elevations in the pumping wells and monitoring wells located in the vicinity and known to be hydraulically active. Finally, a long-term (57 hours) aquifer test was completed to evaluate the effective drawdown and radius of influence that can be achieved by continuous pumping of the proposed HCS.

Results from the hydraulic testing were consistent with those obtained from previous preliminary field testing and modelling results and confirmed that effective hydraulic control can be achieved in the southeastern portion of the landfill property and hydraulically upgradient from the property to the east. The hydraulic connectivity among the pumping wells and the monitoring wells is such that the intermediate bedrock groundwater flow zone contamination can be effectively controlled to mitigate and eventually prevent further off-site migration.

Groundwater quality from the combined discharge was monitored during the long-term aquifer test, and the results from the final sample collected met the surface water criteria (PWQO for all parameters except for boron, and the CCME guideline for boron). Direct discharge to surface water can be considered without requiring treatment.

CLOSING

We trust that the information provided is satisfactory. Do not hesitate to contact the undersigned if you have questions or require additional details.

Report Prepared by:
BluMetric Environmental Inc.

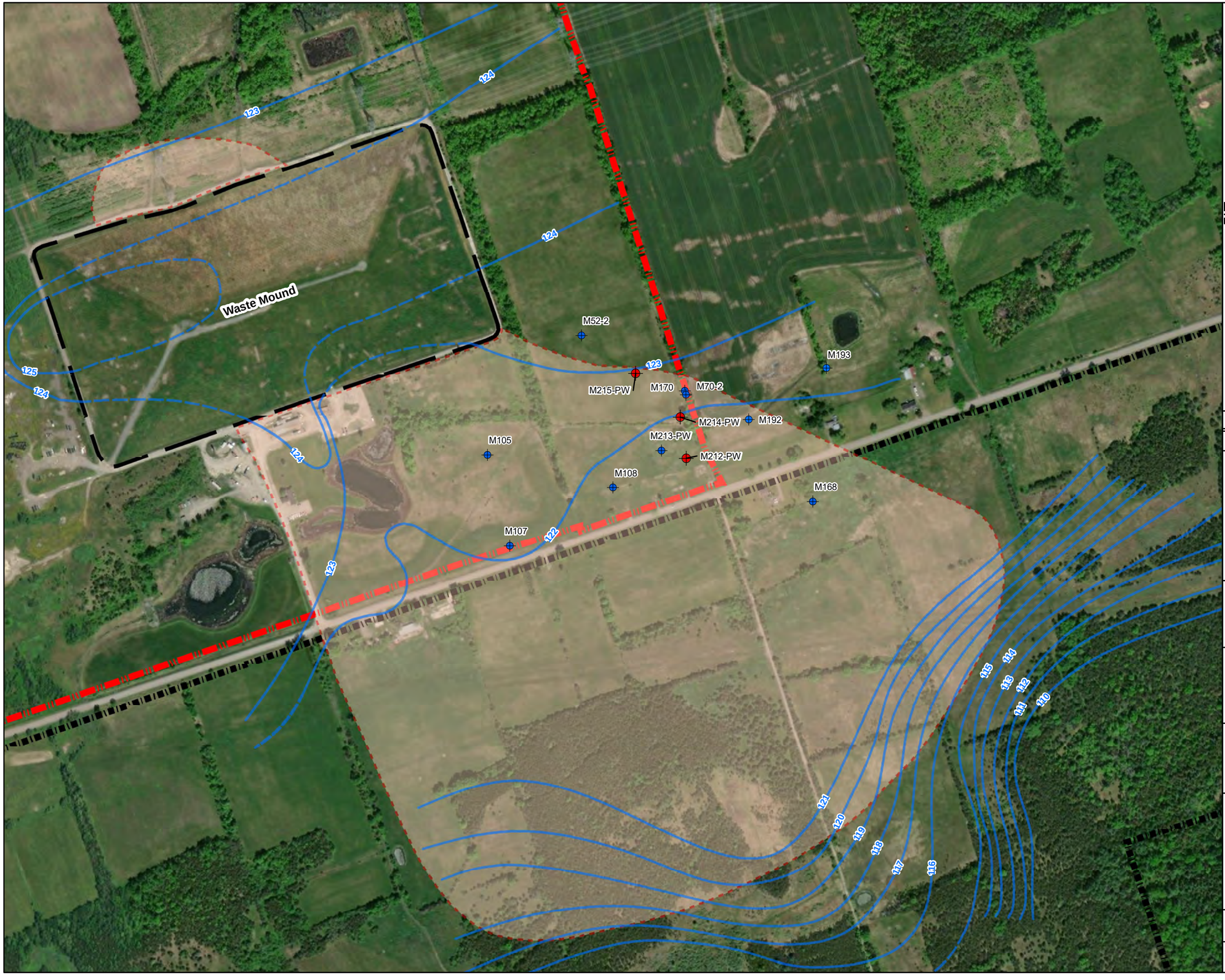
François Richard, Ph.D. P.Geo.
Senior Hydrogeologist

Matthew DeGeer, M.Sc., GIT
Geoscientist-in-Training

Attachments:

Figure 1:	Extraction Wells and Monitoring Network
Figure 2:	Interpolated Groundwater Drawdown – September 2, 2021
Attachment A:	Long Term Aquifer Test Drawdown Plots

FIGURES



LEGEND

- Test Well
- Monitoring Well
- Potentiometric Surface (masl) - May 14, 2018
- Infered Potentiometric Surface (masl) - May 14, 2018
- Extents of 1,4 Dioxane Impacted Area
- Property Boundary
- Proposed CAZ Boundary
- Landfill Footprint

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.

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0 20 40 80 120 160
Meters

1:5,000

CLIENT

WM

PROJECT

Waste Management Richmond Landfill - Hydraulic Containment System

TITLE

Extraction Wells and Monitoring Network

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
210166-06	January 06, 2022

DRAWN	CHECKED	FIG NO.	REV
GM	MC	01	0

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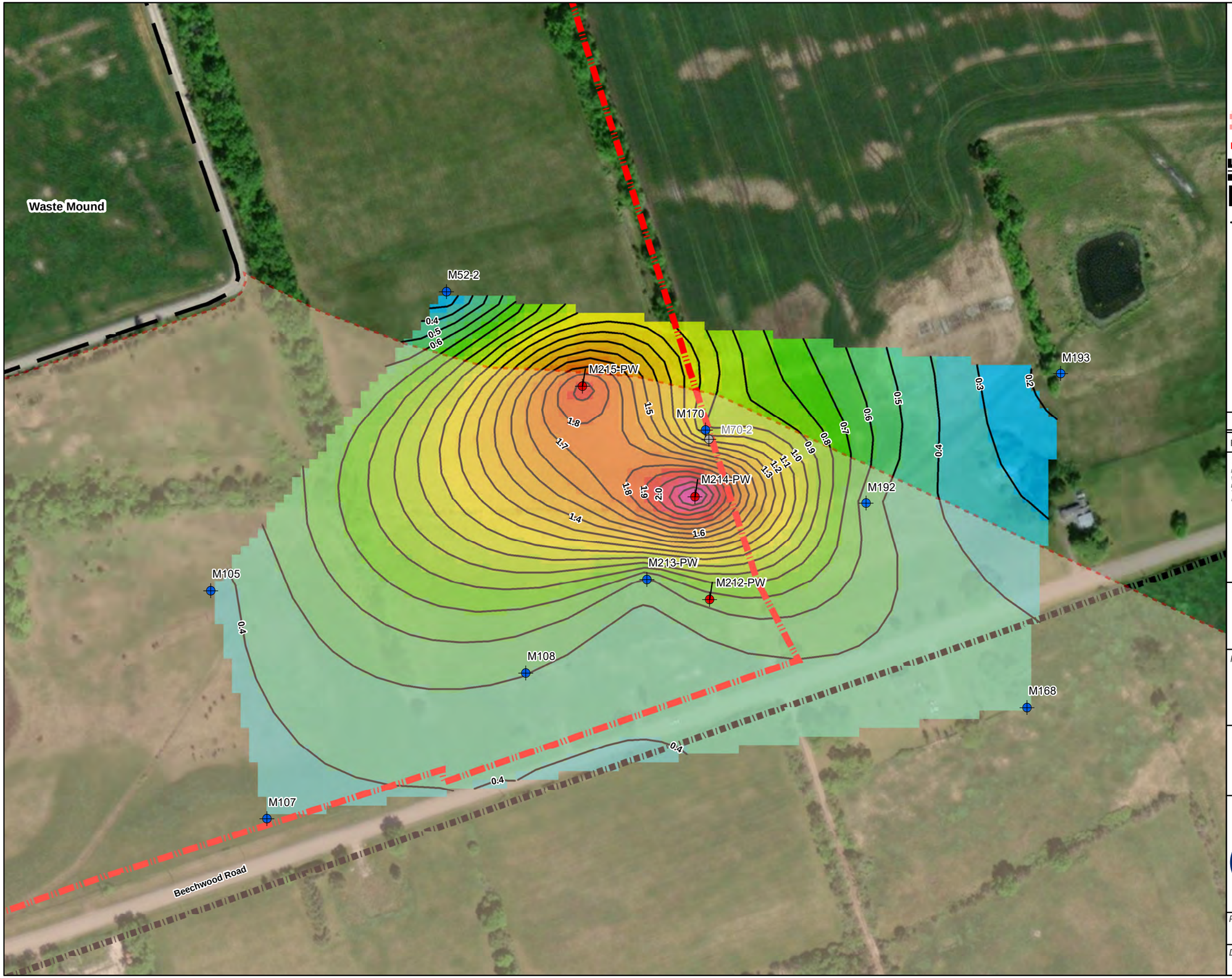

LEGEND

- Test Well
- Monitoring Well
- Not Used in Contouring
- Extents of 1,4 Dioxane Impacted Area
- Property Boundary
- Proposed CAZ Boundary
- Landfill Footprint
- Drawdown Contours (0.1 m interval)

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.

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Meters

1:2,000

CLIENT

WM

PROJECT

Waste Management Richmond Landfill - Hydraulic **Control** System

TITLE

Interpolated Groundwater Drawdown
September 2, 2021

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
210166-06	December 20, 2021

DRAWN	CHECKED	FIG NO.	REV
GM	FR	02	0

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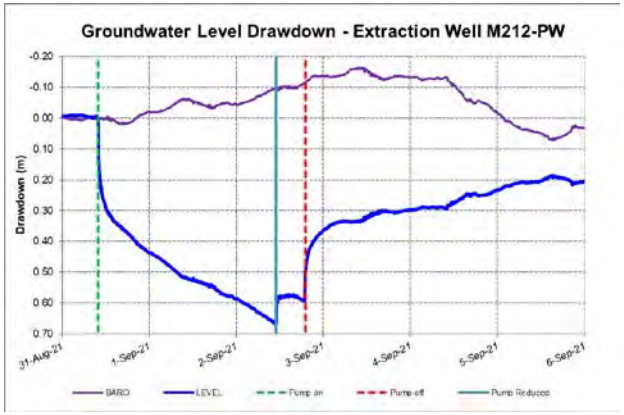
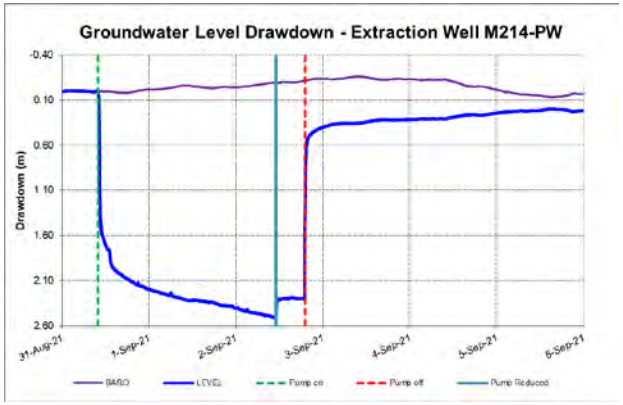
ATTACHMENT A

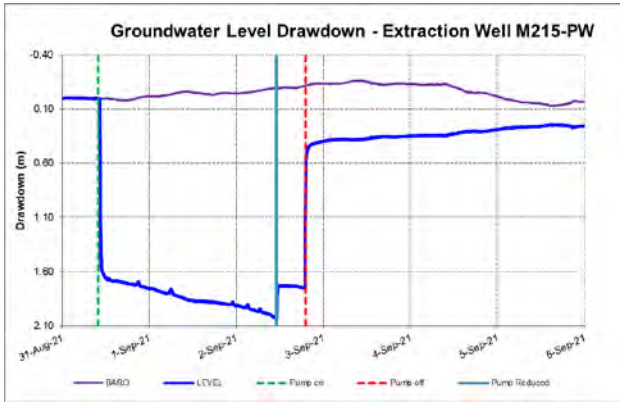
Long Term Aquifer Test Drawdown Plots

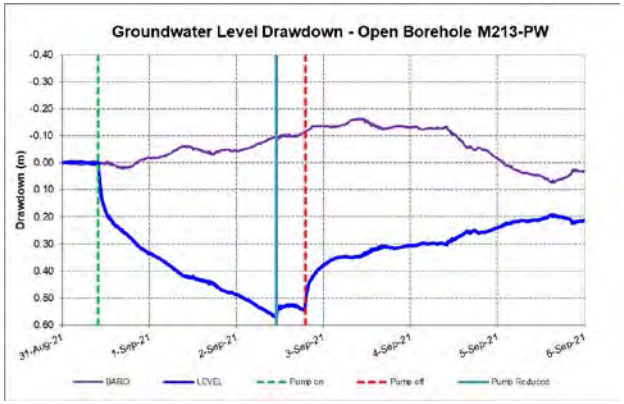
Groundwater Drawdown Graphs

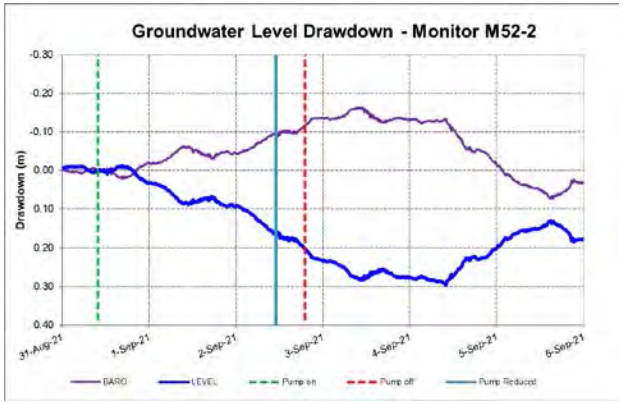
Hydraulic Control System (HCS)
Long-Term Aquifer Test
August 31 to September 6, 2021

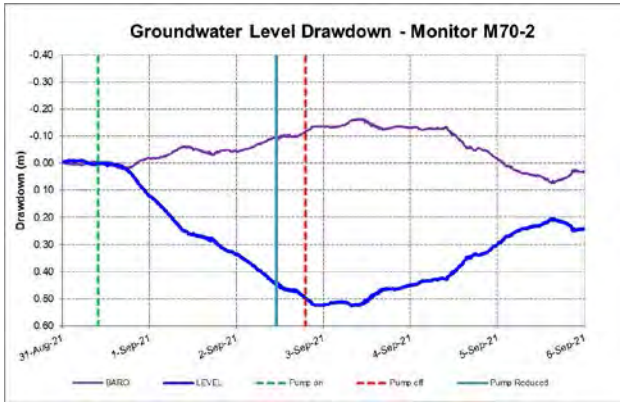


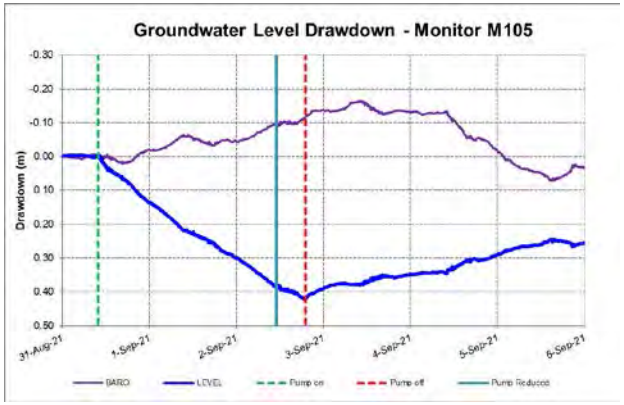


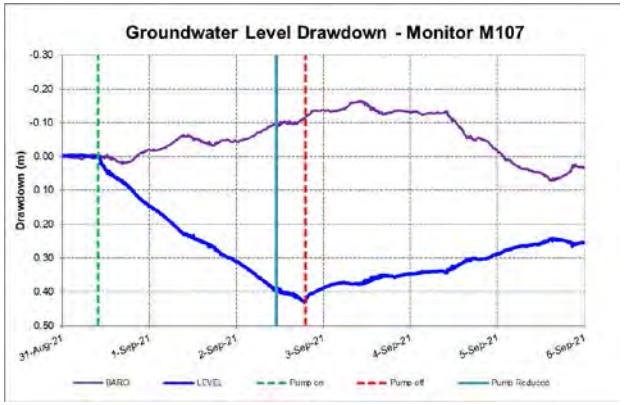


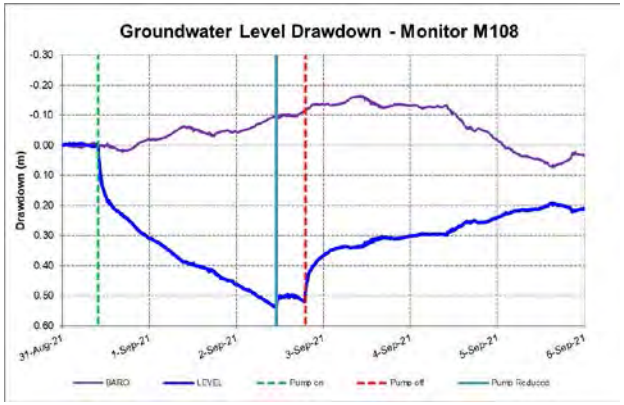






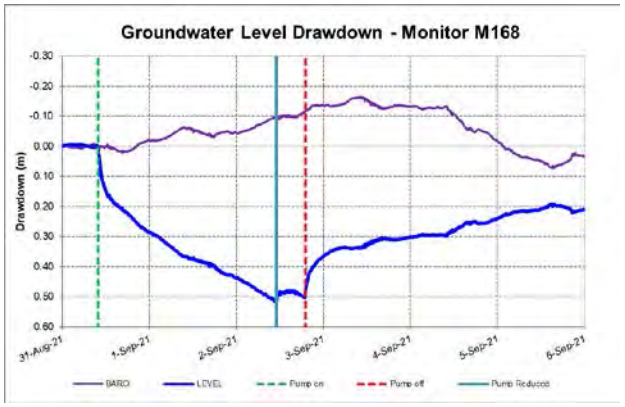


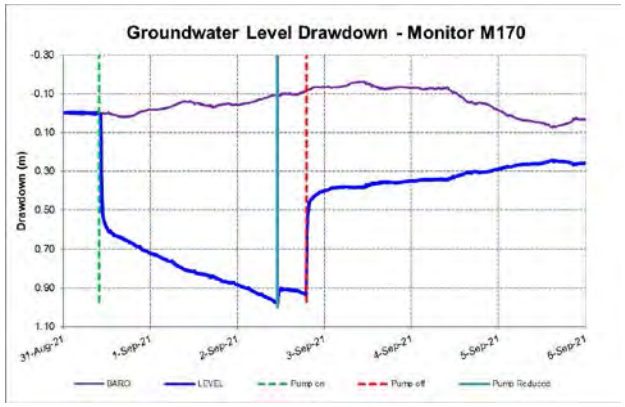


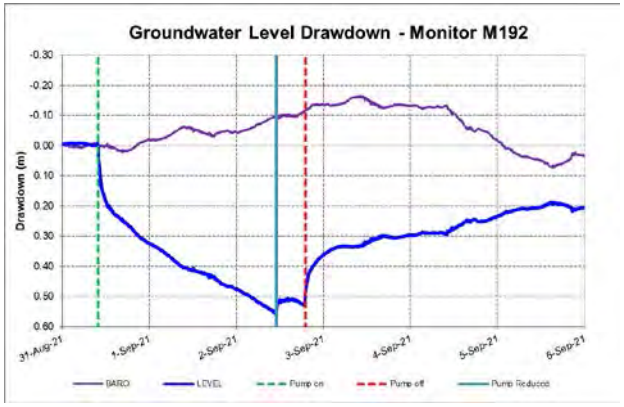


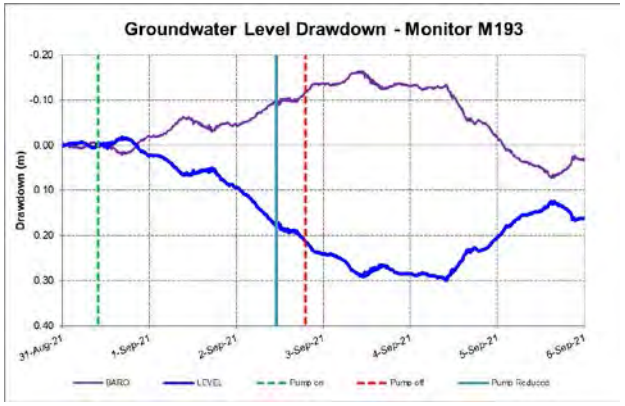
Groundwater Drawdown Graphs

Hydraulic Control System (HCS)
Pumping Test
August 31 to September 6, 2021









APPENDIX B

Preliminary Purge Well System Evaluation (BluMetric, 2018)

MEMORANDUM

DATE:	October 15, 2018
TO:	Chris Prucha, Bill McDonough and Jim Forney (WM)
FROM:	Alija Bos, Madeleine Corriveau, Phil Tibble and Francois Richard (BluMetric)
PROJECT NO:	180150-06
SUBJECT:	Preliminary Purge Well System Evaluation, WM Richmond Landfill Town of Greater Napanee

OBJECTIVE

A purge well system may be required in the southeast portion of the Waste Management (WM) Richmond Landfill property. The objective of the purge well system is to hydraulically control contaminated groundwater in the intermediate bedrock flow zone, currently travelling off property while minimizing the volume of water requiring treatment or transport for disposal.

Preliminary design scenarios using aquifer properties derived from pumping test results, suggest hydraulic capture can be achieved for control of off-site migration. Details are provided below related to the field testing, including drilling test wells and conducting a pumping test, as well as results and interpretations aimed at establishing the feasibility and preliminary design scenarios for the system.

FIELD METHODOLOGY

DRILLING

A total of four boreholes were drilled south and southeast of the landfill footprint on August 16th 2018 (M212-PW through M215-PW). The test wells were installed along a roughly north-south axis 25 to 50 m west from the downgradient Waste Management property line (Figure 1). The intermediate bedrock groundwater flow zone potentiometric surface from May 2018[1] and approximate extent of the known impacted area[2] are also shown on Figure 1.

[1] Spring 2018 Semi-Annual Monitoring Report, Waste Management Richmond Landfill Site, prepared by BluMetric Environmental Inc., July 2018
[2] Site Conceptual Model Update and Contaminant Attenuation Zone Delineation, Waste Management Richmond Landfill Site, prepared by BluMetric Environmental Inc., July 2017

The test wells were installed upgradient of the adjacent property to the east, where landfill derived impacts in the intermediate bedrock groundwater flow zone have been identified.

Drilling of boreholes M212-PW through M215-PW was completed by Chalk Well Drilling Ltd. of Napanee, ON using cable tool, air percussion techniques. After drilling through the overburden, steel casing was installed from ground surface and set into the upper portion of the bedrock. Borehole records are included in Appendix A.

Table 1: Summary of Borehole Construction Details

Borehole	Easting	Northing	Ground Surface Elevation (masl)	Bedrock Elevation (masl)	Bottom of Hole Elevation (masl)
M212-PW	335891	4902773	128.361	125.471	93.5
M213-PW	335857	4902784	127.976	125.236	93.2
M214-PW	335883	4902829	127.245	125.417	93.4
M215-PW	335822	4902889	127.636	126.426	94.4

Reported initial yields during drilling for the boreholes were low, about 1 U.S. gallons per minute (gpm) at M212-PW and less than 1 gpm at the other three holes. Chalk Well Drilling developed the wells with a cable tool and achieved improvements in potential yields, reporting potential yields and depths where water was found as listed in Table 2:

Table 2: Summary of Borehole Observations

Borehole	Potential Yield Lpm (USgpm)	Fractures Noted mbgs (masl)	Water Found mbgs (masl)
M212-PW	75.7 (20)	12.5 (115.9)	27.7 (100.6)
		27.7 (100.6)	
M213-PW	5.7 (1.5)	12.2 (115.8)	27.4 (100.5)
		27.4 (100.5)	
M214-PW	15.1 (4)	11.6 (115.7)	26.5 (100.7)
		26.5 (100.7)	
M215-PW	75.7 (20)	10.7 (117.0)	25.9 (101.7)
		25.9 (101.7)	

PUMPING TEST

Groundwater was pumped from M212-PW pumping well using a three inch Grundfos SQE pump. Groundwater was discharged through a four inch 'lay flat' hose to a temporary water storage tank which was routinely pumped out by Sutcliffe Sanitation Services Ltd. of Napanee, ON. Collected discharge water was disposed of at the Napanee Waste Water Treatment Plant. The flow rate was monitored by an inline Lake displacement gauge and flow rate was controlled by adjustment of a gate valve at the well head. Table 2 summarizes the flow rate and maximum observed drawdown in the pumping well for the test.

Table 2: Summary of Pumping Test Details

Pumping Test Duration (hrs)	Average Flow Rate (USgpm)	Maximum Drawdown (m)	Total Volume USgal
46	8.78	5.86	24,233 (~91,732 L)

Solinst Leveloggers (pressure transducers) were installed in test wells M213-PW, M214-PW, M215-PW as well as in nearby observation wells installed in the intermediate bedrock flow zone, and set to acquire groundwater level readings on five minute intervals. Figure 1 illustrates the location of the observation wells with respect to the pumping well. The Solinst Leveloggers were hung below the water level in the well using optical connection cables that allowed data to be checked and downloaded from the surface without removing the logger from the well. Loggers were installed at least 24 hours prior to the start of the long term constant discharge test to collect background data. Atmospheric pressure was also recorded during the testing period to allow for barometric compensation of the Solinst Levelogger data. In addition to the Solinst Levelogger data, manual water levels were collected using an electronic water level tape prior to and several times during the pumping and recovery phases of the test.

Inflatable packers were used to isolate vertical intervals in M215-PW and M212-PW boreholes for testing purposes. Water level measurements were recorded above and below the isolated zones in these boreholes.

On completion of the pumping and recovery components of the constant discharge test, the water level measurements collected by the data loggers were retrieved and the Solinst Leveloggers removed from the wells. Water level data from the Solinst Leveloggers was corrected for barometric pressure changes and then were normalized to a zero point coinciding with the start of the pumping phase of the constant discharge test to facilitate recognition of the extent of drawdown and recovery.

Observation well response curves to the pumping test conducted at M212-PW are presented in Appendix B.

DATA ANALYSIS

Response to pumping at M212-PW was observed in all monitoring wells indicating the pumping well and other new wells were intersecting the hydraulically active system in the area as identified by previous investigations.

Water level data from the pumping test described above was plotted on a composite plot, with an x-axis of t/r^2, where:

- t: elapsed time since the start of pumping; and,
- r: radial distance from the pumped well.

The Cooper-Jacob analysis can be applied to a composite plot as follows:

$$s = \frac{Q}{4\pi T} 2.303 log_{10} \left[2.2459 \frac{T}{S} \left(\frac{t}{r^2} \right) \right]$$

Where:

- Q: constant well discharge;
- T: transmissivity; and,
- S: storage coefficient.

The approximation in this form suggests that after some time has elapsed, the drawdown is a linear function of the logarithm of t/r^2. Solving for T:

$$T = 2.303 \frac{Q}{4\pi} (SLOPE)^{-1}$$

Where:

- $SLOPE$ = drawdown per log cycle t/r^2

As shown in Figure 2, after some early-time curvature, the drawdown data from all observation wells approximate straight lines with a similar slope indicating that all wells are installed within the same hydrostratigraphic unit. Therefore it is appropriate to use this slope to estimate a representative bulk average transmissivity of the intermediate bedrock unit in this portion of the site as follows:

$$T = 2.303 \frac{48 \frac{m^3}{day}}{4\pi} (1.5m)^{-1}$$
$$T = 5.8\, m^2/day$$
$$T = 7E^{-5}\, m^2/s$$

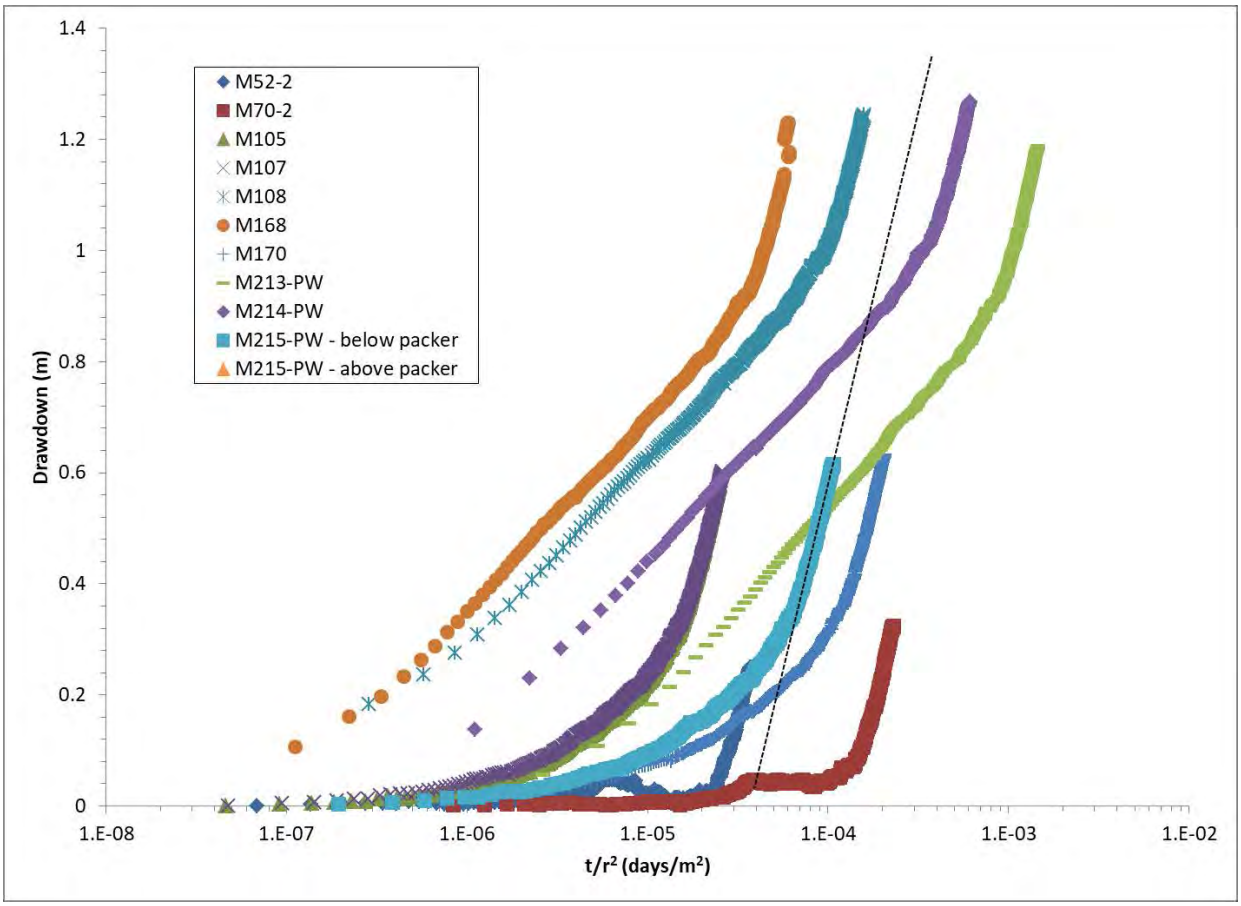


Figure 2: Composite plot of drawdown data

Pumping test data was also analyzed using aquifer test analysis software AquiferTest™ to estimate hydraulic parameters. The Theis solution provided an average transmissivity value of $8E^{-5}$ m^2/s for test wells M213-PW, M214-PW and M215-PW. Analysis data sheets are provided in Appendix C.

PRELIMINARY PURGE WELL DESIGN

The AquiferTest software was used to simulate different potential combinations of pumping wells and pumping rates to hydraulically control impacted groundwater near the southeastern corner of the landfill property.

Three scenarios were simulated, using 2, 3 and 4 pumping wells. Pumping rates in each pumping well were adjusted to achieve 1 m of drawdown throughout the north-south transect, approximately parallel to the property boundary. The target drawdown was selected arbitrarily, with objective of controlling the hydraulic gradient locally while keeping the total pumping rate relatively low.

Scenario 1: Two pumping wells

Pumping Well	Pumping Rate Q (USgmp)
M212-PW	4.2
M215-PW	4.2

Total estimated Q = 8.4 USgpm

Scenario 2: Three pumping wells

Pumping Well	Pumping Rate Q (USgmp)
M212-PW	2.2
M214-PW	2.3
M215-PW	2.2

Total Q = estimated 6.7 USgpm

Scenario 3: Four pumping wells

Pumping Well	Pumping Rate Q (USgmp)
M212-PW	1.4
M213-PW	0.7
M214-PW	2.4
M215-PW	2.0

Total Q = estimated 6.5 USgpm

DISCUSSION AND RECOMMENDATIONS

Water bearing fractures were noted at similar elevations amongst the new boreholes and at elevations consistent with existing groundwater monitoring wells in the area. By way of water level response in the new boreholes and in existing groundwater monitoring wells, the long-term (46 hr) constant discharge test confirmed that the newly installed boreholes are in hydraulically connection with the identified intermediate bedrock groundwater flow zone. The bulk transmissivity of this hydrostratigraphic unit in this portion of the landfill property was estimated through long term pumping test data at approximately 7.5×10^{-5} m^2/s.

Preliminary design scenarios using aquifer properties derived from pumping test results with the new test wells as potential purge wells confirm the feasibility of an engineered system to prevent further off-site migration of impacted groundwater, by inducing groundwater capture through altering the groundwater flow pattern.

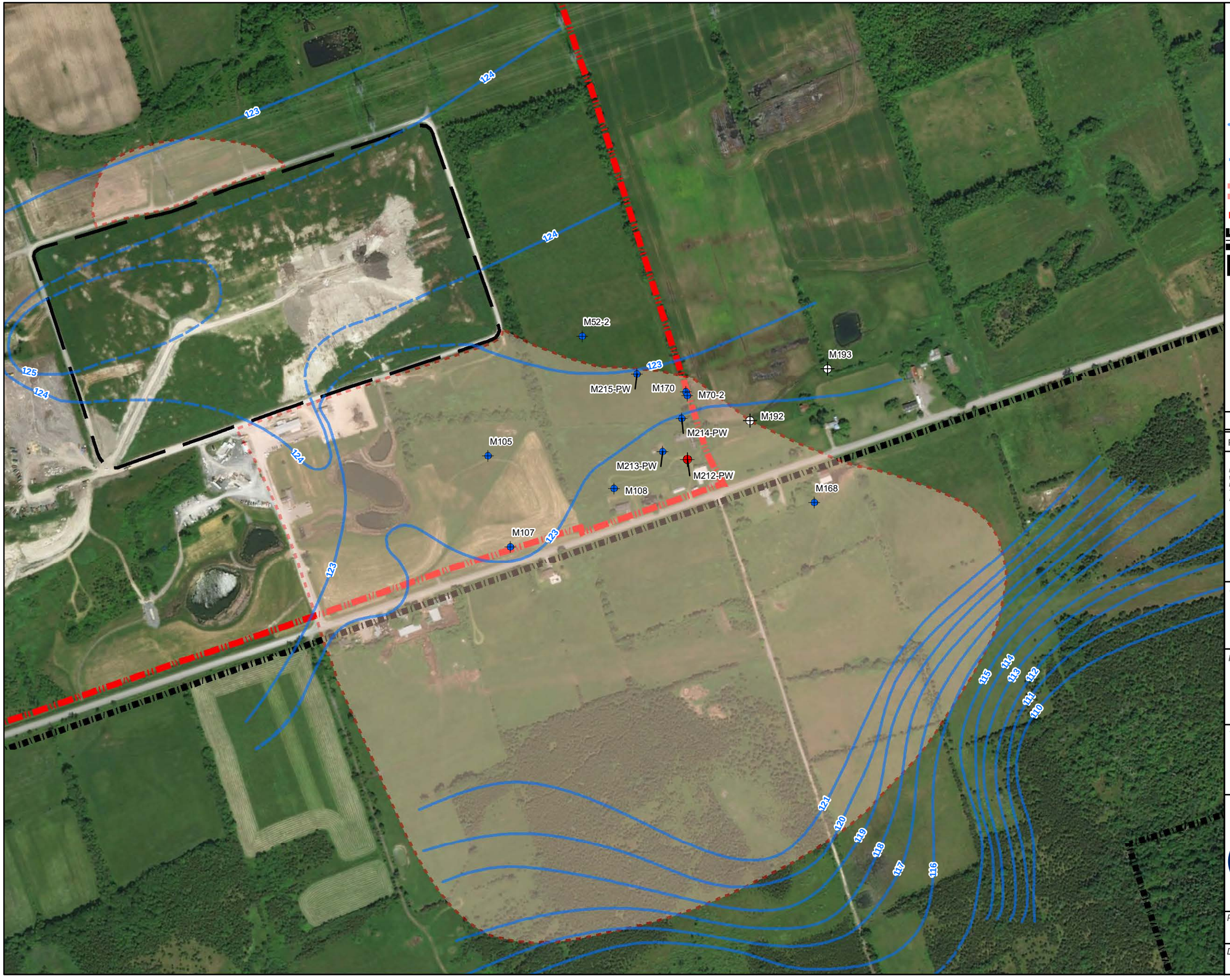
It is recommended to move forward with additional testing to confirm simulated results, and refine and optimize individual purge well pumping rates to create sufficient drawdown of hydraulic heads while minimizing total pumping rates. To accomplish this, complementary field testing will be required to confirm individual test well pumping rates, radius of influence and combined hydraulic head drawdown. The quality of the combined discharge from the potential purge well system will also need to be established through sampling and analysis of purge water during testing.

Additionally, a technical and economic evaluation of discharge options for groundwater collected from the proposed purge well system, including associated permitting requirements as needed, will also need to be considered. Options may include, for example, off site hauling and treatment at an approved waste water treatment plant, on-site treatment plant and/or discharge to surface water following on site passive treatment (e.g., constructed wetlands), collection pond(s) potentially linked to the existing pond system located in the front field of the landfill property to accommodate the additional requirements in terms of storage capacity and holding times.

Attachments:

Figure 1: M212-PW Pumping Test Monitoring Well Network
Appendix A: Borehole Records
Appendix B: Observation Well Drawdown Curves
Appendix C: Pumping Test Analysis
Appendix D: Preliminary Purge Well Scenarios

FIGURES



LEGEND

- Pumping Well
- Observation Well
- Monitoring Well
- Potentiometric Surface (masl) - May 14, 2018
- Infered Potentiometric Surface (masl) - May 14, 2018
- Extents of 1,4 Dioxane Impacted Area
- Property Boundary
- Proposed CAZ Boundary
- Landfill Footprint

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.

N, W, E, S

0 20 40 80 120 160
Meters

1:5,000

CLIENT

WM WASTE MANAGEMENT

PROJECT

Waste Management Richmond - Complementary CAZ Investigation

TITLE

M212-PW Pumping Test Monitoring Well Network

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
180150-06	October 11, 2018

DRAWN	CHECKED	FIG NO.	REV
AL	MC	01	0

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APPENDIX A

Well Records

Ontario | Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag#: A250917 — A250917 — M212-PW

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

Field	Value
First Name / Last Name / Organization	WASTE MANAGEMENT CANADA CORP.
E-mail Address	UNK
Well Constructed by Well Owner	☐
Mailing Address (Street Number/Name)	1271 Beechwood Road
Municipality	Napanee
Province	Ontario
Postal Code	K7R 3L1
Telephone No. (inc. area code)	613 388-1057

Well Location

Field	Value
Address of Well Location (Street Number/Name)	1181 Beechwood Road
Township	Richmond
Lot	3
Concession	IV
County/District/Municipality	Lennox & Addington
City/Town/Village	Greater Napanee
Province	Ontario
Postal Code	K7R 3L1
Other	
UTM Coordinates Zone, Easting, Northing	NAD 83 18 335891 4902773
Municipal Plan and Sublot Number	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay		Packed	0	3
Brown	Clay Till		Packed	3	9.5
Grey	Limestone		Hard	9.5	114.5

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
20	0	Bentonite	7.0

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft):

Pumping rate (l/min / GPM):

Duration of pumping: ___ hrs + ___ min

Final water level end of pumping (m/ft):

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft):

Recommended pump rate (l/min / GPM):

Well production (l/min / GPM):

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

☒ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☒ Air percussion ☐ Other, specify ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

Well Use

☐ Public ☐ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify ☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning ☐ Not used ☐ Dewatering ☒ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6.25	Steel	.188	+2	20

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☒ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Water Details

Water found at Depth 91 (m/ft) Kind of Water: ☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify

Water found at Depth ___ (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Water found at Depth ___ (m/ft) Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	10"
20	109.5	6"
109.5	114.5	5.75"

Map of Well Location

Please provide a map below following instructions on the back.

Comments: Fractures at 41 Ft. & 91 Ft.

Well Contractor and Well Technician Information

Field	Value
Business Name of Well Contractor	Chalk Well Drilling Ltd.
Well Contractor's Licence No.	1507
Business Address (Street Number/Name)	31 Johson's Side Road
Municipality	Napanee
Province	Ontario
Postal Code	K7R 3L1
Business E-mail Address	chalkwel kos.net
Bus. Telephone No. (inc. area code)	613 388-2809
Name of Well Technician (Last Name, First Name)	Chalk, Kevin
Well Technician's Licence No.	0627
Signature of Technician and/or Contractor	Kevin Chalk
Date Submitted	2018 08 16

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: YYYY MM DD

Date Work Completed: 2018 08 16

Ministry Use Only — Audit No. Z291286 — Received

0506E (2014/11) — Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): A 250918 Tag#: A250918 M213-PW

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
WASTE MANAGEMENT	CANADA CORP.	UNK	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1271 Beechwood Road	Napanee	Ontario	K7R 3L1	613 388-1057

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1181 Beechwood Road	Richmond	3	IV

County/District/Municipality	City/Town/Village	Province	Postal Code
Lennox & Addington	Greater Napanee	Ontario	K7R 3L1

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	335857	4902784		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay		Packed	0	2
Brown	Clay Till		Packed	2	6
Brown	Clay/Gravel	Silt	Loose	6	9
Grey	Limestone		Hard	9	114

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
20	0	Bentonite	11.2

Method of Construction

☒ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6.25	Steel	.188	+2	20

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth (m/ft) From	To	Diameter (cm/in)
90 (m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☒ Untested ☐ Other, specify	0	20	10"
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify	20	109	6"
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify	109	114	5.75"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

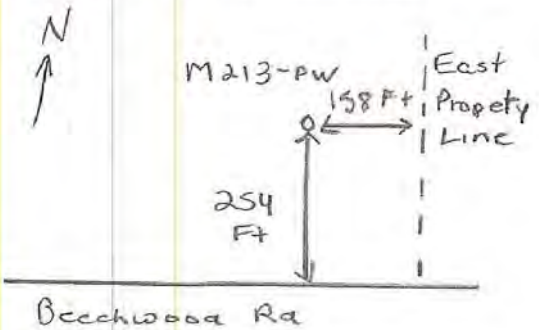
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Fractures at 40 ft. and 90 ft.

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Chalk Well Drilling Ltd.	1507

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
31 Johnson's Side Road	Napanee	Ontario	K7R 3L1	chalkwel.kos.net

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
613 388-2809	Chalk, Kevin	0627	Kevin Chalk	2018 Y 08 M 16 D

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☐ No	Y Y Y Y M M D D	2018 Y 08 M 16 D

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Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below)
Tag#: A250919
A250919 M214-PW

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
WASTE MANAGEMENT	CANADA CORP.	UNK	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1271 Beechwood Road	Napanee	Ontario	K7R 3L1	613 388-1057

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1181 Beechwood Road	Richmond	3	IV

County/District/Municipality	City/Town/Village	Province	Postal Code
Lennox & Adddington	Greater Napanee	Ontario	K7R 3L1

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	335883	4902829		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay		Packed	0	2
Brown	Clay Till		Packed	2	6
Grey	Limestone		Hard	6	111

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
20	0	Bentonite	7.0

Method of Construction

☒ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify ____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6.25	Steel	.188	+2	20

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Water Details

Water found at Depth (m/ft)	Kind of Water	Other, specify
87	☐ Fresh ☒ Untested ☐ Gas	
	☐ Fresh ☐ Untested ☐ Gas	
	☐ Fresh ☐ Untested ☐ Gas	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	10"
20	105	6"
106	111	5.75"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify ____

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

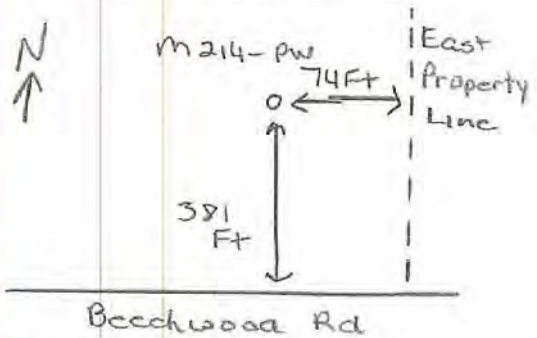
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
Fractures at 38 Ft & 87 Ft.

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Chalk Well Drilling Ltd.	1507

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
31 Johnson's Side Road	Napanee	Ontrio	K7R 3L1	chalkwel kos.net

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
613 388-2809	Chalk, Kevin	0627	Kevin Chalk	2018 08 16

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☐ No		2018 08 16

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Audit No. Z291287
Received

0506E (2014/11)

Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* **Tag#: A250920**
A250920 M215-PW

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	WASTE MANAGEMENT CANADA CORP.	UNK	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
1271 Beechwood Road	Napanee	Ontario	K7R 3L1	613 388-1057

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1681 Beechwood Road	Richmond	3	IV

County/District/Municipality	City/Town/Village	Province	Postal Code
Lennox & Addington	Greater Napanee	Ontario	K7R 3L1

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD	18	335822	4902889		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay		Packed	0	3
Brown	Clay Till		Packed	3	4
Grey	Limestone		Hard	4	109

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m^3/ft^3)
20	0	Bentonite	7.0

Method of Construction

☒ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6.25	Steel	.188	+2	20

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
85	☐	☐ Fresh ☒ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	10"
20	104	6"
104	109	5.75"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping
____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

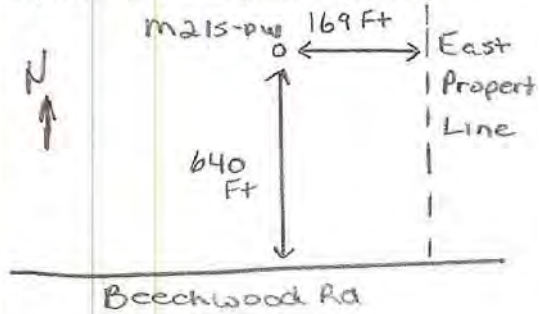
Well production *(l/min / GPM)*

Disinfected?
☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
Fractures at 35 Ft. & 85 Ft.

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Chalk Well Drilling Ltd.	1507

Business Address (Street Number/Name)	Municipality
31 Johnson's Side Road	Napanee

Province	Postal Code	Business E-mail Address
Ontario	K7R 3L1	chalkwel kos.net

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
613 383-2809	Chalk, Kevin

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
0627	Kevin Chalk	2018 Y 08 M 16 D

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☐ No	Y Y Y Y M M D D	2018 Y 08 M 16 D

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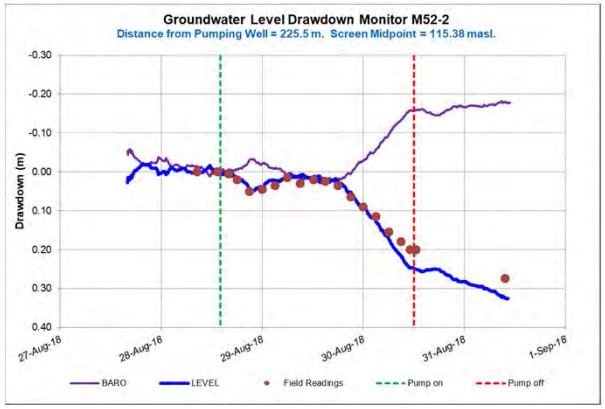
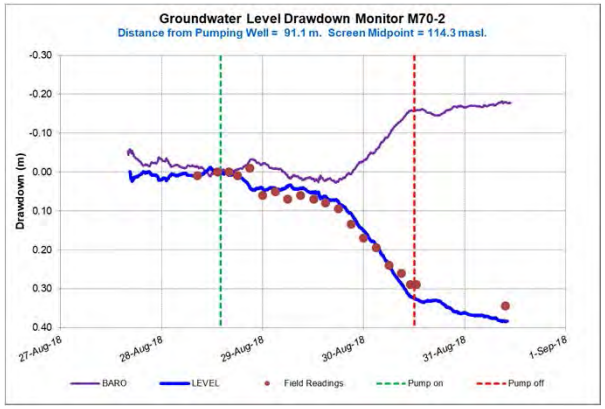
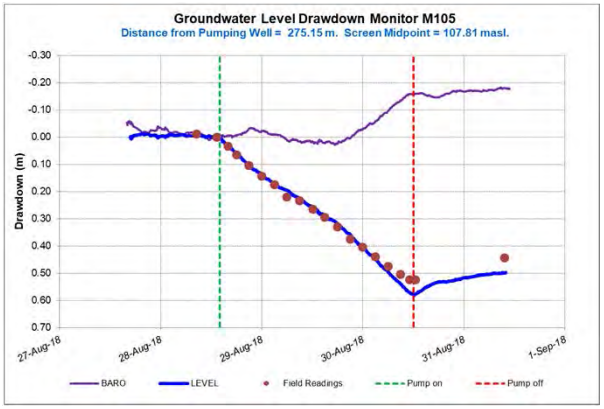
APPENDIX B

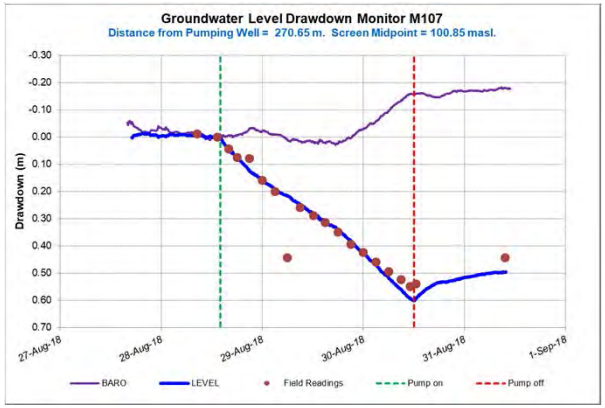
Observation Well Drawdown Curves

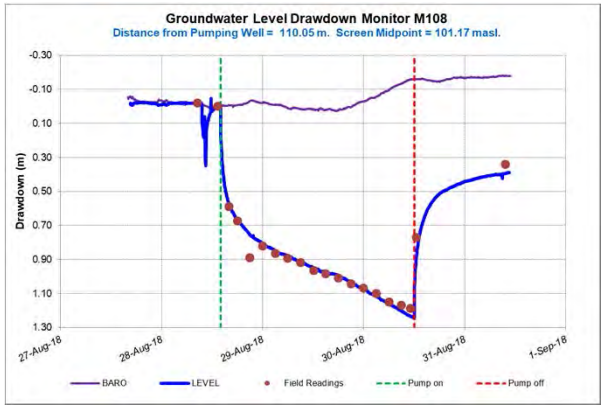
Observation Well Drawdown Charts

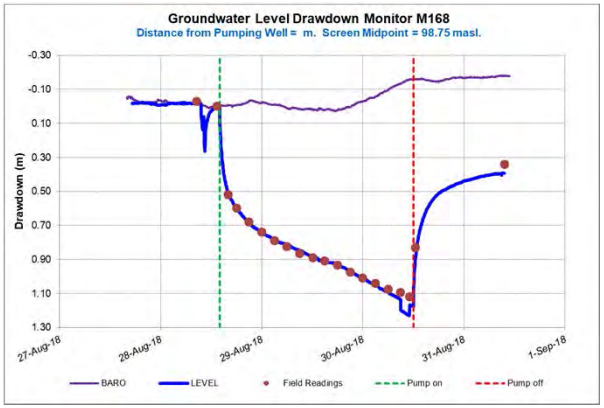


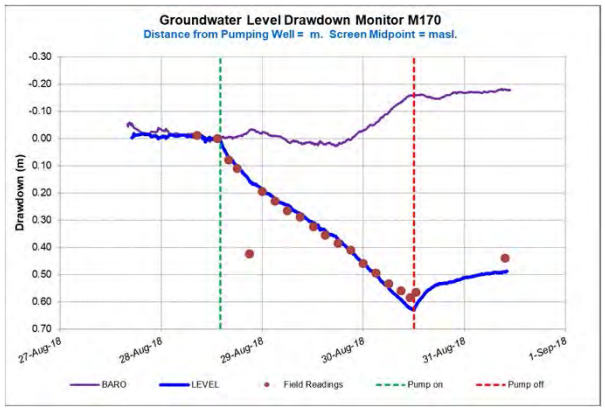




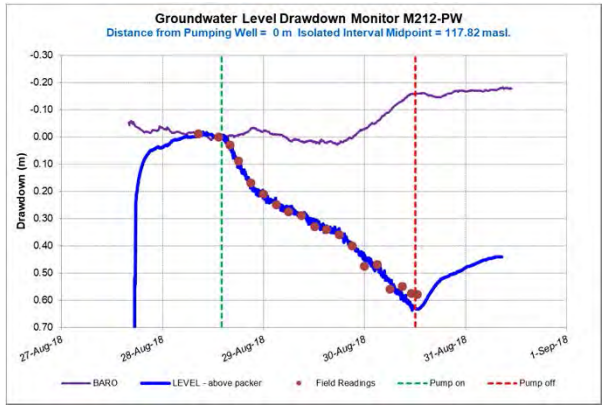


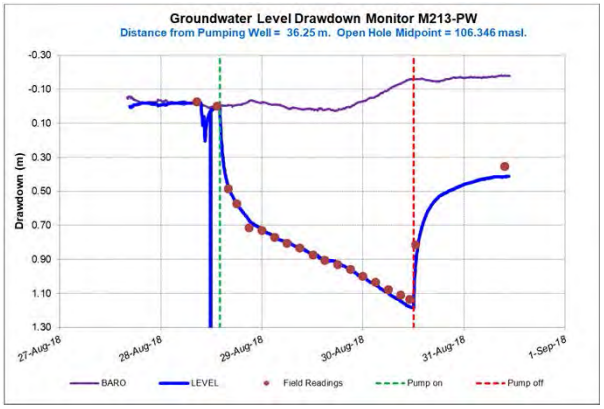


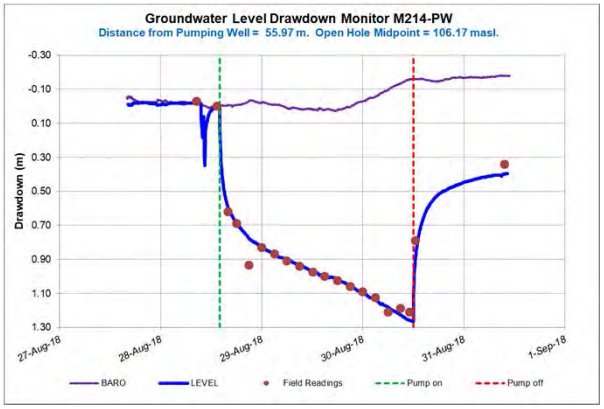


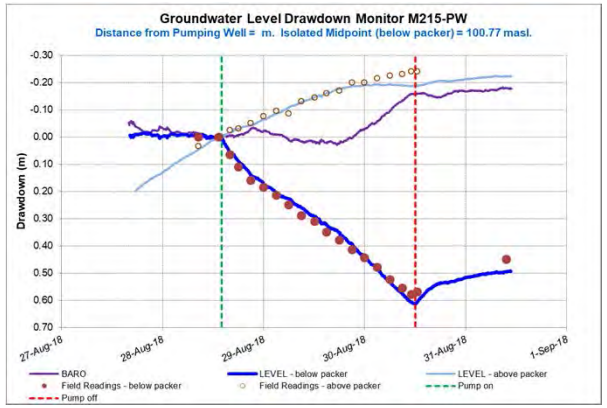


Observation Well Drawdown Charts







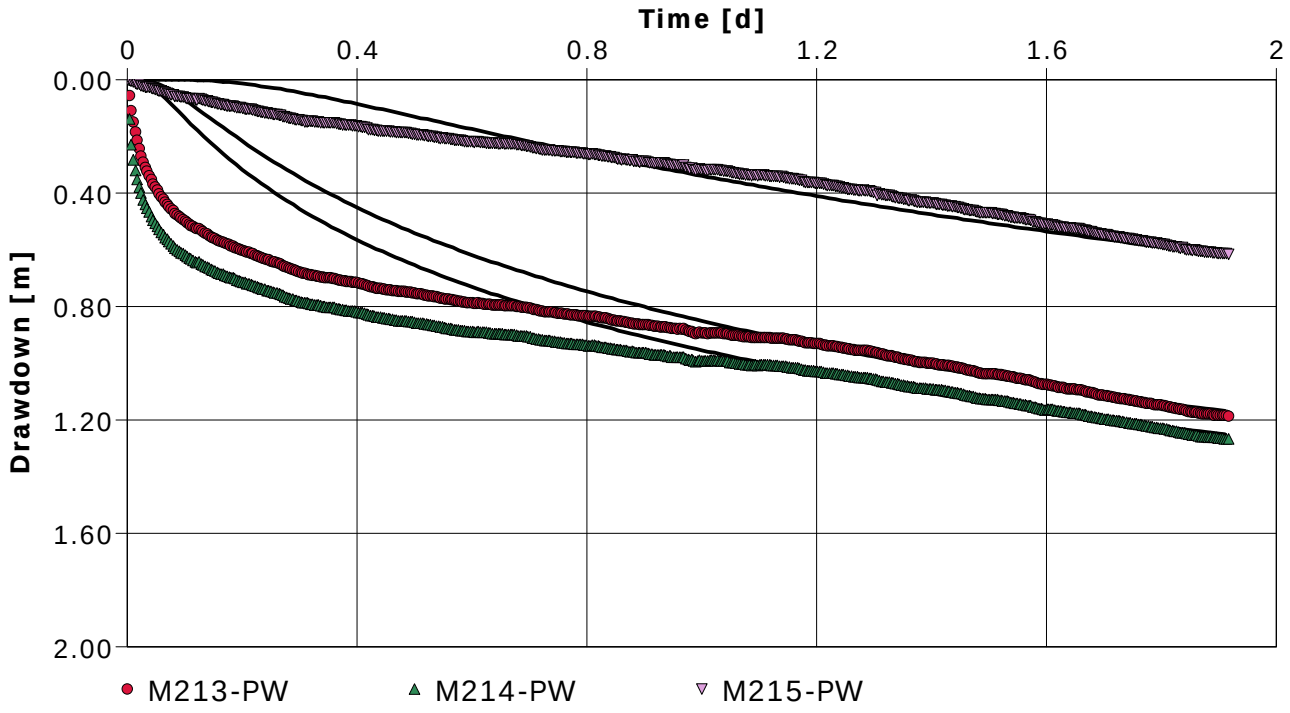


APPENDIX C

Pumping Test Analysis

	Pumping Test Analysis Report
	Project: WM Richmond - Purge Well System
	Number: 180150-06
	Client: Waste Management

Location: Richmond Landfill	Pumping Test: M212-PW Pumping Test	Pumping Well: M212-PW
Test Conducted by: BM		Test Date: 2018-08-28
Analysis Performed by:	Theis Analysis	Analysis Date: 2018-09-18
Aquifer Thickness: 30.00 m	Discharge Rate: 8.78 [U.S. gal/min]	

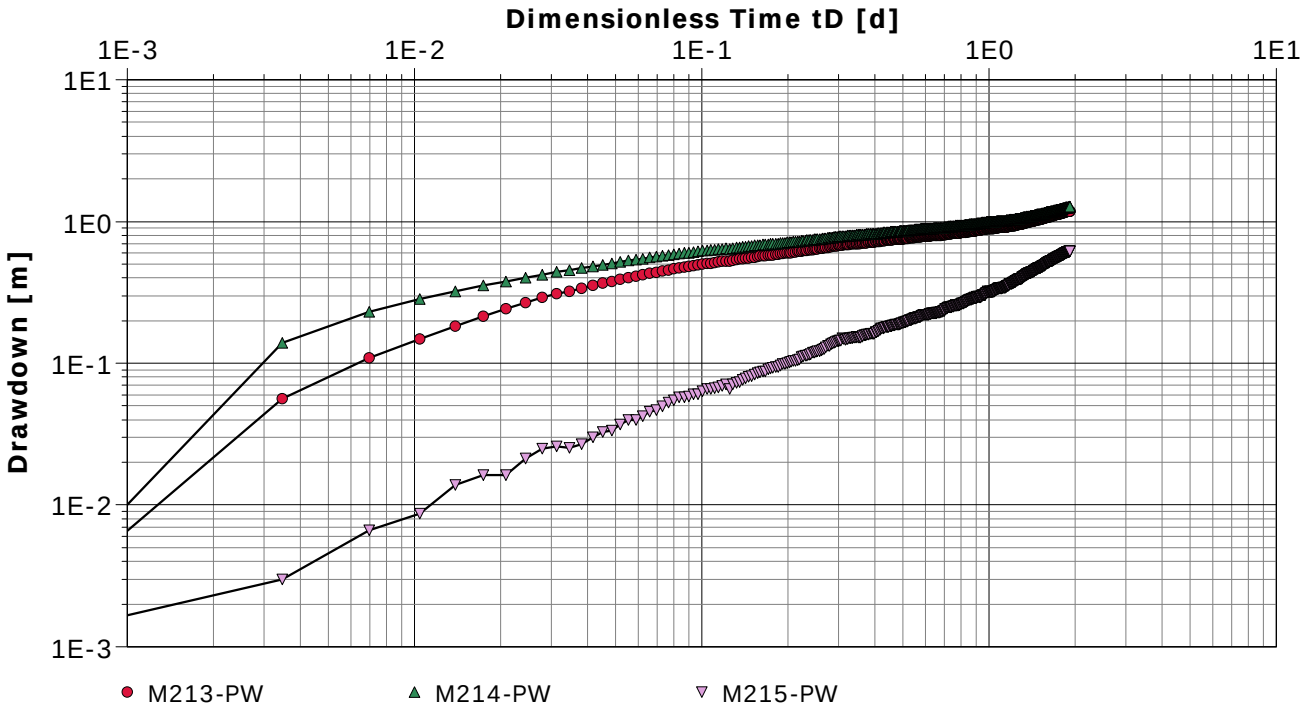


Calculation using Theis

Observation Well	Transmissivity [m²/s]	Hydraulic Conductivity [m/s]	Storage coefficient	Radial Distance to PW [m]	
M213-PW	8.13×10^{-5}	2.71×10^{-6}	2.84×10^{-3}	36.25	
M214-PW	9.00×10^{-5}	3.00×10^{-6}	8.66×10^{-4}	55.97	
M215-PW	7.00×10^{-5}	2.33×10^{-6}	7.00×10^{-4}	133.84	
Average	8.04×10^{-5}	2.68×10^{-6}	1.47×10^{-3}		

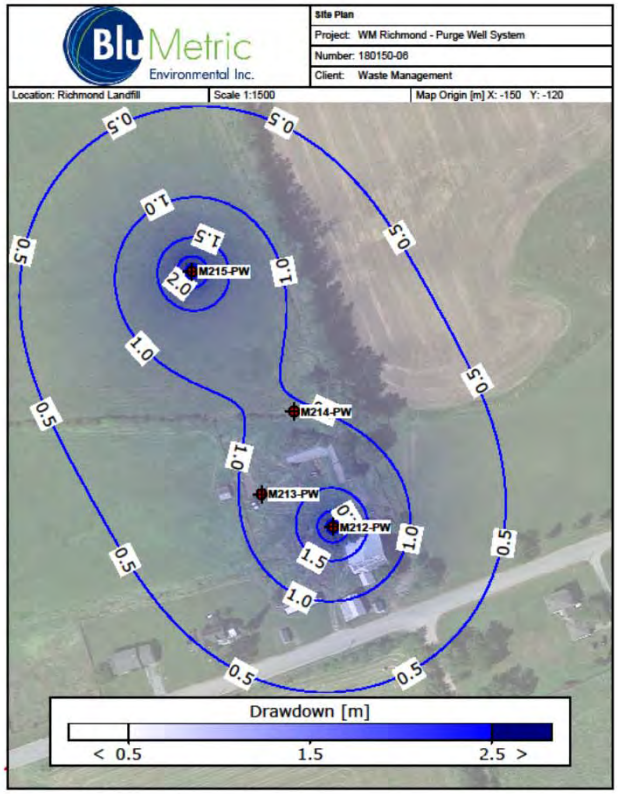
	Pumping Test Analysis Report
	Project: WM Richmond - Purge Well System
	Number: 180150-06
	Client: Waste Management

Location: Richmond Landfill	Pumping Test: M212-PW Pumping Test	Pumping Well: M212-PW
Test Conducted by: BM		Test Date: 2018-08-28
Analysis Performed by:	Time-Drawdown	Analysis Date: 2018-09-18
Aquifer Thickness: 30.00 m	Discharge Rate: 8.78 [U.S. gal/min]	



APPENDIX D

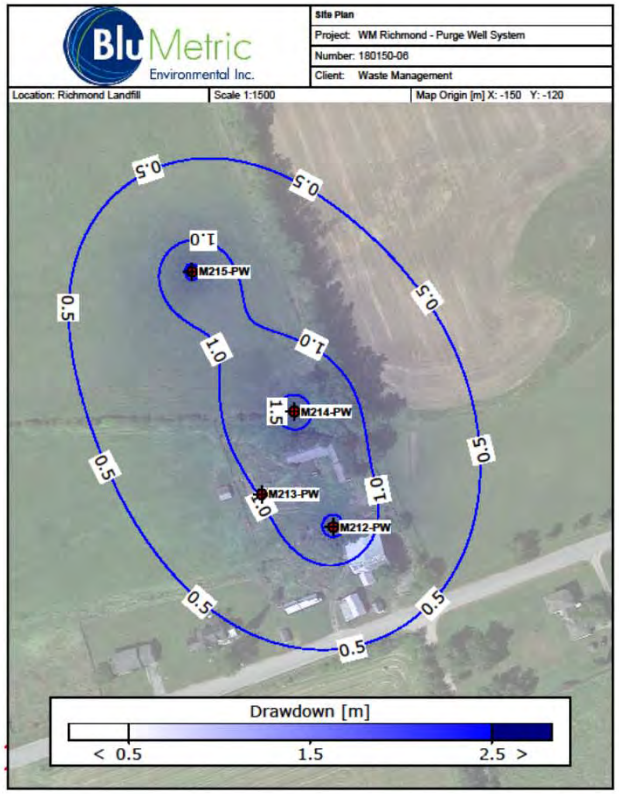
Preliminary Purge Well Scenarios



Scenario 1: Two pumping wells

Pumping Well	Rate (USgmp)
M212-PW	4.2
M215-PW	4.2

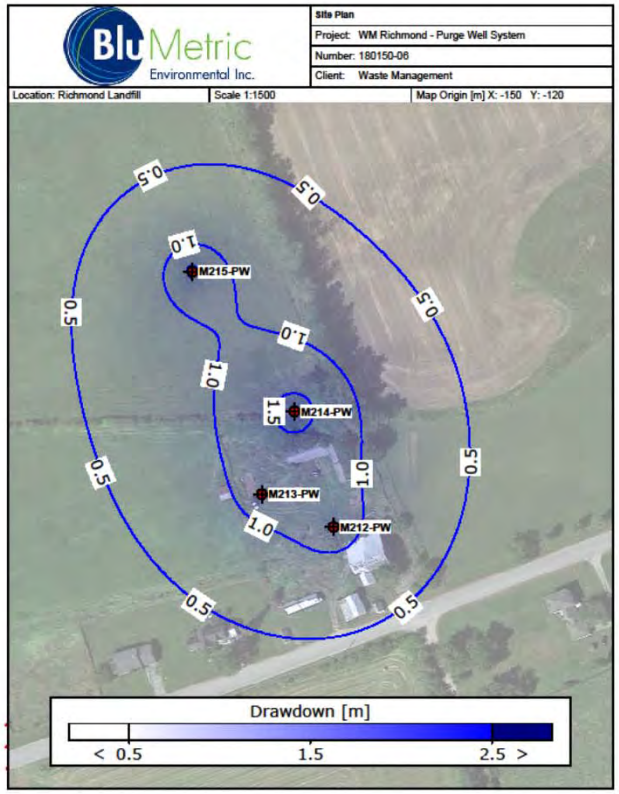
Total Q = 8.4 USgpm



Scenario 2: Three pumping wells

Pumping Well	Rate (USgmp)
M212-PW	2.2
M214-PW	2.3
M215-PW	2.2

Total Q = 6.7 USgpm



Scenario 3: Four pumping wells

Pumping Well	Rate (USgmp)
M212-PW	1.4
M213-PW	0.7
M214-PW	2.4
M215-PW	2.0

Total Q = 6.5 USgpm

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