Proposed Groundwater Monitoring Program
4380 Trail Road, Ottawa, Ontario

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1 Introduction

1.1 Project Description

EXP Services Inc. (EXP) was retained by Drain-All Ltd. (Drain-All) to develop a Proposed Groundwater Monitoring Program for 4380 Trail Road, (hereinafter referred to as the 'Site') (Appendix A - Figure 1). The groundwater monitoring program is in support of an application for an Environmental Compliance Approval (ECA) for the Site.

Drain-All has been managing inert fill and clean soil at 4380 Trail Road since 2015. These activities are now governed by Ontario Regulation 406/19. Consequently, Drain-All made the ECA application to the Ministry of Environment Conservation and Parks (MECP) for the continuation of the operation of the soil management activities. As part of the application, the MECP has requested that Drain-All complete a preliminary hydrogeological assessment of the site and develop a groundwater monitoring program.

1.2 Project Objectives

The purpose of the preliminary hydrogeological assessment is to document the soil and groundwater conditions underlying the site and to support the development of a groundwater monitoring program. The purpose of the groundwater monitoring program is to assess for potential impact to the hydrogeological regime due to the soil management operations.

The main objectives of this project are as follows:

- Establish regional hydrogeological settings.
- Establish the local hydrogeological settings within the Site.
- Compile and analyze hydrogeological data for the Site.
- Develop a groundwater monitoring program.

1.3 Scope of Work

To achieve the investigation objectives, EXP has completed the following scope of work:

- Reviewed available geological and hydrogeological information for the Site;
- Conducted a topographic survey of the site, including on-site monitoring wells and relevant drainage features;
- Completed one round of groundwater level measurements at all on-site monitoring wells;
- Prepared site plans, geological mapping and groundwater contour mapping for the Site; and
- Developed a groundwater monitoring program.

1.4 Resources

The following sources were reviewed as part of this project:

- Annual groundwater monitoring reports for the adjacent Nepean Landfill reports from 2013 to 2019
- Analytical soil and groundwater data provided by Drain-All
- GeoOttawa on-line mapping
- Ontario well records website
- Atlas of Canada – Toporama
- Aggregate Resources Inventory of the City of Ottawa Report
- Rideau Valley Conservation Authority on-line mapping.

2 Soil Management Activities

2.1 Introduction

Since 2015, Drain-all has been operating the Site as a receiver site for unimpacted excess soil generated from various construction sites throughout the region. The soils are sourced from clients who are performing scheduled or emergency maintenance of utilities, such as electrical, natural gas, water, or telecommunications predominantly in urban residential, parks and recreational spaces. Soils that are excavated using vacuum trucks utilize municipal water.

In December 2020, Drain-All applied for an Environmental Compliance Approval (ECA) to continue the operations in accordance with *Ontario Regulation 406/19 On-Site and Excess Soil Management*. The following provides a summary of the site operations plan.

2.2 Soil Handling Procedures

Following source site screening, excavated soils that are transported for placement and storage at 4380 Trail Road are accepted in the following manner:

- The liquid portion of soils that are excavated with a hydro vacuum truck using municipal water is decanted in Area A (Figure 3).
- The solid portion of the hydro-vac loads are temporarily placed in Area A (Figure 3).
- Other dry soils are temporarily placed in Area B.
- The temporarily stockpiled soils are assigned a unique lot number that corresponds to screening and associated laboratory testing.
- The analytical results are compared to Table 6 or 6.1 Excess Soil Quality Standards (ESQS)
- Soils that meet the Table 6 or 6.1 standards are utilized to fill in the Site in a staged approach (Infilling area – Figure 12).
- Soils that do not meet the Table 6 or 6.1 standards are transported off-site to a licensed waste disposal site.

2.3 Soil Analytical Protocols

The following summarizes the analytical protocols that were presented in the *4380 Trail Road Design and Operations Report:*

- Each load delivered to the Site forms part of a composite sample and tested internally **weekly** for:
    - Flashpoint
    - pH
    - PCB
    - Oxidizer
    - REG 153: Metals by ICP/MS
- A **monthly** composite is sent out to an external lab for the following parameters:
    - Chromium, hexavalent
    - Cyanide, free
    - Mercury by CVAA
    - PCBs, total
    - pH,

- PHC F1
- PHCs F2 to F4
- REG 153: ABNs + PAHs
- REG 153: Metals by ICP/MS
- REG 153: VOCs by P&T GC/MS
- Solids, % Gravimetric

Should any composite analytical test result show that a batch of soil is not suitable for placement and storage at the Trail Road site, the composite can be reanalyzed with each discreet sample which formed a portion of the original composite sample. This will identify the specific load(s) of soil forming a portion of the original composite batch that exceeded one or more parameters.

3 Hydrogeological Setting

3.1 Regional Setting

3.1.1 Regional Physiography and Topography

Regionally, the Site is located within a physiographic region named the Ottawa Valley Clay Plains. Ottawa is located in the Central Lowlands. The Central Lowlands are a flat-lying region between the Ottawa River and the St. Lawrence River. The Central Lowlands characterization is a result of multiple glaciations, followed by the intrusion and withdrawal of the Champlain Sea, and lacustrine erosion and deposition. Locally, the site is located on a physiographic landform known as Sand Plains with the southern part of the site located on Beaches.

The topography varies significantly, as the Site and surrounding properties have been used for aggregate resources extraction and for as landfills. The topographic features of the Site are presented in Figure 3.

3.1.2 Overburden Geology

Based on published surficial geology mapping, the area is characterized by low relief deposits of clay interspersed by glacio-fluvial eskers and faulted bedrock. Sediments were deposited during as glaciers retreated which resulted in linear accumulation of glaciofluvial deposits. One such ridge is present in the site area, which trends to the northwest-southeast. The Site is located on the south side of this ridge. Following the intrusion of the Champlain Sea, these glaciofluvial deposits were completely or partially buried by marine clays. Ottawa Valley Clay Plains were deposited by the expansion of the Champlain Sea, as glaciation retreated to the north. Thick layers of clay and silt were deposited in deep marine basins. The Champlain Sea deposits are overlain by reworked beach sand, deposited as the Champlain Sea receded.

Drift thickness maps indicate that overburden drift thickness is generally greater than 15 metres in the area of the Site. Previous investigations have identified glaciofluvial deposits between 30 and 35 metres in thickness present in the area. The surficial geology of the Site and surrounding areas is shown on Figure 4, drift thickness on Figure 5, and aggregate resource areas are shown on Figure 6.

Borehole logs for the boreholes near the Site have identified a stratified sand and gravel layer from surface to bedrock or borehole termination.

3.1.3 Bedrock Geology

Bedrock geology in the area consists of Paleozoic limestone, dolostone, and shale. The Oxford Formation is present underlying the Site. The Oxford Formation is characterized by dark to light grey dolostone. Bedrock elevations are between 66 to the east of the Site and 79 m masl to the west of the Site. Boreholes logs for the boreholes near the Site identified limestone bedrock between 17 and 37 metres below ground surface. A silty cobbly till was encountered overlying the bedrock in some of the boreholes. Only five monitoring wells in the area were installed into bedrock. The drift thickness in the study area is shown in Figure 5.

3.1.4 Regional Hydrogeology

Regional groundwater across the area flows to the northeast, towards the Ottawa River. Local deviation from the regional groundwater flow pattern may occur in response to changes in topography and/or soils, as well as the presence of surface water features and/or existing subsurface infrastructure.

Cross Sections have been generated by Dillon Consulting based on information for boreholes logs installed for the Nepean landfill monitoring program. Five geological units have been identified based on the data from 142 borehole logs, summarized in the Table below.

Table 3-1: Stratigraphic Units

Stratigraphic Unit	General Description
Fine to Medium Sand (Aquifer)	This geology unit mainly consists of fine-grained and medium sand deposits.
Silt and Clay (Aquitard)	This layer consists of a discontinuous layer of silty clay.
Coarse Sand and Gravel (Aquifer)	This layer generally consists of sand and gravel interbedded with fine to medium sand. Significant textural variation is present due to varying depositional environments. Ranges in thickness from 15 to 35 metres.
Silty Cobbly Till (Aquifer)	This layer is sporadically present underlying the coarse sand and gravel aquifer. Thickness of this layer ranges from 0 to 2 metres.
Oxford Formation	Bedrock primarily consists of dolostone. It belongs to the Lower Ordovician Beekmantown Group.

Where the silty clay aquitard is present, the overburden aquifer is divided into a “shallow” and “deep” aquifer. The clay aquitard is primarily present along the edges of the sand and gravel ridge. Only the western portion of the Site is underlain by this clay aquitard as shown on Figure 7. Groundwater flow within the overburden aquifers is highly variable, due to the significant textural variations within deposits caused by varying depositional environments.

3.1.4.1 Shallow Aquifer

The sand and gravel deposits are thicker in the center of the ridge and extend from bedrock to surface. Towards the edges of the ridge, the sand and gravel deposits thin and are overlain by a confining clay layer. A shallow aquifer is present in the fine to medium sand layer perched above the discontinuous clay layer.

In 2004, Dillon Consulting completed a series of pumping tests to characterize the shallow aquifer. Hydraulic conductivity values ranged from $1x10^{-3}$ m/s and $1x10^{-5}$ m/s. Lateral hydraulic gradients have been noted to vary across the study area, ranging from 0.009 to 0.05.

The highest hydraulic gradients are observed in the vicinity of the Beaver Pond, which is located northwest of the Site and the Agricultural Drain to the west (Figure 2).

The lowest hydraulic gradients are observed in the vicinity of the South Aggregate Ponds. Groundwater flow direction in the shallow aquifer is generally towards the southwest. A groundwater flow divide is present to the north of the Nepean Landfill, a northwest component flow towards Beaver Pond which acts a drainage feature. Groundwater flow from 2019 in the shallow aquifer is shown on Figure 8.

The confining clay layer which acts as an aquitard that supports the shallow aquifer is present primarily to the west and north of the site. The aquitard tapers laterally to the west of Moodie Drive and to the east of Trail Road and is not present underlying the Site, therefore there is no shallow aquifer present on the Site.

3.1.4.2 Deep Aquifer

The deep aquifer consists of coarse sand and gravel overlying limestone bedrock and is present underlying the entire study area. A silty cobbly till is present in some areas between the sand and gravel and the bedrock. The aquifer thickness varies between greater than 25 m towards the center of the ridge, to only several meters closer to the edges of the ridge. Due to the variable nature of the depositional processes, the composition of the deep aquifer varies significantly over short distances. Based on the

February 16 groundwater contour map, the direction of groundwater flow in the deep aquifer is towards the Dewatering Pond to the north as shown on Figures 9 and 10. The Dewatering Pond affects local groundwater flow, which may result in differences from regional groundwater flow. In general, the material towards the bottom of the sand and gravel layer tends to be coarser than the top material.

The hydraulic conductivity is estimated to range between $3x10^{-5}$ and $6x10^{-5}$ m/s. The lateral gradient for the study area is approximately 0.002. The groundwater flow direction in the deep aquifer is generally to the north to northwest. Groundwater flow in the upper/mid and lower deep aquifer from 2019 is shown on Figures 9 and 10, respectively.

At the Site, the confining clay layer is absent overlying the deep aquifer, as shown on Figure 7.

3.1.4.3 Landfill Influences

The Nepean Landfill groundwater monitoring program has identified groundwater flow direction to be to the north, west, and southwest from the Site.

A groundwater extraction and treatment system was installed to the west of the Site along Moodie Drive in 2006, as shown on Figure 3. The system consists of six (6) extraction wells located along Moodie Drive. When operating, the observed drawdown in most monitoring well locations was within seasonal variation (0.2 to 0.5 m). The groundwater treatment system was not operational in 2019 and is set to be decommissioned.

3.2 Site Setting

3.2.1 Site Description

The Site is located on the south side of Trail Road, east of Moodie Drive, and covers an area of approximately 4.2 hectares. The Site is bounded by the active Trail Road Landfill to the north across Trail Road, and the closed Nepean Landfill to the north and west. The property to the south and west of the Site is referred to as the South Aggregate Pond. Industrial properties are also present in the study area. A site plan showing the overall study area is provided in Figure 2. A Site Plan is shown on Figure 3.

There are four (4) monitoring wells present on the Site. Monitoring wells P-1 and P-2 were installed as part of the Nepean Landfill monitoring program. Monitoring wells MW-3 and MW-4 were also installed prior to Drain-All's acquisitions but have not been involved in previous groundwater monitoring programs. The well details are included in Table 3-2, based on the depths of the wells, it is inferred that P-1 is screened in the lower deep aquifer, and the remainder of the wells are screened in the upper/mid dep aquifer.

There are two areas where soil is stored on the Site. Incoming excess soil is initially placed in either Zone A for liquid soils (for decanting) or Zone B for dry soils. The soil is then sampled and analyzed for various parameters to confirm suitability for final placement on the site (Figure 12).

3.2.2 Site Topography

A topographic survey completed by EXP in February 2022 to a geodetic benchmark (COSINE Station No.: 01019791701V, Vertical Datum: CGVD28:78, Elevation 95.413) indicates the surface elevation of the Site ranges between approximately 99.5 metres above sea level (masl) at the west end of the Site to 101.8 masl at the east end of the Site. Trail Road is approximately 110.5 masl. The topographic survey is provided in Figure 3.

As the Site, and surrounding properties to the south (South Aggregate Ponds) have been used as aggregate resources and for as landfills, the topography varies significantly locally.

3.2.3 Local Surface Water Features

The Site is located on the north boundary of the Mud Creek watershed. Properties to the are part of the Jock River – Leamy Creek Watershed, and properties to the north are part of the Jock River Barrhaven watershed.

The following surface water features are present in the vicinity of the Site:

- The Beaver Pond
- The Agricultural Drains
- The infiltration ponds (SW4 and SW5)
- The South Aggregate Ponds
- The Dewatering Pond

The Beaver Pond is located north of the Nepean Landfill site, approximately 1 km west of the Site near the intersection of Moodie Drive and Cambrian Road. The Agricultural Drains are located on the west side of Moodie Drive, approximately 1 km west of the Site. Both the Beaver Pond and the Agricultural Drains discharge to the Leamy Drain, which eventually discharges into the Jock River. Both waterbodies are fed by the shallow aquifer.

The infiltration ponds were constructed in 1993 when the landfill was capped. The ponds are located at the western boundary of the Nepean Landfill, approximately 600 m west of the Site. The infiltration ponds do not have outlets and are a surface expression of the shallow aquifer. Water re-infiltrates to shallow aquifer and flows north towards Beaver Pond.

The South Aggregate Ponds (Burnside Ponds) are present south adjacent to the Site. The ponds were generated by aggregate extraction activities on the property. Due to extraction activities, the elevation of the ponds is significantly lower than surrounding properties. The ponds have no outlet and can therefore be considered representative of the local water table (shallow aquifer).

The Dewatering Pond is located north of Cambrian Road, approximately 1.2 km northwest of the Site. It is fed by groundwater discharge from the deep aquifer. A PPTW is in place for the discharge of water from the Dewatering Pond (Number 3862-89YP6V). The PTTW limits the discharge rate from the Dewatering Pond to 4,500 L/min (6,480,000 L/day). During 2019, the discharge frequently exceeded this rate. The Dewatering Pond discharges to the Jock River.

The presence of these surface water bodies, particularly the Dewatering Pond, influence the groundwater flow patterns in the area. The Dewatering Pond has been observed to influence the groundwater flow direction in the deep aquifer. The monitoring program differentiates the deep aquifer into upper and lower sections. The entire deep aquifer is locally hydraulically controlled by the dewatering pond, which acts as a groundwater discharge point for the deep aquifer.

The expansion of the South Aggregate Pond and the addition of the infiltration ponds to the west and northwest of the landfill have impacted the local groundwater flow patterns in the shallow aquifer.

3.2.4 Local Geology

A summary of subsurface soil stratigraphy is provided in the following paragraphs. The soil descriptions are based on the borehole logs from previous investigations. For the wells on the Site, only boreholes log from P-1 were available for review. Borehole logs for wells installed in the vicinity of the Site were also reviewed.

The detailed soil profiles encountered in each borehole and the results of moisture content determinations are presented on the attached borehole logs (Appendix B). The soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling.

Based on the borehole logs, the general subsurface soil stratigraphy consists of the following units from top to bottom:

Sand

A layer of fine, medium to coarse grained, well-sorted sand was present from surface to between 17 to 37 m bgs. The sand was interbedded with layers of fine to very fine-grained sand.

Silty Cobbly Till

A silty cobble till was encountered overlying the bedrock. P-1 encountered 17.2 meters below ground surface. This layer consisted of poorly sorted till with cobbles.

Dolostone Bedrock

Bedrock was not encountered in any of the boreholes on the Site. Based on regional maps and previous investigations, bedrock is anticipated to be dolostone of the Oxford Formation and present approximately 30 to 35 m bgs. In boreholes to the southeast and north of the Site bedrock was encountered at 17 m bgs and 37 m bgs respectively. Bedrock appears to be dipping to the north.

Borehole details are summarized in the following table.

Table 3-2: Summary of Boreholes near the Site

MW ID	Aquifer	Depth (m bgs)	Description	Screen Depth (m bgs)
On Site Monitoring Wells				
P-1	Deep - Lower	0.0 to 17.2 17.2 to 18.9	Sand Till	16.8 to 18.8
P-2 (BH logs unavailable)	Deep - Upper	9.0	Well depth (See Table 3.3)	
MW-3(BH logs unavailable)	Deep - Upper	7.7	Well depth (See Table 3.3)	
MW-4(BH logs unavailable)	Deep - Upper	8.0	Well depth (See Table 3.3)	
Adjacent Monitoring Wells				
BH107-1	Deep – Lower	0.0 to 1.8 1.8 to 37.9 37.9 to 39.5	Fill Sand and Gravel Limestone Bedrock	36.0 to 37.5
BH107-2	Deep - Upper/Mid	0.0 to 0.9 0.9 to 17.0	Fill Sand and Gravel	15.5 to 17.0
BH125-1	Deep – Lower	0.0 to 17.7 17.7 to 20.2	Sand Limestone Bedrock	16.0 to 17.5
BH125-2	Deep - Upper/Mid	0.0 to 8.0	Sand	6.5 to 8.0
BH16A-1	Deep - Lower	0.0 to 35.0	Sand	33.0 to 34.5
MW58-1	Deep - Upper/Mid	0.0 to 0.9 0.9 to 1.8 1.8 to 16.8	Sand Silt and Clay Sand	Not Specified

Notes: m bgs – metres below ground surface

3.2.5 Local Hydrogeology

There are four monitoring wells present at the Site. Two of the wells (P-1; shallow and deep) were installed as part of the landfill groundwater monitoring program. The other two wells (MW-3 and MW-4) were installed prior to Drain-All purchasing the property. All of the wells are installed in the deep aquifer. Monitoring well P1 and P2 are a set of nested wells located at the west edge of the property, between Area A and Area B. MW-3 and MW-4 are installed in the center north and center south areas of the Site respectively. The monitoring well locations are shown in Figure 11.

As part of the project, static water levels in the monitoring wells installed on the Site were recorded on February 16, 2022. A summary of all static water level data as it relates to the elevation survey is given in the table below.

Table 3-3: Groundwater Elevations

MW ID	Grade Elevation (metres)	TOC Elevation (metres)	Well Depth (mbgs)	Depth to Groundwater (mbTOC)	Groundwater Elevation (metres)
P-1	99.58	100.49	20.1	4.41	96.06
P-2	99.66	100.60	9.0	4.69	95.87
MW-3	101.23	101.89	7.7	6.19	95.53
MW-4	100.90	101.47	8.0	5.57	95.78

Notes: mbTOC – metres below top of casing. The groundwater elevations are based on a geodetic benchmark.

Based on the depths of the wells, it is inferred that P-1 is screened in the lower portion of the deep aquifer, and the remainder of the wells are screened in the upper/mid portion of the deep aquifer.

The groundwater elevation recorded in the wells ranged from 95.53 masl to 96.06 masl. Based on the above water levels, groundwater flow direction on the Site is to the north. A groundwater contour plan is shown in Figure 11.

4 Groundwater Quality

The Nepean Landfill is located east of the Site. It operated between 1960 and 1980 and was capped with a low permeability cover in 1993. The monitoring program for the landfill involves collecting groundwater levels, groundwater sampling, surface water sampling, private wells sampling, and landfill gas monitoring.

Regionally, the 2019 report concluded that leachate effects are observed in the shallow aquifer to the south and southwest of the Nepean Landfill. Some impacts in the shallow aquifer have also been observed to the northwest towards the Beaver Pond, over 1 km from the Site. Impacts are characterized by elevated level of inorganic indicator parameters and dissolved phase volatile organic compounds (VOCs). Impacts in the shallow aquifer appear to be generally decreasing with time.

Groundwater impact in the deep aquifer has been observed to the north of the Nepean Landfill site, along the flow path to the Dewatering Pond, which is the discharge point for the deep aquifer. A small zone of impact in the deep aquifer is also present in the vicinity of BH16-1, which is north adjacent to the Site. Impacts in this area appear to be generally decreasing or stable. Impacts for both zones are characterized by elevated level of inorganic leachate parameters and dissolved phase VOCs.

Historic groundwater results for monitoring wells adjacent to the Site are presented in Appendix C. A summary of the 2019 monitoring program for monitoring wells adjacent to the Site is summarized below in Table 4.1. The locations of the adjacent wells are shown on Figure 11.

Based on the results obtained, VOC impact has been observed in BH16-1 during all annual sampling events between 2012 and 2019, except for in 2018 when VOC levels were below the detection limits. The 2012 landfill report stated that the area of impact was localized and appeared to be generally decreasing, indicating that the VOC impact was present in this area prior to 2012, which predates Drain-All's acquisition of the subject property.

In 2019, the data from M125-1 and M125-2 showed slightly elevated levels of leachate indicator parameters when compared to historic data. The VOC impacts have been observed in the vicinity of BH16-1. The most significant VOC impacts are in the upper/middle part of the deep aquifer. Concentrations of VOC in 2019 were below the Ontario Drinking Water Standards (ODWS). VOCs were non-detect in BH16A-1, which is installed in the lower part of the deep aquifer. No VOCs have been detected in the lower part of the deep aquifer in any of the wells adjacent to the Site. The impacts at the BH16-1 predates Drain-All's acquisition of the subject property.

Table 4-1: Groundwater Quality in Wells Near the Site

MW ID	Location Relative to Site	Aquifer	Groundwater Quality
BH107-1	20 m northwest across Trail Road	Deep (Lower)	Some indicator parameters slightly elevated compared to reference; iron exceeds reference concentration range. No VOCs detected
BH107-2	20 m northwest across Trail Road	Deep (Upper/Mid)	Similar to reference; DOC and TKN slightly elevated. No VOCs detected
BH125-1	Adjacent to the south property boundary	Deep (Lower)	Similar to reference; boron slightly elevated compared to reference
BH125-2	Adjacent to the south property boundary	Deep (Upper/Mid)	Similar to reference; iron exceeded reference concentration range
BH16-1	Adjacent to the northwest property boundary	Deep (Upper/Mid)	Similar to reference; boron slightly elevated, Vinyl chloride detected.
BH16A-1	Adjacent to the northwest property boundary	Deep (Lower)	Similar to reference; chloride and iron slightly elevated, no VOCs detected
MW58-1	80 m northwest	Deep (Upper/Mid)	Some indicator parameters elevated compared to reference; boron and iron exceeds reference concentration range. No VOCs detected

5 Proposed Groundwater Monitoring Program

Based on the results of the preliminary hydrogeological assessment EXP is proposing that one monitoring well (MW5) be installed in the upper portion of the deep aquifer (Figure 11). A second provisional monitoring wells MW-6 is also to be considered for installation at a later date as reinstatement progresses. The first monitoring well is to be placed adjacent and downgradient of Zone A. The second provisional monitoring well is to be placed downgradient of the infilling area.

5.1 Drilling Program

The borings will be advanced by means of a track/truck mounted drill rig adapted for soil sampling. Drilling and sampling will conform to standard practice. Groundwater levels will be taken in the open boreholes, and in monitoring wells installed in the boreholes. The fieldwork will be supervised by a qualified geo-environmental engineer/technologist.

Soil samples retrieved from the boreholes will be logged for colour, grain size, moisture content, density, structures, texture, olfactory, staining and screened using a Photoionization Detector (PID) instrument, stored in plastic bags and laboratory provided jars, sealed, and identified. All the soil samples will be transported to our laboratory in Ottawa where they will be further examined by a hydrogeologist and borehole logs will be prepared.

The monitoring wells screens are to be installed to straddle the shallow water table (estimated to be 5 to 6 metres). If the water table is found to be significantly deeper than this during the drilling program, it may be necessary to install wells that are different depths.

The newly installed monitoring wells will consist of a PVC screen interval with an appropriate length of PVC riser pipe at 50 mm diameter. The monitoring wells will be completed with a standup protective casing cover. An geodetic elevation survey will be completed so that the depths to water can be measured, and groundwater flow direction can be assessed. The elevation survey will also include the four existing monitoring wells on the site. EXP will conduct single well response tests (SWRT) in the newly installed of the 50 mm diameter monitoring wells to establish hydraulic conductivities for the aquifer located beneath the property.

Prior to collecting groundwater samples, the monitoring wells will be developed by removing three to five casing volumes of water, or until the well has been purged dry at least twice.

5.2 Semi-Annual Groundwater Monitoring

To assess potential impact to the upper groundwater regime, a semi-annual monitoring program is proposed to occur in the spring and fall. Groundwater elevation measurements will be recorded from all six on-site monitoring wells so that groundwater flow patterns can be monitored. Groundwater water levels will be monitored during site visits. In addition, data loggers will be installed in four wells to provide continuous water level readings and used to generate hydrographs.

Groundwater samples will be collected from monitoring wells (P-2, MW-3, MW-5) for laboratory analyses. These monitoring wells were selected due to their proximity to site activities and/or downgradient location. Sampling would occur at MW-6 in event an additional monitoring well is installed as infilling progresses.

The samples will be submitted to a certified environmental laboratory for analysis of metals and inorganics, PHC fractions, VOC, and PAH along with a blind duplicate of all parameters plus a VOC trip blank and VOC field blank.

At the completion of the monitoring program, an annual letter report will be prepared. The laboratory data will be compiled and compared to Table 3 site condition standards for non-potable sites.

A summary of the sampling program is presented in Table 5.1. Proposed sampling locations are presented in Figure 11.

Table 5-1: Proposed Sampling Program

Sample Location	Frequency	Parameter List
P-2	Semi-annual	Metals and inorganics, PHC, VOC, PAH
MW-3	Semi-annual	Metals and inorganics, PHC, VOC, PAH
MW-5	Semi-annual	Metals and inorganics, PHC, VOC, PAH

5.3 Contingency Plan

If there is a soil load not suitable for placement at the Site, a sample from the infiltration pond will be collected and tested for the same corresponding failed parameters of the rejected soil load. Water in the infiltration pond exceeding the site condition standards will be hauled off site to a licensed receiving facility.

If concentrations of monitored groundwater parameters are observed to increase or exceed the site condition standards, confirmatory samples will be collected. If confirmed, the frequency of sampling will be reviewed. Additional monitoring wells may be required to further delineate the extent of impacts horizontally and vertically and additional mitigation measures may be required.

6 Limitations

This report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the study area. The conclusions and recommendations presented within this report reflect Site conditions existing at the time of the assessment. EXP must be contacted immediately, if any unforeseen Site conditions are experienced during construction activities. This will allow EXP to review the new findings and provide appropriate recommendations to allow the construction to proceed in a timely and cost-effective manner.

Our undertaking at EXP, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience/engineering profession. No other warranty or representation, either expressed or implied, is included or intended in this report.

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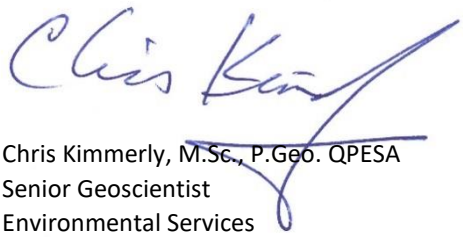
We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact this office.

Sincerely,

EXP Services Inc.

Leah Wells, P.Eng.
Environmental Engineer
Environmental Services



Chris Kimmerly, M.Sc., P.Geo. QPESA
Senior Geoscientist
Environmental Services

Francois Chartier, M.Sc., P.Geo.
Discipline Manager, Hydrogeology
Environmental Services

7 References

- City of Ottawa, GeoOttawa online mapping tool, (maps.ottawa.ca/geoottawa).
- Dillon Consulting Ltd., Nepean Landfill Site 2013 Monitoring and Operating Program Final Report, May 2014
- Dillon Consulting Ltd., Nepean Landfill Site 2014 Monitoring and Operating Program Final Report, May 2015
- Dillon Consulting Ltd., Nepean Landfill Site 2015 Monitoring and Operating Program Final Report, May 2016
- Dillon Consulting Ltd., Nepean Landfill Site 2016 Monitoring and Operating Program Final Report, May 2017
- Dillon Consulting Ltd., Nepean Landfill Site 2017 Monitoring and Operating Program Final Report, May 2018
- Dillon Consulting Ltd., Nepean Landfill Site 2018 Monitoring and Operating Program Final Report, May 2019
- Dillon Consulting Ltd., Nepean Landfill Site 2019 Monitoring and Operating Program Final Report, May 2020
- Geological Survey of Canada, Map -Physiographic Regions of Canada. 1254A. Scale 1:5M compiled by H.S. Bostock. 1967.
- Lee, V.L., 2013 Aggregate Resources Inventory of the City of Ottawa, Southern Ontario; Ontario Geological Survey, Aggregate Resources Inventory Paper 191, 80p.
- Natural Resources Canada, The Atlas of Canada – Toporama website (atlas.gc.ca/toporama/en/)
- Ontario Ministry of Energy, Northern Development and Mines, Bedrock Geology Application (www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/bedrock-geology), March 19, 2018.
- Ontario Ministry of Energy, Northern Development and Mines, Surficial Geology Application (www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/surficial-geology), May 23, 2017.
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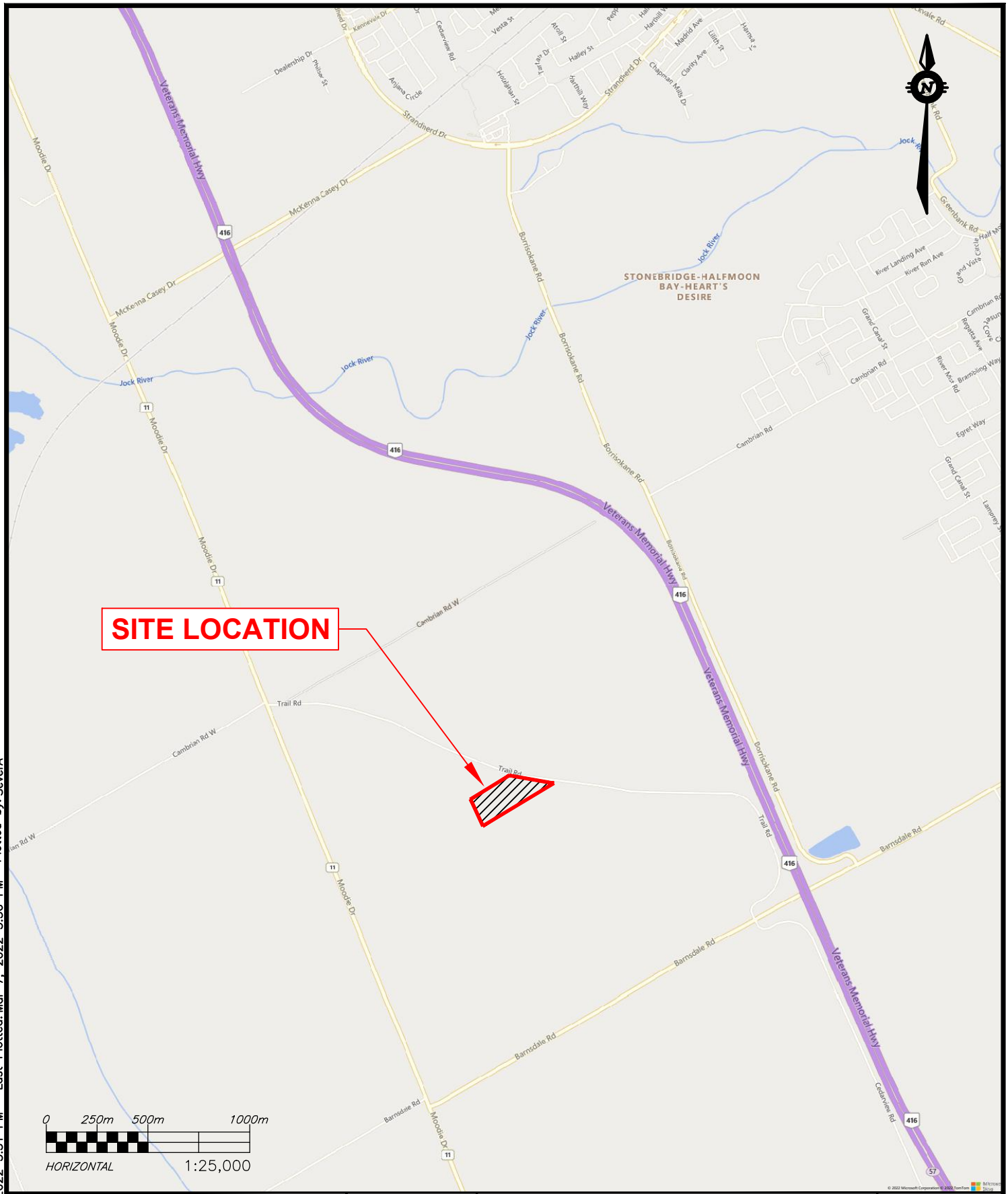
- Rideau Valley Conservation Authority, RVCA Regulations Mapping (https://rvcagis.maps.arcgis.com).

Appendix A – Figures



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PROPOSED GROUNDWATER MONITORING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

SITE LOCATION PLAN

SCALE 1:25,000

SKETCH NO FIG 1

Filename: \\exp\data\OTT\OTT-21023795-A0\60 Execution\65 Drawings\21023795 - Figure 1.dwg
Last Saved: Mar 7, 2022 3:31 PM Last Plotted: Mar 7, 2022 3:36 PM Plotted by: SeverA

NEPEAN LANDFILL SITE
2019 MONITORING AND OPERATING PROGRAM

SITE PLAN
FIGURE 1-3

- Approximate City of Ottawa Property Limits
- Nepean Landfill Site Boundary
- Trail Road Landfill Site Boundary
- Future Stage 5 Area
- Landfill Footprint
- Provincial Highway
- Road
- Surface Water
- Surface Water (Seasonal)
- Waterbody
- Building
- Parcel Boundary

Notes:
1. This drawing is to be read in conjunction with accompanying report

0 50 100 200 m

SCALE 1:10,000

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF, CITY OF OTTAWA

MAP CREATED BY: LK
MAP CHECKED BY: MM
MAP PROJECTION: NAD 1983 UTM Zone 18N

DILLON CONSULTING

PROJECT: 18-7333
STATUS: DRAFT
DATE: 2020-05-22

LEGEND
SITE BOUNDARY

Drawing from Dillon Consulting Ltd., 2019 Nepean Landfill Site Monitoring and Operating Program Final Report

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PROPOSED GROUNDWATER MONITORING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

STUDY AREA SITE PLAN

SCALE N.T.S

FIG 2

LEGEND

MONITORING WELL LOCATION ⊕ P-1

MONITORING WELL NO. & LOCATION ⊕ BH125-1

GROUND ELEVATION × 100.00

0 10m 20m 40m
HORIZONTAL 1:1000

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PROPOSED GROUNDWATER MONITORING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

SITE LAYOUT

SCALE 1:1000

SKETCH NO FIG 3

Filename: \\exp\data\OTT\OTT-21023795-A0\60 Execution\65 Drawings\21023795 – Figure 3.dwg
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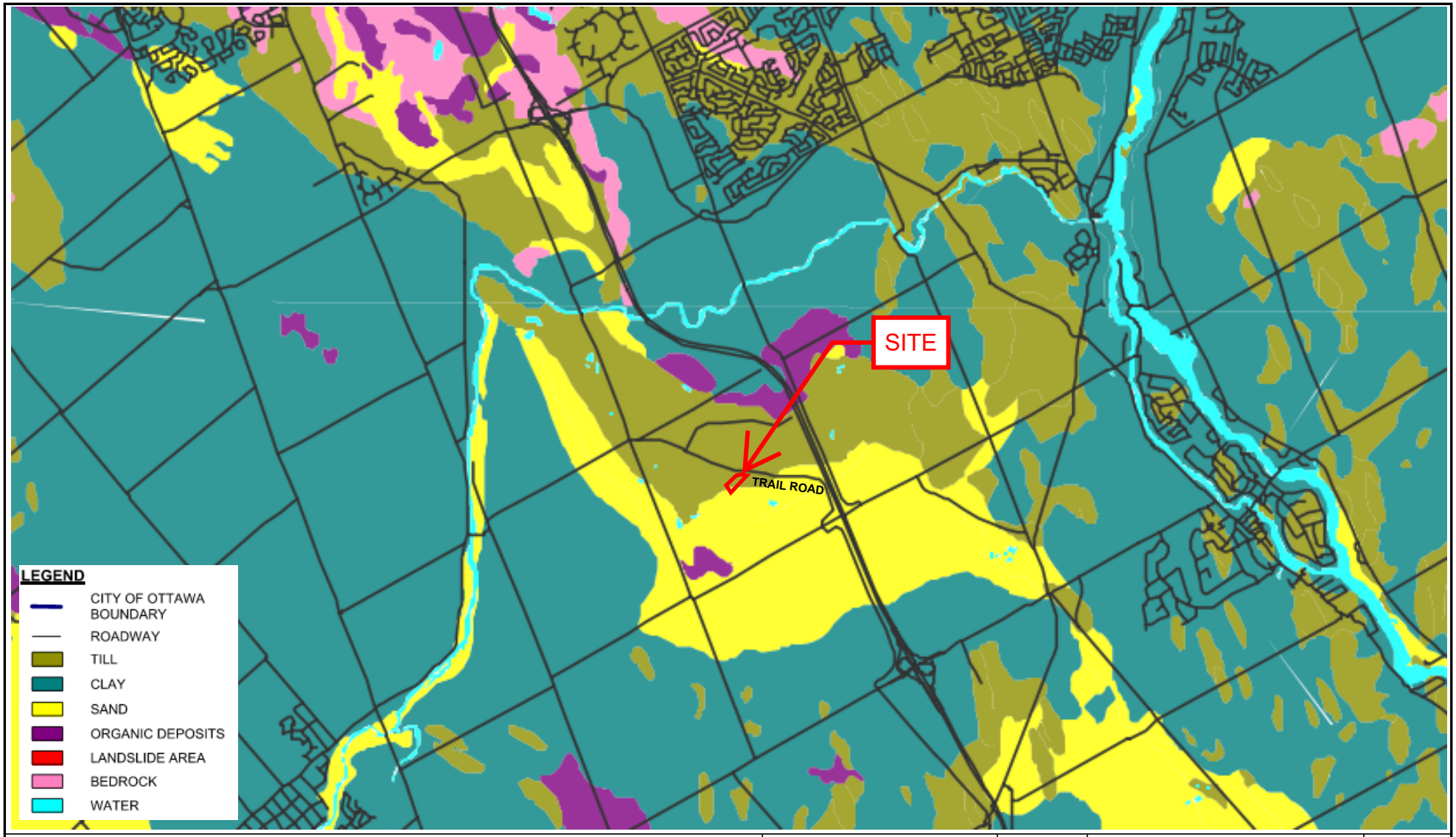

LEGEND
SITE BOUNDARY

City of Ottawa Surficial Geology,Ontario Geological Survey, (S.H. Richard, 1982); Map 1506A, scale 1:100,000

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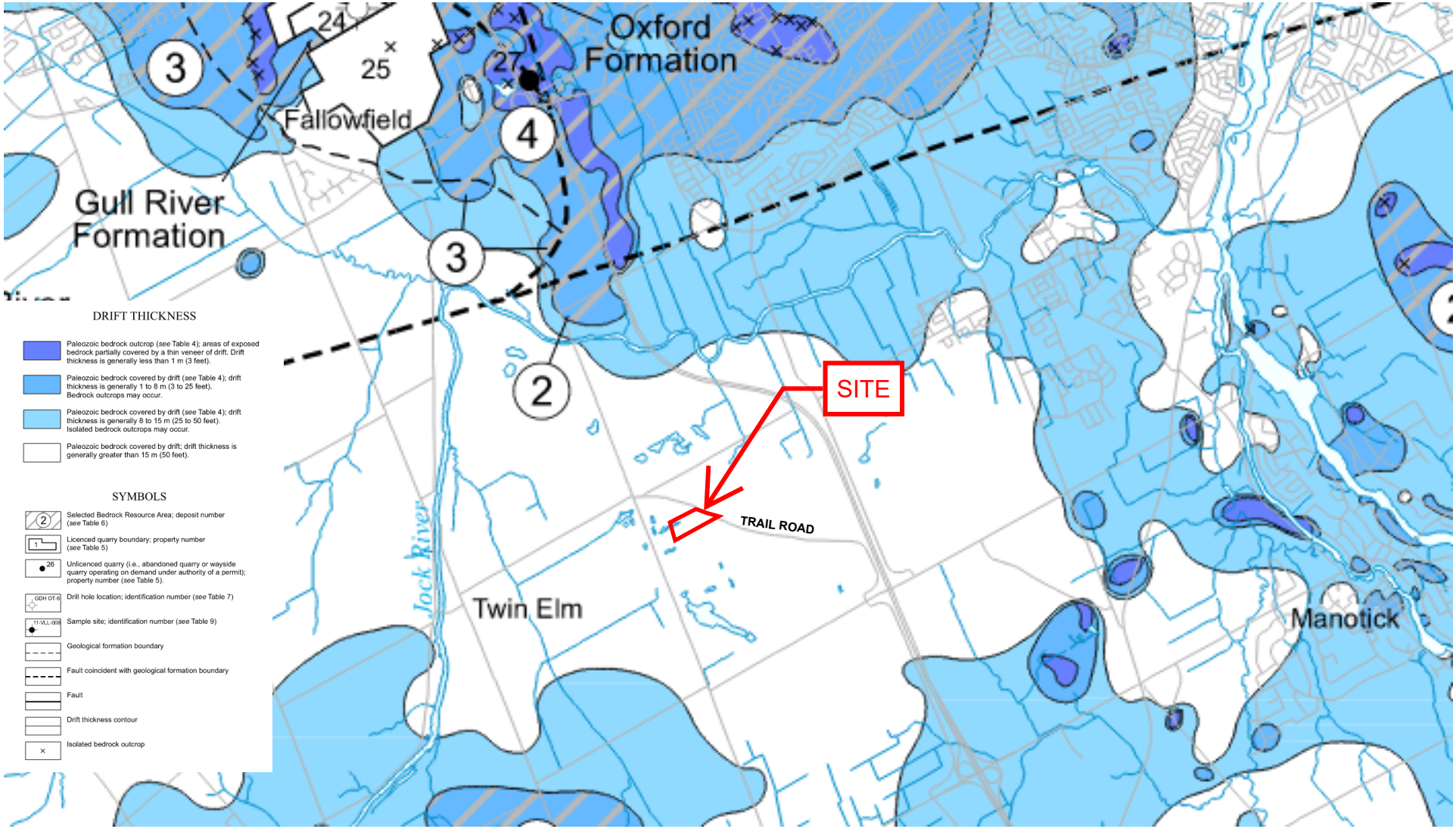
PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

STUDY AREA - SUFICIAL GEOLOGY

SCALE N.T.S.

FIG 4



LEGEND

SITE BOUNDARY

Lee, V.L. 2013, Aggregate Resources Inventory for the City of Ottawa, Southern Ontario; Ontario Geological Survey, Aggregate Resource Inventory Paper 191, Map 2 - Bedrock Resources, scale 1:100,000

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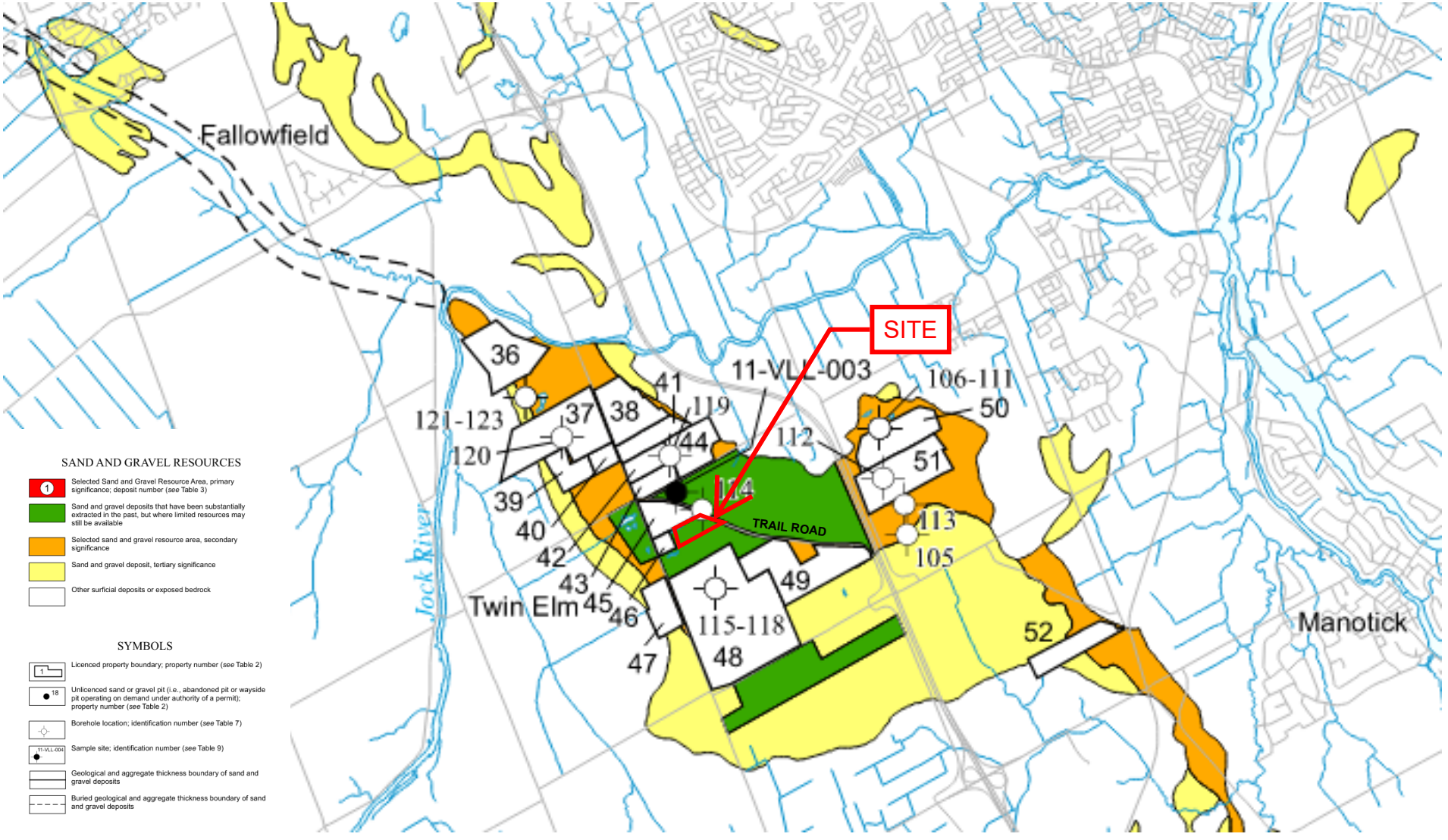
PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

STUDY AREA - DRIFT THICKNESS

SCALE 1:100,000

FIG 5



LEGEND

SITE BOUNDARY

Lee, V.L. 2013, Aggregate Resources Inventory for the City of Ottawa, Southern Ontario; Ontario Geological Survey, Aggregate Resource Inventory Paper 191, Map 1 - Sand and Gravel Resources, scale 1:100,000

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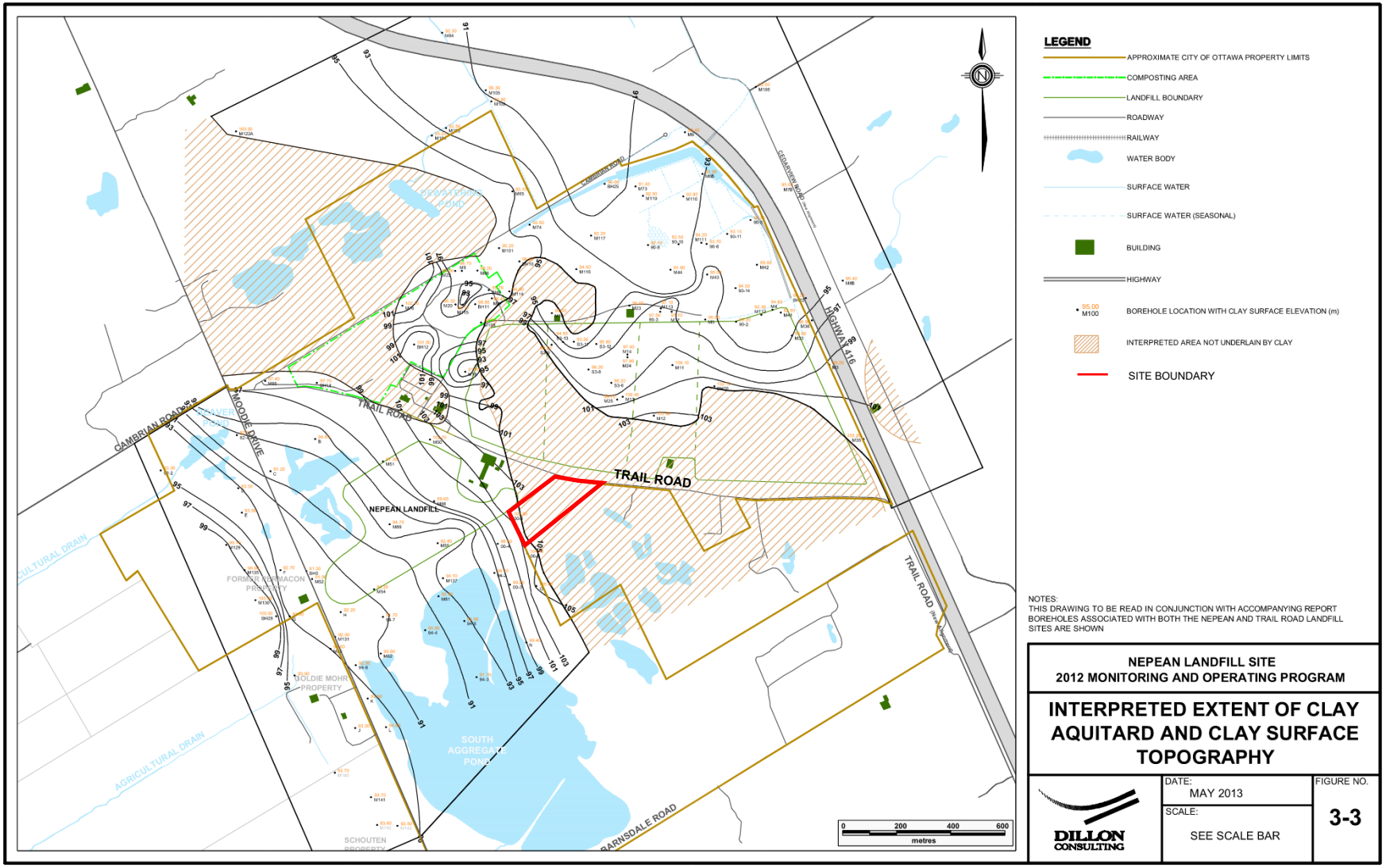
PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

STUDY AREA -
SAND AND GRAVEL RESOURCES

SCALE 1:100,000

FIG 6



NOTES:
THIS DRAWING TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT
BOREHOLES ASSOCIATED WITH BOTH THE NEPEAN AND TRAIL ROAD LANDFILL SITES ARE SHOWN

NEPEAN LANDFILL SITE
2012 MONITORING AND OPERATING PROGRAM

INTERPRETED EXTENT OF CLAY AQUITARD AND CLAY SURFACE TOPOGRAPHY

DILLON CONSULTING

DATE: MAY 2013
SCALE: SEE SCALE BAR
FIGURE NO. 3-3

Drawing from Dillon Consulting Ltd., 2012 Nepean Landfill Site Monitoring and Operating Program Final Report

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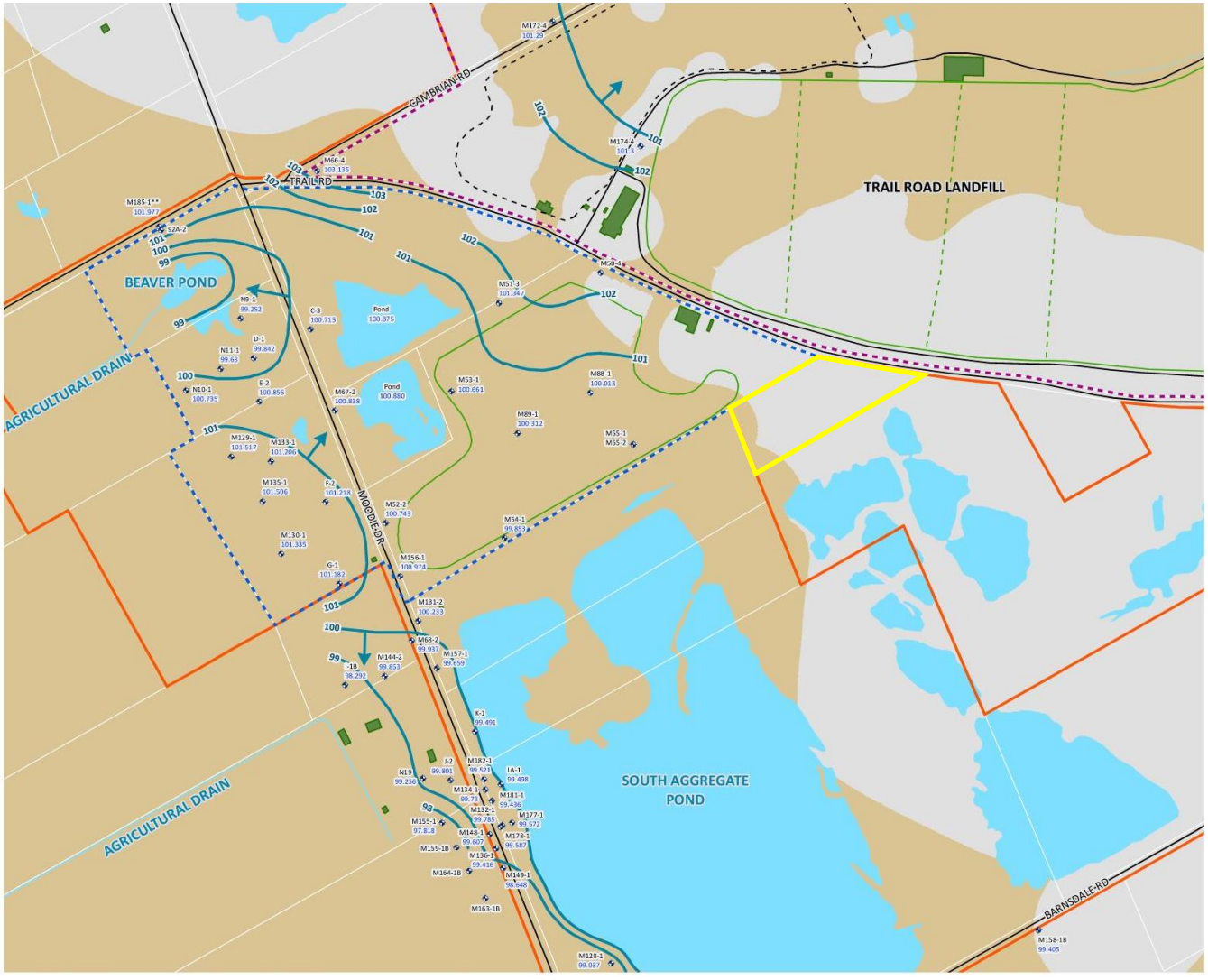
PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

INTERPRETED EXTEND OF CLAY AQUITARD

SCALE N.T.S

FIG 7



NEPEAN LANDFILL SITE
2019 MONITORING AND OPERATING PROGRAM

2019 INTERPRETED POTENTIOMETRIC SURFACE AND GROUNDWATER FLOW IN THE SHALLOW AQUIFER
FIGURE 3-5

- Approximate City of Ottawa Property Limits
- Nepean Landfill Site Boundary
- Trail Road Landfill Site Boundary
- Future Stage 5 Area
- Landfill Footprint
- Provincial Highway
- Road
- Surface Water
- Surface Water (Seasonal)
- Waterbody
- Parcel Boundary
- Building
- Monitoring Well Location and Shallow Aquifer Water Level Elevation (m)
- Approximate Groundwater Elevation Contour
- Interpreted Groundwater Flow Direction
- Interpreted Area Underlain by Clay

Notes:
1. This drawing is to be read in conjunction with accompanying report
2. Monitoring wells associated with both the Nepean and Trail Road Landfills are shown
3. ** Water level measured on March 24, 2020

0 25 50 100 m
SCALE 1:7,500

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF, CITY OF OTTAWA

MAP CREATED BY: LK
MAP CHECKED BY: MM
MAP PROJECTION: NAD 1983 UTM Zone 18N

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SITE BOUNDARY

Drawing from Dillon Consulting Ltd., 2019 Nepean Landfill Site 2019 Monitoring and Operating Program Final Report

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PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

GROUNDWATER FLOW
SHALLOW AQUIFER - 2019

SCALE N.T.S

FIG 8

NEPEAN LANDFILL SITE
2019 MONITORING AND OPERATING PROGRAM

2019 INTERPRETED POTENTIOMETRIC SURFACE AND GROUNDWATER FLOW IN THE UPPER/MIDDLE DEEP AQUIFER
FIGURE 3-6

- Approximate City of Ottawa Property Limits
- Nepean Landfill Site Boundary
- Trail Road Landfill Site Boundary
- Future Stage 5 Area
- Landfill Footprint
- Provincial Highway
- Road
- Surface Water
- Surface Water (Seasonal)
- Waterbody
- Parcel Boundary
- Building
- Monitoring Well Location and Upper/Middle Aquifer Water Level Elevation (m)
- Approximate Groundwater Elevation Contour
- Interpreted Groundwater Flow Direction

Notes:
1. This drawing is to be read in conjunction with accompanying report
2. Monitoring wells associated with both the Nepean and Trail Road Landfills sites are shown
3. * Water level measured on December 3, 2020
4. ** Water level measured on March 24, 2020

0 25 50 100 m

SCALE 1:9,500

MAP DRAWING INFORMATION:
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MAP CHECKED BY: MM
MAP PROJECTION: NAD 1983 UTM Zone 18N

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PROJECT: 18-7333
STATUS: DRAFT
DATE: 2020-05-27

LEGEND
SITE BOUNDARY

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PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

GROUNDWATER FLOW
DEEP AQUIFER, UPPER/MID - 2019

SCALE N.T.S

FIG 9

NEPEAN LANDFILL SITE
2019 MONITORING AND OPERATING PROGRAM

2019 INTERPRETED POTENTIOMETRIC SURFACE AND GROUNDWATER FLOW IN THE LOWER DEEP AQUIFER
FIGURE 3-7

- Approximate City of Ottawa Property Limits
- Nepean Landfill Site Boundary
- Trail Road Landfill Site Boundary
- Future Stage 5 Area
- Landfill Footprint
- Provincial Highway
- Road
- Surface Water
- Surface Water (Seasonal)
- Waterbody
- Parcel Boundary
- Building
- Monitoring Well Location and Lower Aquifer Water Level Elevation (m)
- Approximate Groundwater Elevation Contour
- Interpreted Groundwater Flow Direction

Notes:
1. This drawing is to be read in conjunction with accompanying report
2. Monitoring wells associated with both the Nepean and Trail Road Landfills sites are shown

0 25 50 100 m

SCALE 1:8,500

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNR, CITY OF OTTAWA

MAP CREATED BY: LK
MAP CHECKED BY: MM
MAP PROJECTION: NAD 1983 UTM Zone 18N

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PROJECT: 18-7333
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DATE: 2020-05-27

LEGEND
SITE BOUNDARY

Drawing from Dillon Consulting Ltd., 2019 Nepean Landfill Site Monitoring and Operating Program Final Report

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PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

GROUNDWATER FLOW
DEEP AQUIFER, LOWER - 2019

SCALE N.T.S

FIG 10

LEGEND

- SITE BOUNDARY
- MONITORING WELL NAME AND LOCATION (GROUNDWATER ELEVATION)
- PROPOSED MONITORNG WELL
- SURFACE WATER SAMPLE LOCATION
- MW-5 GROUNDWATTER SAMPLE LOCATION
- (95.75m) GROUNDWATER CONTOUR ELEVATION
- (96.06m) GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

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PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

PROPOSED SAMPLING LOCATIONS + GROUNDWATER FLOW DIRECTION

SCALE 1:1250

FIG 11

LEGEND

- SITE BOUNDARY
- MONITORING WELL NAME AND LOCATION (GROUNDWATER ELEVATION)
- PROPOSED MONITORNG WELL

AREA A STAGED INFILL AREA

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PROPOSED GROUNDWATER SAMPLING PROGRAM
4380 TRAIL ROAD, OTTAWA, ONTARIO

PROPOSED REINSTATEMENT PLAN

SCALE 1:1250

FIG 12

Appendix B – Borehole Logs

Borehole No. 10

0" - 15'0"	Brown medium sands, thin layered.
15'0" - 38'0"	Grey thin layered clay, occasional fine sand seam, saturated.
38'0" - 40'0"	Bouldery sand and gravel, saturated.

Borehole terminated at 40'0" in sand and gravel.

Borehole No. 11

0" - 13'0"	Brown fine to medium sand, rust stained.
13'0" - 22'0"	Grey clay, interlayered with thin sand seams and occasional thin gravel layer, saturated.
22'0" - 29'0"	Predominantly sand and gravel. Some thin clay layers, saturated.
29'0" - 32'0"	Bouldery sand and gravel, some silt, saturated.

Borehole terminated at 32'0"

Borehole No. 12

0" - 7'0"	Brown medium sand, rust stains.
7'0" - 17'0"	Interlayered silt and clay with fine sand, saturated.
17'0" - 21'0"	Sand and gravel.
21'0" - 53'0"	Grey very fine sand.
53'0" - 65'0"	Grey medium sand, grading into coarse sand at 65'0".
65'0" - 80'0"	Grey coarse sand grading into coarse gravel at 80'0".

Borehole terminated at 80'0".

Borehole No. 13

0" - 75'0"	Brown medium sand, layered with fine and coarse sand, saturated after 30'0".
75'0" - 82'0"	Coarse cobbly gravel, saturated.

Borehole terminated at 82'0" with refusal on boulders.

Borehole No. 14

0" - 28'0"	Brown medium sand.
28'0" - 38'0"	Grey clay, interlayered with silt and fine sand, saturated.
38'0" - 60'0"	Grey fine to medium sand, with some silt and clay layers, saturated.

Borehole terminated at 60'0".

Borehole No. 15

0" - 1'0"	Black organic topsoil.
1'0" - 2'4"	Brown fine sand.
2'4" - 4'6"	Grey clay.
4'6" - 20'0"	Bouldery gravel and sand, some silt, saturated.

Borehole terminated at 20'0"

Borehole No. 16

0" - 95'0"	Brown medium sand, some fine and coarse sand layers.

Borehole terminated at 95'0".

Borehole No. 17

0" - 18'0"	Brown coarse sand with coarse gravel layers.
18'0" - 22'0"	Bouldery gravel.
22'0" - 75'0"	Brown coarse sand with some gravel, saturated after 40'0"±.
75'0" - 90'0"	Grey medium sand, saturated.

Borehole terminated at 90'0"±.

TABLE IV

GROUND WATER MONITOR INSTALLATION DETAILS
TRAIL ROAD LANDFILL SITE

Borehole No.	Pipe No.	PVC Pipe Diameter	Monitor Type	Elevation of Monitor Tip	Elevation of Bentonite Seal	Remarks
1	1	3/4"	*P	272.0	–	No seals placed in this borehole
	11	3/4"	P	290.5	–	
	111	3/4"	P	314.5	–	
	1111	3/4"	**S	328.5	–	
2	1	3/4"	P	287.6	290.1-289.6	
	11	3/4"	P	297.6	300.3-299.1	
	111	3/4"	P	307.1	–	
	1111	3/4"	S	323.6	–	
3	1	1-1/2"	P	376.5	–	
	11	3/4"	P	306.0	–	
	111	3/4"	S	326.5	–	
4	1	1-1/2"	P	292.9	296.4-295.4	
	11	1-1/2"	P	316.9	–	
	111	3/4"	S	326.4	–	
5	1	3/4"	P	291.5	294.5-293.5	
	11	3/4"	P	300.5	–	
	111	3/4"	P	320.0	–	
	1111	3/4"	S	327.5	–	
6	1	3/4"	P	269.0	272.5-271.5	
	11	3/4"	P	282.0	285.5-284.5	
	111	3/4"	P	302.5	–	
	1111	3/4"	S	328.5	–	
7	1	1-1/2"	P	262.3	265.3-264.3	
	11	3/4"	P	299.3	298.8-297.8	
					302.3-301.3	
	111	3/4"	P	309.3	–	
	1111	3/4"	P	315.8	–	
	11111	1-1/2"	S	305.3	–	
8	1	1-1/2"	P	304.7	307.7-306.7	
	11	3/4"	P	314.7	–	
	111	3/4"	S	316.7	–	
9	1	1-1/2"	P	307.9	–	
	11	3/4"	S	315.4	–	
10	1	3/4"	P	291.6	294.6-293.6	
	11	3/4"	P	306.6	308.6-307.6	
	111	1-1/2"	S	317.6	–	
11	1	3/4"	P	307.7	–	
	11	1-1/2"	S	322.2	–	
12	1	3/4"	P	284.5	328.0-327.0	
	11	3/4"	P	290.5	328.0-327.0	
	111	3/4"	P	316.5	328.0-327.0	
	1111	1-1/2"	S	322.0	–	
13	1	3/4"	P	286.6	–	
	11	3/4"	P	292.1	–	
	111	3/4"	P	312.1	–	
	1111	1-1/2"	S	314.1	–	
14	1	1-1/2"	P	296.1	313.6-312.6	
	11	3/4"	P	317.6	320.6-319.6	
	111	1-1/2"	S	330.6	–	
15	1	1-1/2"	P	314.3	329.3-328.3	
	11	1-1/2"	S	316.8	–	
16	1	1-1/2"	P	283.1	–	
	11	1-1/2"	S	318.1	–	
17	1	1-1/2"	P	285.3	–	
	11	1-1/2"	S	320.3	–	
18	1	1-1/2"	P	305.9	318.9-317.9	
	11	1-1/2"	S	321.9	–	
19	1	3/4"	P	300.7	307.2-308.2	
	11	3/4"	S	314.2	–	
20	1	3/4"	S	319.5	–	
21	1	3/4"	P	282.1	–	
	11	3/4"	S	317.6	–	
22	1	3/4"	P	292.1	300.1-299.1	
	11	3/4"	S	313.1	–	
23	1	3/4"	S	327.6	–	
24	1	3/4"	P	300.3	–	
	11	3/4"	S	313.3	–	
25	1	3/4"	P	229.5	–	Pipe destroyed
26	1	3/4"	P	278.1	308.1-307.1	
	11	3/4"	P	316.1	–	
	111	3/4"	S	323.6	–	
27	1	1-1/2"	S	310.8	–	
28	1	1-1/2"	P	284.0	–	
	11	1-1/2"	S	317.5	–	
29	1	3/4"	P	278.1	284.1-283.1	
	11	1-1/2"	S	328.1	–	

*P - Piezometer **S - Standpipe

PROJECT: 991-2806

RECORD OF BOREHOLE: BH16A

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: December 14, 1999

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	Gastechtor ppm (ppm)	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		113.30							
	Power Auger 200mm Diam (Hollow Stem)	Compact to dense light brown stratified fine SAND, occasional to trace silt,		0.00	1	50 DO	20				Cement Seal
					2	50 DO	31				Native Backfill
5					3	50 DO	24				Bentonite Seal
				103.96							
		Dense to compact brown to grey fine to medium stratified SAND, occasional coarse sizes, occasional to trace silt		9.34	4	50 DO	40				
10					5	50 DO	34				Native Backfill
					6	50 DO	44				
15					7	50 DO	26				
					8	50 DO	41				
20					9	50 DO	27				
											Caved Material
25					10	CS	-				
					11	CS	-				Bentonite Seal
30											Granular Filter
					12	CS	-				38mm PVC #10 Slot Screen #1
35		END OF BOREHOLE		78.25 35.05							
40											

DEPTH SCALE

1 : 200

Golder Associates

LOGGED: D.J.S.

CHECKED: AH

BOREHOLE 991-2906.GPJ HYDROGEO.GDT 2 6 01

Project No: 03-1387-8002
Project: Trail Rd. Stg. 2 LFG Investigation **Borehole ID: GM12**
Client: City of Ottawa
Location: South side of Trail Road ***Supervised By:*** E. Shilts

DILLON CONSULTING

SUBSURFACE PROFILE				WELL DATA		Remarks
Depth (ft / m)	Symbol	Description	Elevation	A	B	
-4		Ground Surface	0			25mm-dia. sched-40 PVC with needle valve on slip cap.
1		*Gravel and Sand* Grey-brown, loose, dry road base gravel.	-1			Backfill to surface.
6		*Fine Sand* Grey-brown, loose, dry fine sand.				Bentonite seal
11 / 4			-5			
16		*Sand and Gravel* Brown, dry, loose, medium sand and gravel.				#3 Morie sand pack #10 screen
21						
26 / 9			-9			
31		*Medium Sand* Brown, dry, loose, medium sand.				Bentonite seal
36						
41						#3 Morie sand pack #10 screen
46 / 14			-15			
		End of Borehole				

Drilled By: EAD
Drill Method: Hollow Stem Auger
Drill Date: March 31, 2003
Vapour Unit:

Dillon Consulting Limited
5310 Canotek Rd.,
Gloucester, Ontario, K1J 9N5
(613) 745-2213

Hole Size: 150 mm
Datum:
Sheet: 1 of 1
Top of Casing:

E-326

BOREHOLE NO. M1

PROJECT NAME Trail Road Landfill — PROJECT NO. 83-10

CLIENT Regional Municipality of Ottawa-Carleton — DATE May 4, 1977

BOREHOLE TYPE 3¼" Hollow Stem Auger — GEOLOGIST JH

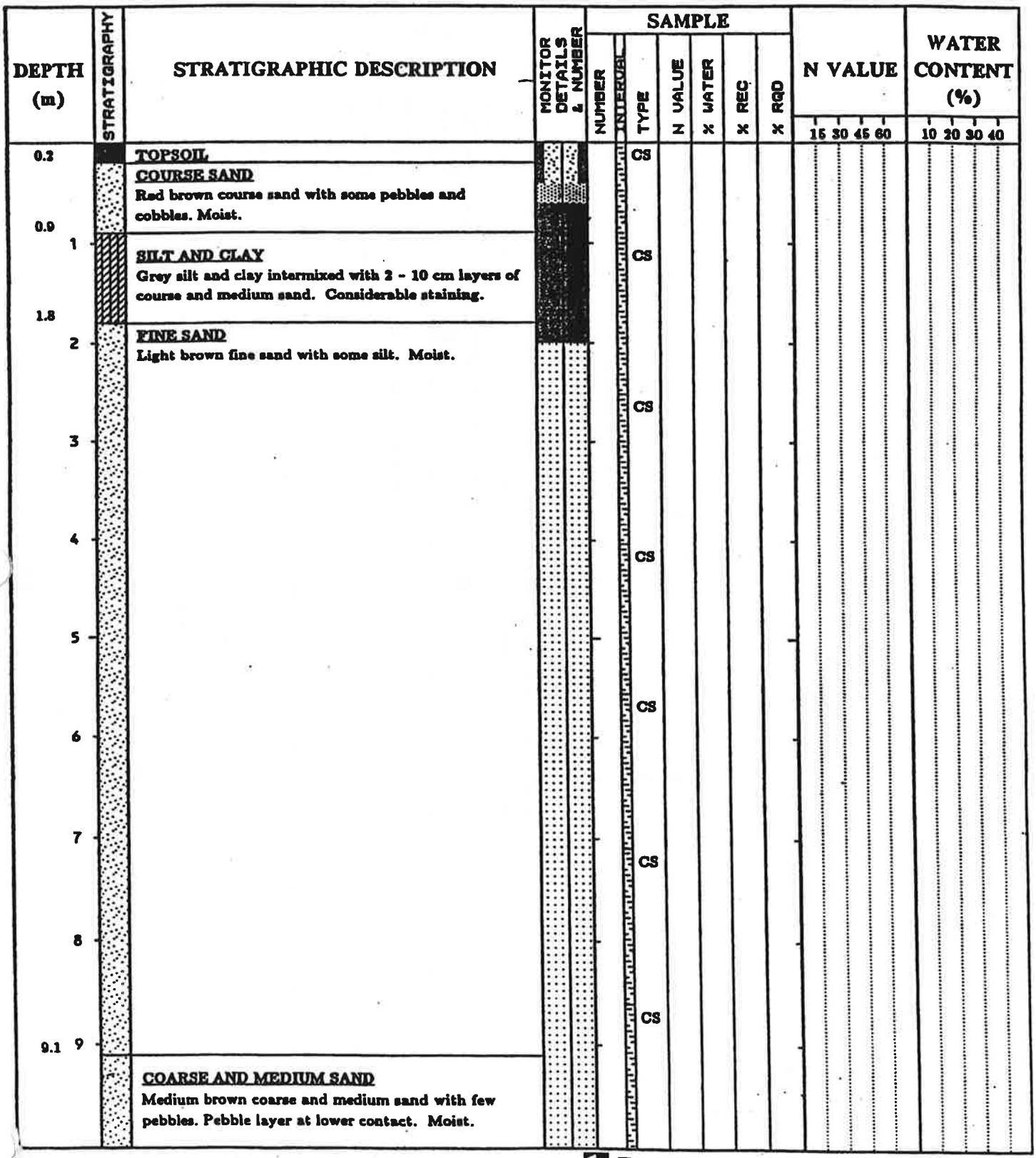
ELEVATION 108.7 m ASL — TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	SAMPLE BLOWS/FT.	SAMPLE % WATER	GROUND WATER	REMARKS
0'		Sand Primarily brown medium grained sand with minor gravel layers					▽	
50'		Borehole terminated at 50' in sand.						

BOREHOLE LOG	PROJECT: 88-218	BOREHOLE: M34
Ground Water and Gas Monitor Installation Trail Rd. Landfill FOR: Regional Municipality of Ottawa-Carlton		DATE: 29 June 1988 GEOLOGIST LD ELEVATION 103.2 m ASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE	N VALUE	WATER CONTENT (%)
0.4	TOPSOIL		15 30 45 60	10 20 30 40
1	SAND Light grey brown medium and fine sand with some silt. Diminishing medium sand with depth. Moist, saturated seam between 6.6 m and 6.7 m. Saturated below about 12 m.	W 1 SS 16		
2				
3		2 SS 17		
4		G		
5		3 SS 38		
6		4 SS 46		
7		5 SS 57 Y		
8				
9				
10		R		
11		6 SS 52		
12	Sample 7: Gravel 0% Sand 85.6% Silt 12.3% Clay 2.1%	7 SS 52		
13				
14				
15.2 15	Borehole terminated in sand at 15.2 m.			

BOREHOLE LOG	PROJECT: 89-258	BOREHOLE: M58
Stage III Trail Rd. Landfill FOR: Regional Municipality of Ottawa-Carleton		DATE: 1 September 1989 GEOLOGIST LD ELEVATION 111.9 m ASL



Environmental Strategies Limited

BOREHOLE LOG	PROJECT: 89-258	BOREHOLE: M58
Stage III Trail Rd. Landfill FOR: Regional Municipality of Ottawa-Carleton		DATE: 1 September 1989 GEOLOGIST LD ELEVATION 111.9 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
11						CS						
12						CS						
12.8												
13		**FINE SAND** Fine light brown sand. Wet				CS						
13.7												
14		**MEDIUM AND COARSE SAND** Medium brown coarse and medium sand. Wet to saturated below about 14 m. Cobbles inferred from drilling progress below about 15.3 m.										
15						CS						
16												
16.8		Borehole terminated in coarse sand and cobbles at 16.8 m.										

Environmental Strategies Limited

PROJECT: 991-2806

RECORD OF BOREHOLE: M107

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: January 26, 1999

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		111.07							
		Brown silty sand, trace gravel (FILL)		110.16							Cement Seal
		Brown fine sand, scattered trace gravel (FILL)		109.39							Bentonite Seal
		Brown SILTY fine SAND, trace gravel		1.83	1	50 DO	22				Granular Filter
		Dark brown silty sand TOPSOIL		108.17							25mm PVC #10 Slot Gas Monitor
		Compact to dense brown SAND and GRAVEL, occasional cobble and boulder		2.90	2	50 DO	19				
		Compact brown fine to coarse SAND		107.26							Bentonite Seal
5		Brown SAND and GRAVEL, some cobbles, occasional boulder		3.81	3	50 DO	85				
	Rotary Drilling HW Casing			95.53							
15		Probably mainly sands, occasional trace of gravel or cobble		15.54							
20											Native Backfill
25											
30											
35											50mm PVC #10 Slot Screen
	Rotary Drilling NQ Core			73.18	4	NQ RC	DD				
		Slightly weathered grey LIMESTONE BEDROCK, trace calcite and very thin shale interbed END OF BOREHOLE		37.89	5	NQ RC	DD				
40				71.57	6	NQ RC	DD				
				39.50							

BOREHOLE 991-2906.GPJ HYDROGEO.GDT 2 6 01

DEPTH SCALE

1 : 200

Golder Associates

LOGGED: D.J.S.

CHECKED: AH

PROJECT: 011-2929

RECORD OF BOREHOLE: M107-2

SHEET 1 OF 1

LOCATION: SEE SITE PLAN

BORING DATE: NOV 12, 2001

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		111.17							
0	ROTARY DRILLING HW CASING	Brown silty sand, trace gravel (FILL)		0.00	1	50 DO	6				
		Brown fine sand, scattered trace gravel (FILL)		0.30 110.26							
		Brown SILTY fine SAND, trace gravel		0.91 109.49							
		Dark brown silty sand TOPSOIL									
2		Compact to dense brown SAND and GRAVEL, occasional cobble and boulder		1.63 108.27							
		Compact brown fine to coarse SAND		2.90	2	50 DO	5				
				107.36							
4		Brown SAND and GRAVEL, some cobbles, occasional boulder		3.81							Native Backfill
6											
8											
10											
12											
14											Bentonite Seal
											Granular Filter
16		Probably mainly sands, occasional trace of gravel or cobble		15.54							32 mm PVC #10 slot screen
				95.63	3	50 DO	37				W.L. in screen at elev. 95.63 m on Dec. 3, 2001 (top of pipe at elev. 111.98 m on Nov. 12, 2001)
				94.11							
		END OF BOREHOLE STRATIGRAPHY INFERRED FROM DEEP BOREHOLE		17.08							
18											
20											

DEPTH SCALE
1 : 100

Golder Associates

E-290A

LOGGED: C.A.S.
CHECKED: ---

BOREHOLE 011-2929.GPJ GLDR_CAN.GDT 21/3/02 M.A.C.

RECORD OF BOREHOLE: M125-1

PROJECT: 011-2930

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: November 20, 2001

SHEET 1 OF 1

DATUM: Geodetic

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		97.17							
0	POWER AUGER 200 mm Diam. (Hollow Stem)	Loose to dense brown to grey fine SAND, trace silt		0.00	1	50 DO	-				Bentonite Seal
					2	50 DO	8				
5					3	50 DO	4				Native Backfill
					4	50 DO	37				
10					5	50 DO	13				
15					6	50 DO	14				Bentonite Seal Silica Sand 50 mm PVC #10 slot screen A
	ROTARY DRILL NQ Core	Fresh grey LIMESTONE BEDROCK		79.49 17.68	7	NQ RC	DD	T.C.R. (%) 93			Bentonite Seal
20				76.97	8	NQ RC	DD	S.C.R. (%) 89			
		END OF BOREHOLE		20.20				R.Q.D. (%) 68			W.L. in screen at elev. 96.57 m on Dec. 3, 2002 (top of pipe (screen A) at elev. 97.97 m on Jan. 29, 2002)
25											
30											
35											
40											
45											
50											

DEPTH SCALE
1 : 250

Golder Associates

E-324

LOGGED:

CHECKED:

BOREHOLE 011-2930.GPJ HYDROGEO.GDT 4 8 02

PROJECT: 011-2930

RECORD OF BOREHOLE: M125-2

SHEET 1 OF 1

LOCATION:

BORING DATE: 18 January 2002

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		97.16							
		For stratigraphy refer to record of borehole M125-1		0.00							Bentonite Seal Native Backfill Caved Material 32 mm PVC # 10 slot screen B
5											
		END OF BOREHOLE		89.17 7.99							(top of pipe (screen B) at elev. 98.06 m on Jan. 29, 2002)
10											
15											
20											
25											
30											
35											
40											
45											
50											

BOREHOLE 011-2930.GPJ HYDROGEO.GDT 21/3/02

DEPTH SCALE
1 : 250

Golder Associates

E-325

LOGGED: D.J.S.
CHECKED:

DILLON

PROJECT No.: 95-2953
DATUM: GEODETIC

BOREHOLE: P-1
SHEET: 1 of 2

PROJECT: NEPEAN LANDFILL BUFFERLANDS ASSESSMENT
LOCATION: FORMER BAKERMET PROPERTY

DATE: July 14/95
GEOLOGIST: D.T.B

DEPTH (m)	ELEVATION	LITHOLOGY	DESCRIPTION	SAMPLES NUMBER	INTERVAL	TYPE	N VALUE	% REC	% WATER CONTENT	MONITOR INSTALLATION
			PIEZOMETER TOP: 99.600 m GROUND ELEVATION: 98.91 m							
0	100.0		0.00 - 2.44 m., SAND, fine grained occassional cobbles, dry, compact							
-1	99.0					AS				
						AS				
-2	98.0		numerous boulders							
			2.44 - 3.05 m., SAND, fine grained, some silt, damp to moist, compact							
-3	97.0		3.05 - 7.01 m., SAND, med. to coarse grained, some fine grained sand, wet			SS	32	67		
-4	96.0					AS				
-5	95.0					AS				
-6	94.0									
-7	93.0		7.01 - 8.53 m., SAND, coarse grained with med. grained sand, wet, firm, well sorted							
-8	92.0					SS	30	67		
			8.53 - 12.50 m., SAND, med. grained, some coarse, med. density, wet, well sorted							
-9	91.0					SS	20	83		
-10	90.0									

DILLON

PROJECT No.: 95-2953
DATUM:GEODETIC

BOREHOLE: P-1
SHEET: 2 of 2

PROJECT: NEPEAN LANDFILL BUFFERLANDS ASSESSMENT
LOCATION: FORMER BAKERMET PROPERTY

DATE: July 14/95
GEOLOGIST: D.T.B

PIEZOMETER TOP: 99.800 m
GROUND ELEVATION: 98.910 m

DEPTH (m)	ELEVATION	LITHOLOGY	DESCRIPTION	SAMPLES NUMBER	INTERVAL	TYPE	N VALUE	% REC	% WATER CONTENT	MONITOR INSTALLATION
			8.53 - 12.50 m., SAND, med. grained, some coarse, med. density, wet, well sorted							
11	89.0		rusty red stain in water			SS	20			
12	88.0					SS	29	75		
			12.50 - 14.17 m., SAND, med and fine grained, brown, firm							
13	87.0						25	71		
14	86.0		14.17 - 15.85 m., SAND, very fine grained, silty, moist to wet, grey, well sorted, firm				6	67		
15	85.0									
16	84.0		15.85 - 16.92 m., SAND, med. to coarse grained, grey, wet							
			difficult drilling							
17	83.0		16.92 - 17.22 m., SAND, very fine grained, silty, wet			SS	30	83		
			17.22 - 18.92 m., TILL, poorly sorted, firm, cobbles, wet, poorly consolidated							
18	82.0									
						SS	17	83		
			boulder							
19	81.0		REFUSAL DEPTH 18.92 metres			CS		100		
20	80.0									

Appendix C – Historic Groundwater Analytical Data

Table 1 - Historic Results in Groundwater - Inorganics
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	P-1	P-1	P-1	P-1	P-1	P-1	P-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1
Sampling Date		**Bold**	Dark Orange	24-Apr-2018	5-Feb-2017	9-May-2016	11-May-2015	1-May-2014	22-Apr-2013	4-Apr-2012	8-May-2019	10-Jul-2019	30-Apr-2018	18-Jul-2018	3-May-2017	25-Jul-2017
Aquifer				Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower
Alkalinity ($CaCO_3$)	mg/L	NV	NV	143	135.9	135	134	127	131	125	131	130	126	126	129	127.1
Boron	mg/L	45	5	0.013	0.011	0.015	0.01	0.01	0.012	<0.01	<0.02	<0.02	0.015	0.023	0.013	0.016
Bromide	mg/L	NV	NV	<0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.15	<0.15	<0.15	<0.15	<0.1	<0.1
Calcium	mg/L	NV	NV	55.1	52.5	51.7	52.6	59	52.8	53.1	50.8	52.4	56.1	58.4	53.1	55
Chloride	mg/L	2300	790	38.5	43.9	41.8	49.8	60.6	43.5	42.3	46	45.1	67.6	60.7	58.1	57.7
Conductivity	mS/cm	NV	NV	43.4	46.27	45.4	48.5	49.2	44.7	44.4	0.464	0.46	51.9	50.9	49.89	49.82
DOC	mg/L	NV	NV	1.2	1.23	1.49	1.82	0.99	1.29	0.81	1.7	1.6	1.3	2.1	1.33	1.24
Iron	mg/L	NV	NV	0.011	<0.005	<0.005	0.005	<0.005	<0.005	<0.01	0.108	0.119	0.194	0.122	0.189	0.129
Hardness (CaCo3)	mg/L	NV	NV	200	195	189.9	193.8	216	200	195	187	192	205	211	198	201
Potassium	mg/L	NV	NV	1.9	1.41	1.47	1.62	1.62	1.58	1.43	1.6	1.5	1.8	1.7	1.55	1.63
Magnesium	mg/L	NV	NV	15.1	15.6	14.8	15.2	16.7	15.2	15.1	14.6	14.9	15.8	16.5	15.8	15.4
Sodium	mg/L	2300	490	14.5	16.6	15.1	18.1	17.3	14.4	13.6	18.2	17.8	19.9	21.5	20.6	20.7
Nitrate	mg/L	NV	NV	0.051	0.004	0.006	0.007	<0.003	0.008	<0.003	<0.02	<0.02	0.213	<0.005	0.018	0.015
Nitrite	mg/L	NV	NV	<0.02	<0.04	<0.1	<0.1	<0.05	<0.05	<0.05	-	-	<0.02	<0.02	<0.1	<0.1
pH	NV	NV	NV	8.28	8.24	8.14	7.13	8.15	8.2	8.17	8.25	8.22	8.21	8.22	8.16	8.25
Sulfate	mg/L	NV	NV	30	32	33	33	33	34	35.3	32	33	34	33	31	33
TKN	mg/L	NV	NV	0.13	0.09	0.08	0.05	0.11	0.06	0.06	0.1	0.07	0.28	0.11	0.11	0.08
Total Phosphorus	mg/L	NV	NV	0.022	<0.005	<0.0005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
TSS	mg/L	NV	NV	15	11	24	3	7	4	4	<2	5	5	17	17	14

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 1 - Historic Results in Groundwater - Inorganics
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	M107-1	M107-1	M107-1
Sampling Date		**Bold**	Dark Orange	18-Apr-2016	29-Jul-2016	4-May-2015	20-Jul-2015	6-May-2014	18-Jul-2014	26-Jun-2013	26-Jun-2013	18-Apr-2012	13-Jul-2012	10-Jul-2019	29-Apr-2019	17-May-2018
Aquifer				Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower
Alkalinity ($CaCO_3$)	mg/L	NV	NV	127	127	126	128	124	124	122	123	146	125	127	144	153
Boron	mg/L	45	5	0.015	0.013	0.007	0.014	0.014	0.009	0.012	0.007	<0.01	0.006	<0.02	<0.02	0.016
Bromide	mg/L	NV	NV	<0.1	<0.1	<0.1	<0.1.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.15	<0.15	<0.15
Calcium	mg/L	NV	NV	52	55.2	57.5	56.2	52	56.5	51.2	52.6	49	51	52.9	61.1	70.7
Chloride	mg/L	2300	790	60.9	59.7	70.2	70.1	61.19	67	50.9	51.4	41.3	48.8	53.9	53.9	64.7
Conductivity	mS/cm	NV	NV	50.8	50.1	53.8	52.1	50.2	51.9	45.9	47.2	40.8	46.1	0.478	0.509	56.1
DOC	mg/L	NV	NV	1.3	1.42	1.49	1.49	2.3	1.2	1.07	1.34	1.59	<0.5	1.5	1.6	1.7
Iron	mg/L	NV	NV	0.201	0.112	0.146	0.208	0.166	0.135	0.096	0.159	6.26	0.124	0.14	0.226	0.354
Hardness (CaCo3)	mg/L	NV	NV	193.6	204.8	212.2	206.9	192.3	207.7	200	200	200	186	192	209	238
Potassium	mg/L	NV	NV	1.6	1.71	1.73	1.87	1.58	1.71	1.55	1.55	1.63	1.44	1.5	1.9	2.2
Magnesium	mg/L	NV	NV	15.5	16.3	16.7	16.2	15.2	16.2	14.9	15.3	14.8	14.2	14.5	13.7	15
Sodium	mg/L	2300	490	20.2	21	20	19.8	15.8	16.8	14	15.2	11.1	14	20.6	20.5	25.1
Nitrate	mg/L	NV	NV	0.026	0.013	0.018	<0.003	0.022	0.01	<0.003	0.004	0.037	0.015	<0.02	<0.02	0.065
Nitrite	mg/L	NV	NV	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.02	<0.05	0.03	<0.05	-	-	<0.02
pH	NV	NV	NV	8.08	8.22	8.09	8.13	8.13	8.2	8.11	8.23	8.04	8.21	8.21	8.23	8.17
Sulfate	mg/L	NV	NV	33	33	34	34	33	35	36	34	8.5	35	32	32	32
TKN	mg/L	NV	NV	0.13	0.08	0.08	0.06	0.09	0.1	0.06	0.06	0.1	0.07	0.11	0.19	0.28
Total Phosphorus	mg/L	NV	NV	0.008	0.005	0.005	0.007	<0.005	0.005	<0.005	<0.005	0.005	<0.005	0.008	0.006	0.016
TSS	mg/L	NV	NV	86	215	2	109	15	10	5	11	8	21	37	74	454

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 1 - Historic Results in Groundwater - Inorganics
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	M107-1	M107-1	M107-1	M107-1	M107-1	M107-1	M125-1	M125-1	M125-1	M125-1	M125-1	M125-1	M125-1
Sampling Date		**Bold**	Dark Orange	8-May-2017	5-May-2016	11-May-2015	21-May-2014	19-Apr-2013	4-Apr-2012	3-Dec-2019	18-Apr-2017	25-Jul-2017	11-May-2015	21-Jul-2015	1-May-2014	17-Jul-2014
Aquifer				Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower
Alkalinity ($CaCO_3$)	mg/L	NV	NV	207.9	159	150	202	216	129	127	126.4	124.6	137	126	122	122
Boron	mg/L	45	5	0.019	0.014	0.009	0.016	0.015	<0.01	<0.02	0.011	0.015	0.008	0.011	0.008	0.01
Bromide	mg/L	NV	NV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Calcium	mg/L	NV	NV	72.9	63.8	55.1	98.3	82.9	57.5	49.2	53.2	56.2	54.7	54.7	60.1	57.1
Chloride	mg/L	2300	790	56.7	72.3	70	89	52.7	50.6	56	60.1	66.9	67.6	73.8	71.4	72.3
Conductivity	mS/cm	NV	NV	63.03	57.3	53.4	70.2	62.2	48	47.9	50.93	51.74	52.8	53.1	51.9	52.5
DOC	mg/L	NV	NV	1.97	1.97	1.8	1.97	6.71	1.18	1.3	0.31	1.42	1.67	1.32	0.96	1.43
Iron	mg/L	NV	NV	1.36	0.442	0.091	3.397	1.573	0.14	0.07	0.091	0.132	0.184	0.164	0.187	0.199
Hardness (CaCo3)	mg/L	NV	NV	243	217.7	199.7	314.6	300	203	183	195	203	199.1	198.7	217.5	207.1
Potassium	mg/L	NV	NV	2.38	1.8	1.6	2.45	2.07	1.5	1.7	0.55	1.54	1.6	1.69	1.58	1.58
Magnesium	mg/L	NV	NV	14.9	14.2	15.1	27.6	16.2	14.5	14.7	15.2	15.2	15.2	15.1	21.3	19.8
Sodium	mg/L	2300	490	27.4	26.8	23.6	27.6	22.9	16	19.8	23.8	24.1	23.4	23.1	21.3	19.8
Nitrate	mg/L	NV	NV	0.132	0.259	0.016	0.309	0.023	<0.003	<0.02	0.004	0.016	0.003	0.007	0.007	0.023
Nitrite	mg/L	NV	NV	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05
pH	NV	NV	NV	8.08	8	6.79	7.83	7.9	8.15	8.22	8.16	8.25	7.47	8.24	8.17	8.19
Sulfate	mg/L	NV	NV	24	23	33	27	29	36.2	34	32	32	34	35	33	34
TKN	mg/L	NV	NV	0.33	0.4	0.07	0.6	0.29	0.08	0.15	0.08	0.08	0.07	0.07	0.09	0.11
Total Phosphorus	mg/L	NV	NV	0.007	0.008	0.007	0.021	0.007	0.005	0.01	<0.005	<0.005	<0.005	0.005	<0.005	0.008
TSS	mg/L	NV	NV	59	3	43	783	33	25	6	2	422	3	4	2	12

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 1 - Historic Results in Groundwater - Inorganics
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	M125-1	M125-1	M125-1	M125-1	BH16-1	BH16-1	BH16-1	BH16-1	BH16-1	BH16-1	BH16-1	BH16-1	BH16-1
Sampling Date		**Bold**	Dark Orange	17-Apr-2013	16-Jul-2013	4-Apr-2012	12-Jul-2012	8-May-2019	22-Jul-2019	30-Apr-2018	5-Mar-2017	25-Jul-2017	18-Apr-2016	29-Jul-2016	20-Jul-2015	23-Nov-2015
Aquifer				Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid
Alkalinity ($CaCO_3$)	mg/L	NV	NV	124	121	122	120	166	164	160	166.1	160.7	170	173	182	176
Boron	mg/L	45	5	0.01	0.007	<0.01	<0.005	0.05	<0.02	0.052	0.07	0.057	0.083	0.08	0.087	0.1
Bromide	mg/L	NV	NV	<0.1	<0.1	<0.1	<0.1	<0.15	<0.15	<0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Calcium	mg/L	NV	NV	54.4	52.4	52.6	49.2	47	61.9	48.2	45.7	47.4	45.5	49.6	48.5	45.2
Chloride	mg/L	2300	790	51	51.6	47	43.9	5.6	29.4	6.1	5.9	5.9	6.4	6.6	6.4	6.7
Conductivity	mS/cm	NV	NV	47.6	47	45.6	43.6	34.4	0.522	33.4	34.67	34.3	35.3	35.7	36.2	36.6
DOC	mg/L	NV	NV	0.88	1.55	0.87	0.6	1.6	1.7	1.2	1.72	1.35	1.31	1.59	1.79	1.3
Iron	mg/L	NV	NV	0.205	0.199	0.19	0.161	0.04	0.233	0.059	0.208	1.036	0.418	0.518	0.152	0.642
Hardness (CaCo3)	mg/L	NV	NV	200	200	191	178	175	184	179	175	178	173.6	187.6	181.5	170.8
Potassium	mg/L	NV	NV	1.49	1.46	1.45	1.33	2	2	1.7	1.88	1.84	2.13	2.36	2.67	2.83
Magnesium	mg/L	NV	NV	14.6	14.6	14.5	13.3	14	14.9	14.2	14.7	14.4	14.6	15.5	14.7	14.1
Sodium	mg/L	2300	490	16.7	16.3	15.7	14.6	2.2	3.5	3.3	4.2	4.1	4.6	4.8	5.1	4.7
Nitrate	mg/L	NV	NV	0.007	0.006	0.011	0.01	0.05	<0.02	0.007	0.075	0.068	0.045	0.013	0.004	0.072
Nitrite	mg/L	NV	NV	<0.1	<0.05	<0.05	<0.05	-	-	<0.02	<0.02	<0.02	<0.02	0.03	<0.1	0.02
pH	NV	NV	NV	8.18	8.2	8.2	8.19	8.21	8.2	8.16	8.13	8.23	8.06	8.23	8.03	8.14
Sulfate	mg/L	NV	NV	35	34	35.9	34	13	13	16	13	15	12	11	10	12
TKN	mg/L	NV	NV	0.08	0.07	0.07	0.07	0.1	0.11	0.05	0.14	0.1	0.16	0.11	0.07	0.11
Total Phosphorus	mg/L	NV	NV	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.0005	0.005	0.006	0.012	0.008	0.036	0.011
TSS	mg/L	NV	NV	6	35	2	2	50	19	43	102	71	80	694	285	1757

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 1 - Historic Results in Groundwater - Inorganics
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	BH16-1	BH16-1	BH16-1	BH16-1	M58-1	M58-1	M58-1	M58-1	M58-1	M58-1	M58-1	M58-1	M58-1
Sampling Date		**Bold**	Dark Orange	6-May-2014	18-Jul-2014	17-Apr-2012	13-Jul-2012	29-Apr-2019	17-May-2018	1-May-2019	8-May-2017	9-May-2016	11-May-2015	21-May-2014	19-Apr-2013	4-Apr-2012
Aquifer				Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid
Alkalinity ($CaCO_3$)	mg/L	NV	NV	185	180	188	186	370	522	437	283.3	386	287	330	358	318
Boron	mg/L	45	5	0.103	0.08	0.14	0.101	0.159	0.068	0.076	0.191	0.217	0.125	0.14	0.23	0.14
Bromide	mg/L	NV	NV	0.2	0.2	0.2	0.2	<0.15	<0.15	<0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Calcium	mg/L	NV	NV	46.9	47.5	49.1	46.6	127.9	187.1	145.8	86.9	125.7	80	113.6	108.6	100
Chloride	mg/L	2300	790	7	8.1	7.1	6.7	33.2	70.1	54.4	37.4	28.6	15.9	22	17	24
Conductivity	mS/cm	NV	NV	38.3	37	37.2	37	0.889	123.7	102.8	68.68	82.9	56.7	70.2	71.1	68.5
DOC	mg/L	NV	NV	2.58	1.79	2.34	1.7	2.8	7.2	3.5	3.17	2.52	2.01	1.7	1.38	1.3
Iron	mg/L	NV	NV	0.243	0.787	0.81	1.47	0.401	4.42	1.299	0.016	<0.005	<0.005	0.005	0.011	<0.001
Hardness (CaCo3)	mg/L	NV	NV	173.8	180.3	200	173	467	640	504	298	409.4	270.9	383.6	400	387
Potassium	mg/L	NV	NV	2.41	2.44	2.7	2.61	1.4	2.7	2	1.34	1.62	1.31	1.4	1.5	1.38
Magnesium	mg/L	NV	NV	13.8	15	14.9	13.9	35.9	42.1	33.9	19.7	23.2	17.3	24.3	26.2	24.4
Sodium	mg/L	2300	490	5.6	5.4	6.7	6.5	21.3	47.7	32.6	21.5	19.4	14.6	17.6	11.3	13.7
Nitrate	mg/L	NV	NV	0.051	0.04	0.167	0.122	1.4	0.262	0.18	0.014	0.005	0.006	0.008	<0.003	<0.003
Nitrite	mg/L	NV	NV	0.07	<0.05	<0.05	<0.05	-	0.36	0.36	<0.1	0.17	0.54	0.8	0.6	0.7
pH	NV	NV	NV	8.13	8.13	8.14	8.18	8.08	7.84	7.86	8.07	7.78	7.16	7.86	7.9	8
Sulfate	mg/L	NV	NV	9.8	12	7.3	8.6	76	66	51	22	26	23	29	18	24
TKN	mg/L	NV	NV	0.12	0.14	0.25	0.19	0.74	2.03	0.95	0.32	0.2	0.06	0.11	0.11	0.06
Total Phosphorus	mg/L	NV	NV	0.006	0.016	0.015	0.018	0.024	0.025	0.022	0.005	0.005	0.005	<0.005	0.005	<0.005
TSS	mg/L	NV	NV	1195	543	1006	694	161	46	52	21	53	66	67	53	12

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 1 - Historic Results in Groundwater - Inorganics
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	O-1	O-1	O-1	O-1	O-1	O-1	O-1	O-1	M107-2	M107-2	M107-2	M107-2	M107-2
Sampling Date		**Bold**	Dark Orange	10-May-2019	24-Apr-2018	18-Apr-2017	13-Apr-2016	30-Apr-2015	14-Apr-2014	10-Apr-2013	11-Apr-2012	2-May-2019	5-Aug-2017	5-May-2016	11-May-2015	21-May-2014
Aquifer				Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid
Alkalinity ($CaCO_3$)	mg/L	NV	NV	335	304	195.4	205	180	175	177	180	184	364.8	273	291	341
Boron	mg/L	45	5	<0.02	0.016	0.007	0.018	0.005	0.006	<0.005	<0.01	<0.02	0.109	0.036	0.034	0.123
Bromide	mg/L	NV	NV	<0.75	<0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.15	<0.1	<0.1	<0.1	<0.1
Calcium	mg/L	NV	NV	167.6	147.8	67.8	71.1	61.1	56.6	53.4	58.1	58.5	112.8	79.3	79.8	111.8
Chloride	mg/L	2300	790	8.4	7.7	4.8	6.6	3.4	2.5	1.9	2.2	11.9	7.5	5.1	3.6	3
Conductivity	mS/cm	NV	NV	109.9	92.2	46.82	50.1	41.8	38.2	38.5	38.6	40.3	75.51	54.4	55.2	68.1
DOC	mg/L	NV	NV	1.8	1.3	0.91	1	1.43	0.88	0.66	0.8	1.9	2.32	1.93	2.28	2.17
Iron	mg/L	NV	NV	0.064	0.037	0.016	0.023	0.05	<0.005	0.044	0.05	<0.02	0.007	0.024	0.005	0.01
Hardness (CaCo3)	mg/L	NV	NV	605	528	244	254	217.1	201	200	200	214	401	289.7	294.6	405
Potassium	mg/L	NV	NV	2.4	2.3	1.59	1.54	1.5	1.46	1.43	1.36	1.6	2.29	1.87	1.83	2.41
Magnesium	mg/L	NV	NV	45.4	38.7	18.1	18.6	15.7	14.5	14.3	14.3	16.5	28.9	22.3	23.2	30.6
Sodium	mg/L	2300	490	9.3	7.9	3.6	4.1	3.6	3.6	3.3	4.2	3	3.8	2.5	2.9	6.4
Nitrate	mg/L	NV	NV	0.28	<0.005	0.005	0.024	0.005	0.011	0.013	<0.0003	<0.02	0.02	0.004	<0.0003	0.0004
Nitrite	mg/L	NV	NV	-	0.15	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	-	0.27	0.06	<0.1	0.4
pH	NV	NV	NV	8	8.18	8.19	8.2	8.25	8.11	8.17	8.18	8.21	8.15	7.98	7.44	7.95
Sulfate	mg/L	NV	NV	290	210	49	58	46	32	33	29.8	17	46	18	31	41
TKN	mg/L	NV	NV	0.07	<0.05	0.04	0.07	0.04	0.07	<0.02	0.03	0.36	0.1	0.12	0.06	0.13
Total Phosphorus	mg/L	NV	NV	0.01	<0.005	0.007	<0.0005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005
TSS	mg/L	NV	NV	103	26	47	50	500	5	36	5	88	69	226	137	586

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 1 - Historic Results in Groundwater - Inorganics
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	M107-2	M107-2	M125-2	M125-2	M125-2	M125-2	M125-2	M125-2	M125-2	M125-2	M125-2	M125-2
Sampling Date		**Bold**	Dark Orange	19-Apr-2013	4-Apr-2012	3-Dec-2019	18-Apr-2017	25-Jul-2017	13-Apr-2016	13-Jul-2016	11-May-2015	21-Jul-2015	1-May-2014	17-Jul-2014	17-Apr-2013	16-Jul-2013
Aquifer				Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid
Alkalinity ($CaCO_3$)	mg/L	NV	NV	382	206	230	130.9	136.2	130	130	151	135	168	159	172	177
Boron	mg/L	45	5	0.144	0.05	<0.02	0.007	0.013	0.014	0.012	0.007	0.01	0.008	0.009	0.011	0.007
Bromide	mg/L	NV	NV	<0.1	<0.1	<0.015	<0.1	<0.1	<0.1	<0.1	<001	<0.1	<0.1	<0.1	<0.1	<0.1
Calcium	mg/L	NV	NV	121.8	59.5	61.9	42.8	46	38.2	41.7	38.2	37.4	50.3	42.7	46.7	47.8
Chloride	mg/L	2300	790	5	3.3	29.4	13.8	16.9	8.6	10	2.4	5.1	5.7	5.1	5	5.6
Conductivity	mS/cm	NV	NV	80.4	40.8	52.2	32.67	33.49	29.2	29.3	27.6	27.3	32.8	31.7	33.3	34.4
DOC	mg/L	NV	NV	2.34	1.07	2.6	1.42	1.54	1.23	1.5	1.58	1.17	0.95	1.42	1.09	1.5
Iron	mg/L	NV	NV	0.006	<0.01	0.488	<0.005	0.008	0.014	0.008	0.005	<0.005	<0.0005	<0.0005	0.308	0.0012
Hardness (CaCo3)	mg/L	NV	NV	400	219	244	163	172	145.9	155.1	145.5	141.9	191.4	162.9	200	200
Potassium	mg/L	NV	NV	2.86	1.84	1.5	1.44	1.62	1.48	1.42	1.82	2.02	2.37	1.36	1.48	2.04
Magnesium	mg/L	NV	NV	35	17.1	21.7	13.6	13.8	12.3	12.4	12.2	11.8	16	13.7	14.5	15.6
Sodium	mg/L	2300	490	10	3.4	12.5	4	5.2	2.6	2.6	2.7	2.7	3	2.4	2.9	3
Nitrate	mg/L	NV	NV	<0.003	<0.003	<0.02	0.01	0.018	0.018	0.017	0.025	0.034	0.027	0.034	0.0034	0.019
Nitrite	mg/L	NV	NV	0.6	<0.05	-	<0.02	<0.02	<0.04	<0.04	<0.02	<0.04	<0.02	<0.02	<0.1	<0.02
pH	NV	NV	NV	7.86	8.13	8.24	8.17	8.27	8.23	8.13	7.41	8.23	8.19	8.19	8.21	8.23
Sulfate	mg/L	NV	NV	74	15.7	13	20	19	14	15	4.8	9.8	10	11	7	6.6
TKN	mg/L	NV	NV	0.15	0.05	0.26	0.1	0.08	0.07	0.1	0.04	0.07	0.08	0.08	0.06	0.07
Total Phosphorus	mg/L	NV	NV	<0.005	0.005	0.008	0.022	0.03	0.05	0.104	0.049	0.058	0.067	0.046	0.036	0.044
TSS	mg/L	NV	NV	247	267	1574	2844	678	1646	6814	4701	2453	2108	3442	2442	2960

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 1 - Historic Results in Groundwater - Inorganics
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	M125-2	M125-2
Sampling Date		**Bold**	Dark Orange	4-Apr-2012	12-Jul-2012
Aquifer				Deep - Upper/Mid	Deep - Upper/Mid
Alkalinity ($CaCO_3$)	mg/L	NV	NV	166	150
Boron	mg/L	45	5	<0.01	<0.005
Bromide	mg/L	NV	NV	<0.1	<0.1
Calcium	mg/L	NV	NV	45.6	41.5
Chloride	mg/L	2300	790	6.7	6.1
Conductivity	mS/cm	NV	NV	32.7	30.4
DOC	mg/L	NV	NV	1.14	0.8
Iron	mg/L	NV	NV	<0.01	0.161
Hardness (CaCo3)	mg/L	NV	NV	173	156
Potassium	mg/L	NV	NV	1.49	1.65
Magnesium	mg/L	NV	NV	14.4	12.8
Sodium	mg/L	2300	490	2.2	2.3
Nitrate	mg/L	NV	NV	0.023	0.009
Nitrite	mg/L	NV	NV	<0.02	<0.02
pH	NV	NV	NV	8.18	8.19
Sulfate	mg/L	NV	NV	6.5	8
TKN	mg/L	NV	NV	0.08	0.06
Total Phosphorus	mg/L	NV	NV	0.049	0.025
TSS	mg/L	NV	NV	3789	1400

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 2 - Historic Results in Groundwater - VOC
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	BH16-1	BH16-1	BH16-1	BH16-1	BH16-1	BH16-1	BH16-1	M107-2	M107-2	M107-2	M107-2	M107-2	M107-2
Sampling Date		Bold	Dark Orange	8-May-2019	30-Apr-2018	3-May-2017	18-Apr-2016	20-Jul-2015	6-May-2014	17-Apr-2012	2-May-2019	3-May-2017	5-May-2016	11-May-2015	21-May-2014	19-Apr-2013
Aquifer				Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid	Deep-Upper/Mid
1,1 - Dichloroethane	mg/L	0.32	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1 - Dichlororethylene	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2 - Dichlorobenzene	mg/L	4.6	0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2 - Dichloroethane	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
cis-1,2-Dichlorothylene	mg/L	0.0016	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
trans-1,2-Dichlorothylene	mg/L	0.0016	0.0016	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005
1,2 - Dichloropropane	mg/L	0.016	0.00058	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,3,5-Trimethylbenzene	mg/L	NV	NV	<0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,3-Dichlorobenzene	mg/L	9.6	0.059	<0.0005	<0.0003	<0.003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005
1,4-Dichlorobenzene	mg/L	0.008	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Benzene	mg/L	0.044	0.0005	<0.0003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0003	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	18	0.024	<0.0003	<0.0003	<0.003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005
Ethylbenzene	mg/L	2.3	0.0024	<0.0003	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	0.0009	<0.0005	<0.0005	<0.0005	<0.0005
Xylene (m and p)	mg/L	4.2	0.072	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylene (o)	mg/L	4.2	0.072	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chlorobenzene	mg/L	0.63	0.03	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chloroethane	mg/L	NV	NV	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Triochloroethylene	mg/L	0.0016	0.0005	<0.0005	<0.0003	0.0006	0.0007	<0.0003	<0.0003	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005
Tetrachloroethylene	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vinyl Chloride	mg/L	0.0005	0.0005	**0.0006**	<0.0005	**0.0019**	**0.005**	**0.0065**	**0.001**	**0.0109**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse textured soils)

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 2 - Historic Results in Groundwater - VOC
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	M107-2	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	BH16A-1	M107-1	M107-1	M107-1
Sampling Date		**Bold**	Dark Orange	4-Apr-2012	8-May-2019	10-Jul-2019	30-Apr-2018	3-May-2017	4-May-2015	4-May-2015	6-May-2014	9-Apr-2013	17-Apr-2012	29-Apr-2019	10-Jul-2019	17-May-2018
Aquifer				Deep-Upper/Mid	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower
1,1 - Dichloroethane	mg/L	0.32	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1 - Dichlororethylene	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2 - Dichlorobenzene	mg/L	4.6	0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2 - Dichloroethane	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
cis-1,2-Dichlorothylene	mg/L	0.0016	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
trans-1,2-Dichlorothylene	mg/L	0.0016	0.0016	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003
1,2 - Dichloropropane	mg/L	0.016	0.00058	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,3,5-Trimethylbenzene	mg/L	NV	NV	<0.0005	<0.0003	<0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003	<0.0005
1,3-Dichlorobenzene	mg/L	9.6	0.059	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003
1,4-Dichlorobenzene	mg/L	0.008	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Benzene	mg/L	0.044	0.0005	<0.001	<0.0003	<0.0003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0003	<0.0003	<0.001
Toluene	mg/L	18	0.024	<0.0005	<0.0003	<0.0003	<0.0003	<0.003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003
Ethylbenzene	mg/L	2.3	0.0024	<0.0005	<0.0003	<0.0003	<0.0005	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003	<0.0005
Xylene (m and p)	mg/L	4.2	0.072	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylene (o)	mg/L	4.2	0.072	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chlorobenzene	mg/L	0.63	0.03	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chloroethane	mg/L	NV	NV	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.0005
Triochloroethylene	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0005	<0.0025	<0.0005	<0.0005	<0.0003
Tetrachloroethylene	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vinyl Chloride	mg/L	0.0005	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition (coarse textured soils)

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS

Table 2 - Historic Results in Groundwater - VOC
Monitoring Wells Adjacent to 4380 Trail Road
OTT-21023795-A0

Parameter	Units	MECP Table 3 [1]	MECP Table 6 [2]	M107-1	M107-1	M107-1	M107-1	M107-1	M58-1	M58-1	M58-1	M58-1	M58-1	M58-1
Sampling Date		**Bold**	Dark Orange	8-May-2017	11-May-2015	21-May-2014	19-Apr-2013	4-Apr-2012	8-May-2017	9-May-2016	11-May-2015	21-May-2014	23-Apr-2013	4-Apr-2012
Aquifer				Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Lower	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid	Deep - Upper/Mid
1,1 - Dichloroethane	mg/L	0.32	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,1 - Dichlororethylene	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2 - Dichlorobenzene	mg/L	4.6	0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,2 - Dichloroethane	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
cis-1,2-Dichlorothylene	mg/L	0.0016	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
trans-1,2-Dichlorothylene	mg/L	0.0016	0.0016	<0.0003	<0.0003	<0.0003	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
1,2 - Dichloropropane	mg/L	0.016	0.00058	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,3,5-Trimethylbenzene	mg/L	NV	NV	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
1,3-Dichlorobenzene	mg/L	9.6	0.059	<0.0003	<0.0003	<0.0003	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
1,4-Dichlorobenzene	mg/L	0.008	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Benzene	mg/L	0.044	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	18	0.024	<0.0003	<0.0003	<0.0003	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Ethylbenzene	mg/L	2.3	0.0024	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylene (m and p)	mg/L	4.2	0.072	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylene (o)	mg/L	4.2	0.072	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chlorobenzene	mg/L	0.63	0.03	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chloroethane	mg/L	NV	NV	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Triochloroethylene	mg/L	0.0016	0.0005	<0.0003	**0.0027**	<0.0003	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tetrachloroethylene	mg/L	0.0016	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Vinyl Chloride	mg/L	0.0005	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

NOTES:

1 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 6 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

2 Ontario Ministry of Environment, Conservation and Parks (MECP), Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 2011, Table 3 Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse textured soils)

NV No Value

Indicates groundwater exceedance of MECP Table 6 SCS

BOLD Indicates groundwater exceedance of MECP Table 3 SCS