HYDROGEOLOGICAL INVESTIGATION

217 & 227 Cross Avenue and 571 Argus Road, Oakville, Ontario

Client

Oakville Argus Cross LP
1-90 Wingold Avenue
Toronto, Ontario, M6B 1P5

Project Number

BIGC-ENV-349B

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1 Introduction

1.1 Project Description

B.I.G. Consulting Inc. (BIG) was retained by Oakville Argus Cross LP (the Client) to conduct a Hydrogeological Investigation to support the proposed development of the site located at 217 & 227 Cross Avenue and 571 Argus Road, Oakville, Ontario (Site).

The Site is located south of the Queen Elizabeth Way, north of Cross Avenue and east of Argus Road Oakville, Ontario, as shown on Figure 1. The Site measures approximately 8,779 m² in size and is currently occupied by two (2) commercial buildings (Site buildings) at 217 and 227 Cross Avenue and one (1) vacant and undeveloped area at 571 Argus Road. The areas surrounding the Site buildings are covered with asphalt and landscaped areas.

It is BIG's understanding that the proposed re-development at the Site will consist of two (2) condominium towers with five (5) levels of undergrounding parking structure.

The following investigations previously completed for the subject Site were reviewed by BIG:

- Phase I and Phase II Environmental Site Assessment, 217 Cross Avenue and 571 Argus Road, Oakville, Ontario, dated October 11, 2019, prepared by Terrapex Environmental Ltd. (Terrapex); and,
- Preliminary Geotechnical Investigation, 217 Cross Avenue and 571 Argus Road, Oakville, Ontario, dated December 3, 2019, prepared by BIG.

This report addresses the hydrogeological aspects of the proposed project. Reports for the Preliminary Geotechnical Investigation, Phase One and Phase Two Environmental Site Assessments will be issued under separate covers. The field investigation for the geotechnical, environmental and hydrogeological investigations was carried out concurrently.

1.2 Project Objectives

The main objectives of the Hydrogeological Investigation were to:

a) Establish the local hydrogeological settings of the Site;
b) Provide assessment of anticipated construction dewatering flow rates for a generic construction scenario;
c) Estimate foundation sub-drain discharge volumes, if applicable;
d) Assess groundwater quality and compare the results to Region of Halton and Town of Oakville Combined/Sanitary and Storm Sewer Use By-Law parameters;
e) Qualitatively assess the potential impact to the nearby water body and comment on future regulatory agency involvement; and,
f) Prepare a Hydrogeological Investigation Report.

1.3 Scope of Work

To achieve the investigation objectives, BIG proposed and initiated the following scope of work:

a) Background desktop review of pertinent geological and hydrogeological resources;
b) Review of the Ministry of Environment, Conservation and Parks (MECP) Water Well Records;
c) Advancement of fifteen (15) boreholes (BH101 to BH115) to a maximum depth of 23.4 m bgs and installation of monitoring wells (MW101 to MW115);
d) Utilizing previously installed monitoring wells at the Site by BIG in 2019;

e) Perform single well response tests (SWRT) at selected monitoring wells to assess the hydraulic characteristics of the bedrock at the Site;
f) Complete groundwater level measurements at monitoring wells;
g) Evaluate the information of groundwater level measurements and groundwater quality;
h) Collection of one (1) groundwater sample for laboratory testing and compare it against the Region of Halton and Town of Oakville Combined/Sanitary and Storm Sewer Use By-Law parameters;
i) Assess groundwater discharges during construction phases;
j) Assess foundation sub-drain discharge volumes, if applicable; and,
k) Prepare a Hydrogeological Investigation Report.

1.4 Previous Reports

1.4.1 Terrapex Phase I and II Environmental Site Assessment Report

Terrapex completed a Phase I and II Environmental Site Assessment at the Site, dated October 11, 2019 that consisted of advancement of five (5) boreholes (MW101, MW102, BH103, MW104 and MW105) to a maximum depth of 3.05 m, installation of four (4) monitoring wells (MW101, MW102, MW104, and MW105), collection of soil samples from the boreholes and groundwater samples from the monitoring wells.

1.4.2 BIG Preliminary Geotechnical Investigation Report

BIG completed a Preliminary Geotechnical Investigation at the Site, dated December 3, 2019 that consisted of the advancement of six (6) boreholes (BH1 to BH6) to a maximum depth of 17.7 m bgs and installation of three (3) piezometers (MW3, MW4 and MW6).

2 Regional Setting

2.1 Regional Physiography

The Ontario Geological Survey Map P. 2204, indicates the Site lies in the Iroquois Plain physiographic region of Southern Ontario known as the shale plains. Figure 2 shows the physiographic regions of Southern Ontario around the Site.

During the last retreat of the Laurentide Ice Sheet (12,000 years B.P.) lake levels in what was to become Lake Ontario where much higher due to ice blockage in the St. Lawrence waterway. This created the glacial Lake Iroquois which was up to 60 m higher in elevation in the Toronto area than the current Lake Ontario water levels. The Iroquois Shoreline that coincided with this elevated lake, terminated just above St. Clair Avenue West.

2.2 Regional Geology

The surficial geology of the immediate area around the Site is described as Paleozoic bedrock. The surficial geology for the Site and surrounding areas is shown on Figure 3.

Bedrock of the region corresponds to the Georgian Bay Formation, Blue Mountain Formation, Billings Formation, Collingwood Member and Eastview Member consisting of shale, limestone, dolostone and siltstone. The contact between the bedrock and the overlying overburden is expected to be at approximately 3 m bgs.

2.3 Regional Hydrogeology

Groundwater movement through the subsurface is controlled by hydraulic gradients, the physical characteristics of the sediments, and the interconnectedness of lithological formations. Fine grained sediments restrict lateral movement of groundwater and induce vertical infiltration, while coarse grained sediments allow vertical flow with increased transmissivity.

The regional shallow groundwater flow is expected to follow the local topography and discharge to local area creeks and streams. Local deviation from the regional groundwater flow directions may occur in response to changes in topography and/or soil stratigraphy, as well as the presence of surface water features and/or existing subsurface infrastructure.

No local aquifers were identified that could negatively impact the subject Site.

3 Site Setting

3.1 Site Topography and Drainage

The Site is irregular in shape and has an area of approximately 8,779 m². The Site is currently occupied by two (2) commercial buildings (Site buildings) at 217 and 227 Cross Avenue and one (1) vacant and undeveloped area at 571 Argus Road. The areas surrounding the Site buildings are covered with asphalt and landscaped areas. The topography of the Site generally slopes to the south/southeast and based on the borehole logs, the ground elevation ranges between 103.45 m and 100.96 m above sea level (asl). Precipitation that falls on the Site is inferred to predominantly be directed to the catch basins located in the parking lot of the Site and nearby Town of Oakville catch basins.

3.2 Local Surface Water Features

The Site does not feature any surface water bodies on the Site. The closest surface water body to the Site is a tributary to Morrison Creek, located approximately 335 m east of the Site. The Site is situated within the Lower Morrison Creek watershed and is not part of Conservation Halton regulated area.

3.3 Ministry of Environment, Conservation and Parks Water Well Review

Well Records from the Ministry of Environment, Conservation and Parks (MECP) Water Well Record Database (WWR) were reviewed to determine the number of water wells and locations present within a 500 m radius of the Site boundaries.

The MECP WWR database indicated 83 well records within 500 m radius of the Site. All identified wells are shown on Figure 4. A summary of the Water Well Records is included in Appendix B, Table B-1. A review of the records indicated that the majority of the wells were classified for observation well, monitoring well and test hole purposes within 500 m radius of the Site. One (1) supply water well was identified at the Queen Elizabeth Way, located approximate 200 m northwest of the Site. The well was installed in 1948 and the well is located in a developed area, the supply well is likely not present. Given the area is serviced by municipal system, no private well water user is expected.

3.4 Permit to Take Water and Environmental Activity and Sector Registry Search

The MECP also maintains a database of all active and expired Permit to Take Water (PTTW) and Environmental Activity and Sector Registry (EASR) items related to construction dewatering and pumping test. There are nine (9) expired PTTW and three (3) EASR registrations within 1 km of the Site and are summarized in Table B-2, Appendix B. The location for each registration is shown on Figure 5.

4 Field Program

4.1 Borehole and Monitoring Well Details

BIG advanced fifteen (15) borehole (BH101 to BH115) to a maximum depth of 23.4 m bgs between January 13 and 27, 2021 and instrumented all boreholes with monitoring wells (MW101 to MW115). The boreholes were advanced by using a truck mounted hollow and solid stem continuous flight auger equipment under the direction and supervision of BIG field personnel. Soil samples were retrieved at regular intervals with a 50 mm outside diameter split barrel sampler drive and accordance with the Standard Penetration Test Procedure (ASTM D1586). The samples were logged in the field and returned to the BIG laboratory for detailed visual examination. The borehole records and monitoring well construction detail are included in Appendix A.

The following monitoring wells were previously installed at the Site:

a) Three (3) monitoring wells (BH/MW3, BH/MW4 and BH/MW6) installed by BIG to maximum depth of 10.5 m bgs in 2019.
b) Four (4) monitoring wells (MW101, MW102, MW104 and MW105) installed by Terrapex to a maximum depth of 3.05 m bgs in 2019.

It should be noted that, BIG could not locate MW101, MW102, MW104 and MW105 installed by Terrapex.

Figure 6 is a detailed Borehole/Monitoring Well Location Map of the Site. The borehole logs are attached in Appendix A.

4.2 Site Specific Overburden Geology

The borehole locations are shown on Figure 6 and detailed subsurface conditions are presented on the borehole logs in Appendix A. The following table is provided in addition to the borehole descriptions to provide a general summary of the soil conditions. The soil descriptions are predominately based on BIG's investigation, however, where applicable soil conditions encountered during previous investigation by others are included. The soil boundaries indicated on the borehole logs and discussed herein are inferred from the visual observations and auger resistance and should not be regarded as exact planes of geological change.

The soil conditions encountered at the borehole locations are summarized below. A stratigraphic cross-section across the property as aligned on Figure 6 is included as Figure 7.

Table 4-1: Soil description

Layer	Description
Ground Cover	All boreholes, with the exception of BH/MW112 to BH/MW114, were advanced through the existing asphalt pavement, consisting of approximately 75 to 150 mm thick asphalt concrete over 150 to 300 mm thick granular bases. BH/MW113 was advanced through an approximately 50 mm thick gravel. BH/MW112 and BH/MW114 were advanced through an existing ground surface cover consisting of approximately 150 mm thick topsoil.
Fill	Below the ground surface cover, existing fills, predominantly consisting of clayey silt and sandy silt, were encountered at all borehole locations that extended to depths varying between 0.5 and 1.7 m bgs. Fills also contained trace sand, trace gravel, trace rootlets and trace organics.

Layer	Description
Clayey Silt Till	Below the fills, a native deposit of glacial clayey silt till was encountered in all boreholes that extended to depths varying between 1.7 and 2.8 m bgs. Clayey silt till deposit also contained trace sand, trace gravel and occasional fragments of Shale.
Shale Bedrock	Below clayey silt till, a highly weathered to excellent quality of Georgian Bay Formation grey Shale bedrock was encountered in all boreholes. All boreholes were drilled into the Shale bedrock and sampled up to the borehole termination depths of 5.5 to 7.8 m bgs. First water strike was also recorded in majority of boreholes between 3.7 and 5.3 m bgs.

4.3 Water Level Monitoring

Water levels at all monitoring well locations were recorded after installation. A summary of all available water level observations is included in Table 4-2. Groundwater was observed in all monitoring wells on February 8, 2021 and depths to the groundwater ranged from 1.72 m to 21.09 m bgs. The shallow wells, BH/MW101 to BH/MW104, BH/MW106 to BH/MW113, BH/MW3 and BH/MW4 were observed with groundwater elevations of 101.15 m to 98.51 m asl. The deep wells, BH/MW105, BH/MW114 and BH/MW115 were observed with groundwater elevations of 84.43 and 81.29 m asl.

An interpreted shallow groundwater contour map for the water level measurements recorded on February 8, 2021 are included as Figure 8. Based on the water level measurements obtained, the inferred direction of shallow groundwater flow across the Site is interpreted to be to the south direction.

Seasonal variability can produce significant changes to the static water level. It has been observed that groundwater can rise and lower in response to changing weather and climate.

Table 4-2: **Monitoring Well Details and Water Levels Elevations**

Well ID	Ground Elevation (m asl)	Well Depth (m bgs)	February 1, 2021		February 8, 2021	
			Water Level (m bgs)	Elevation (m asl)	Water Level (m bgs)	Elevation (m asl)
BH/MW101	103.04	6.10	3.10	99.94	3.38	99.66
BH/MW102	102.55	6.10	3.61	98.94	3.67	98.88
BH/MW103	101.78	5.50	2.72	99.06	2.79	98.99
BH/MW104	100.96	6.10	2.45	98.51	2.45	98.51
BH/MW105	102.38	21.90	20.99	81.39	21.09	81.29
BH/MW106	102.83	6.10	3.32	99.51	3.32	99.51
BH/MW107	102.40	6.10	3.38	99.02	3.61	98.79
BH/MW108	102.55	6.10	3.58	98.97	3.90	98.65
BH/MW109	102.89	6.10	4.17	98.72	4.20	98.69
BH/MW110	101.82	6.10	2.88	98.94	3.08	98.74
BH/MW111	101.94	6.10	3.29	98.65	3.37	98.57
BH/MW112	102.78	6.10	4.20	98.58	4.23	98.55
BH/MW113	103.45	6.10	4.74	98.71	4.77	98.68
BH/MW114	103.31	21.60	N/A	N/A	18.88	84.43
BH/MW115	101.72	21.60	5.99	95.73	17.91	83.81
BH/MW3	102.87	2.30	1.85	101.02	1.72	101.15
BH/MW4	102.32	10.50	3.77	98.55	3.80	98.52
BH/MW6	102.74	3.70	Dry	Dry	Dry	Dry

4.4 Hydraulic Conductivity Testing

The hydraulic conductivity test was completed to estimate the saturated hydraulic conductivity (K) of the soil at the well screen depth at selected monitoring well locations.

Given that slug tests provided adequate aquifer properties, a pump test was not required.

In advance of performing SWRT, the monitoring well was developed to remove the potential presence of fine sediments. The development process involved purging of the monitoring wells to induce the flow of fresh formation water through the screen. The monitoring well water level was permitted to fully recover prior to performing SWRTs.

During the SWRT, a slug of water was instantaneously removed from the well and the response to the water level is recorded. The Hydraulic Conductivity values for each of the tested wells were calculated from the SWRT data using Aqtesolv Software and the Hvorslev solution for unconfined conditions. The semi-log plots for normalized drawdown versus time are included in Appendix C.

The summary of the hydraulic conductivity (K) values estimated from the SWRTs are provided below in Table 4-3:

Table 4-3: Summary of Hydraulic Conductivity (K) Testing Results

Monitoring Well	Well Depth (m bgs)	Hydraulic Conductivity (m/s)
BH/MW104	6.1	3.31×10^{-7}
BH/MW106	6.1	5.86×10^{-7}
BH/MW110	6.1	1.20×10^{-6}
BH/MW113	6.1	5.34×10^{-5}
BH/MW114	21.6	1.93×10^{-8}
BH/MW115	21.6	1.58×10^{-8}
Geometric mean K value (m/s)		**3.95×10^{-7}**

The SWRT provides an estimate of K for the geological formation in the immediate media zone surrounding the well screen and may not be representative of bulk formation hydraulic conductivities.

4.5 Groundwater Sampling

To assess the suitability for discharge of pumped groundwater to the Region of Halton Sanitary or Town of Oakville Storm Sewer during dewatering activities, a groundwater sample was collected from BH/MW113 on February 3, 2021.

Prior to collection of the samples, approximately three (3) standing well volumes of groundwater were purged from the well. The sample was collected and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required.

The sample was not field filtered. Dedicated nitrile gloves were used during sample handling. The groundwater sample was submitted to an independent laboratory, Bureau Veritas Laboratories, of Mississauga, Ontario, for analysis.

For the assessment purposes, the analytical results were compared to Table 1 – Limits for Sanitary and Combined Sewer Discharge (By-Law No. 2-03) of the Regional Municipality of Halton; and Table 2 – Limits for Storm Sewer Discharge (By-Law No 2009-031) of the Corporation of the Town of Oakville.

The laboratory Certificate of Analysis (CofAs) and chain of custody are enclosed in Appendix E.

The laboratory CofAs show that there were no exceedances against the Table 1 – Limits for Sanitary and Combined Sewer Discharge.

When compared against the more stringent Table 2 – Limits for Storm Sewer Discharge, the sample indicated exceedance for total suspended solids (TSS), total copper (Cu) and total manganese (Mn). A summary of the exceedance is provided in Table 4-4.

Table 4-4: Summary of Analytical Results

Parameter	Limits for Sanitary and Combined Sewer Discharge (mg/L) (Table 1)	Limits for Storm Sewer Discharge (mg/L) (Table 2)	Concentration for BH/MW113 (mg/L) (February 3, 2021)
Total Suspended Solids (TSS)	350	15	**19**
Total Copper (Cu)	3	0.04	**0.061**
Total Manganese (Mn)	5	0.05	**0.61**

Notes:
***Bold** indicates concentration exceeds the Storm Sewer Discharge Limit.*

If the groundwater encountered during excavation activities is discharged to the Region of Halton sanitary and combined sewer, no treatment will be required. A treatment is required prior to discharge to the Town of Oakville storm sewer.

5 Temporary Construction Dewatering

5.1 Construction Dewatering Requirements

It is BIG's understanding that the proposed re-development at the Site will consist of two (2) condominium towers with five (5) levels of undergrounding parking structure. It is anticipated that slab of five (5) levels of underground parking structure will be at an approximate depth of 16 m bgs. The footing elevation is assumed approximately 17 m bgs.

The stabilized groundwater level measurements, both in shallow and deep monitoring wells, observed on February 8, 2021 were found to be varying between elevations of 101.15 m and 81.29 m asl. For conservative purposes, the construction dewatering calculation is based on an open cut excavation at the present time. To excavate under dry conditions, the water level is anticipated to be lowered at least to a minimum of approximately 1.0 m below the footing elevation.

Additional dewatering capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. It should be noted that the dewatering estimates provided in this report are based on the conceptual building information available at this time. If design details are changed (including any changes to excavation depth), the dewatering estimates must be revised to include the final layout of the development.

5.2 Construction Dewatering Flow Rate Assumptions

The assumptions used for the calculation of the dewatering rate for the proposed development are presented in Table 5-1.

Table 5-1 Dewatering Estimate Assumptions

Input Parameter	Values	Notes
Surface Elevation (m asl)	100.96	Based on the borehole logs
Footing Elevation (m asl)	83.96	Assumed 17 m below ground
Dewatered Elevation Target (m asl)	82.96	Approximate 1 m below footing elevation
Groundwater Elevation (m asl)	101.15	Highest groundwater elevation from shallow wells on February 8, 2021
Estimated Excavation Area	94 m x 106 m	Based on area extent equivalent
Hydraulic Conductivity (m/s)	3.95×10^{-7}	Geometric mean K

5.3 Dewatering Flow Rate Equation

The Dupuit equation for steady flow from a circular source of an excavation at distance of radius of influence (R_0) through an unconfined aquifer resting on a horizontal impervious surface was used to obtain a flow rate estimate, and is expressed as follows:

$$Q_w = \frac{\pi K(H^2 - h^2)}{\ln\left[\frac{R_0}{R_e}\right]}$$

Where:

Q_w = Rate of pumping (m^3/s)
R_0 = Radius of influence (m)
R_e = Equivalent radius of well (m)
K = Hydraulic conductivity (m/s)
H = Head beyond the influence of pumping (static groundwater elevation) (m)
h = Head above base of aquifer at the excavation (m)

It is expected that the initial dewatering rate will be higher in order to remove groundwater from within the overburden formation. The dewatering rates are expected to decrease once the target water level is achieved in the excavation footprint as groundwater will have been removed locally from storage resulting in lower seepage rates into the excavation. Additionally, the use of a continuous caisson shoring system will further reduce groundwater migration into the excavation reducing the ongoing seepage rate.

5.4 Radius of Influence

The Radius of Influence (ROI) for the construction dewatering is based on the empirical Sichardt Equation. This equation is used to predict the distance at which the drawdown resulting from pumping is negligible. This equation is empirical and was developed to provide representative flow rates using the steady state flow dewatering equations, as discussed below.

It is noted that in steady state conditions, the radius of influence of pumping will extend until boundary flow conditions are reached and provide sufficient water inputs to the aquifer, such as recharge and surface water bodies. As a result, the distance of influence calculated using Sichardt equation is used to provide a representative flow rate calculation, but it is not precise in determining the actual radius influenced by pumping.

The ROI of pumping (dewatering) for radial flow is calculated based on the Sichardt equation, which is described as follows:

$$R_0 = R_e + 3000\ (\mathrm{H} - \mathrm{h})\sqrt{\mathrm{K}}$$

Where:

K = Hydraulic conductivity (m/s)
H = Static Saturated Head (m)
h = Dynamic Saturated Head (m)
R_0 = Radius of influence (m)
R_e = Equivalent radius of well (m)

Based on the Sichardt equation and the geometric mean K value, the ROI is approximately 98 m from the centre of the excavation for radial flow. The ROI calculation is provided in Appendix E.

The ROI calculation is a conservative methodology and is calculated based on the assumption of active pumping during the construction dewatering. It should be noted that most of the water will be pumped during the first stage of the construction period or when a rain event occurs. Although the ROI was conservatively predicted as 98 m from the centre of the excavation, over a period of time, the drawdown curve will be very close to the bottom of the excavation and thus resulting in negligible ROI. The likelihood for impacts to the nearby structures are negligible. Additionally, the use of a shoring system will further reduce radius of influence.

5.5 Results of Construction Dewatering Flow Rate Estimates

Based on the assumptions provided in this report, the results of the dewatering rate estimate are as follows:

Table 5-2 Summary of Construction Dewatering Flow Rate Estimate

Location	Construction Dewatering Flow Rate Without Safety Factor (L/day)	Peak Construction Dewatering Flow Rate Including Safety Factor of 2 (L/day)
Excavation area	100,400	201,000

Construction dewatering flow rate estimates are provided in Table E-1, in Appendix E.

The peak construction dewatering flow rate includes a factor of safety of two (2) to account for accumulation of rainfall, seasonal fluctuations in the groundwater table, flow from beddings of existing sewers, and variation in hydrogeological properties beyond those encountered during the course of this study. This total dewatering flow rate also provides additional capacity for the dewatering contractors. Given that the predicted dewatering volume exceeds the 50,000 L/day limit, an EASR for construction dewatering will be required.

It should be noted that if caisson wall shoring system is considered for the subject Site, reduction in groundwater quantities can be anticipated.

Please note that it is the responsibility of the contractor to ensure dry conditions are maintained within the excavation at all times.

Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. Additionally, the presence of near-surface fill material could hold significant groundwater.

The maximum flow calculation is intended to provide a conservative estimate to account for unforeseeable conditions that may arise during construction. It should be noted that the dewatering estimate provided in this report are based on the proposed development information available at this time. If changes to the design are implemented (e.g., increase to planned excavation depths, widening of excavations, etc.), the dewatering estimates must be revised to include and reflect future changes.

6 Long Term Discharge Estimate

6.1 Long-Term Dewatering

Based on Pre-Consultation comments from Town of Oakville dated September 20, 2023, the long-term foundation drainage is not allowed to discharge into the City's sewer system, the proposed building should be designed and supported by "tanked" water-proofed continuous raft foundation without permanent dewatering.

7 Potential Groundwater Impacts

7.1 Impacts to Nearby Groundwater Users

The Site lies within a urban area of Oakville, based on the MECP WWR database, one (1) supply water well was identified at the Queen Elizabeth Way, located approximate 200 m northwest of the Site. The well was installed in 1948 and the well is located in a developed area, the supply well is likely not present. Given the area is serviced by municipal system, no private well water user is expected. There are no potential impacts to nearby groundwater users due to construction dewatering is expected.

7.2 Impacts to Nearby Structures

As discussed in Section 5, given the groundwater table is above the excavation, construction dewatering is required. The ROI calculation is a conservative methodology and is calculated based on the assumption of active pumping during the construction dewatering. It should be noted that most of the water will be pumped during the first stage of the construction period or when a rain event occurs. Although the ROI was conservatively predicted as 98 m from the centre of the excavation, over a period of time, the drawdown curve will be very close to the bottom of the excavation and thus resulting in negligible ROI. The likelihood for impacts to the nearby structures are negligible. Additionally, the use of a shoring system will further reduce radius of influence.

8 Water Taking and Discharge Permits

8.1 EASR

During the active construction dewatering phase, the volume of water expected to be pumped exceeds the daily limit on groundwater taking under the Ontario Water Resources Act (50,000 L/day) if the excavation is to be undertaken all at once. Therefore, it is necessary to register the construction dewatering under the EASR guidelines, as cumulative discharge rate for construction is 201,000 L/day. The limit for water taking under an EASR is 400,000 L/day. If combined storm and groundwater were to exceed this limit, the dewatering rate would need to be capped to 400,000 L/day of pumped water. If it is necessary to exceed 400,000 L/day of water taking, a Permit to Take Water as per O.Reg.387/04 would be required.

9 Conclusions

Based on the findings of the Hydrogeological Investigation, the following summary of conclusions are provided:

a) It is BIG's understanding that the proposed re-development at the Site will consist of two (2) condominium towers with five (5) levels of undergrounding parking structure.
b) The Site is located within a physiographic region within the Iroquois Plain known as the shale plains;
c) The surficial geology of the immediate area around the Site is described as Paleozoic bedrock;
d) The MECP WWR database indicate that there are 83 well records registered with the database within 500 m of the Site. One (1) supply water well was identified at the Queen Elizabeth Way, located approximate 200 m northwest of the Site. The well was installed in 1948 and the well is located in a developed area, the supply well is likely not present. Given the area is serviced by municipal system, no private well water user is expected;
e) Groundwater was observed in all monitoring wells on February 8, 2021 and depths to the groundwater ranged from 1.79 m to 21.09 m bgs. The shallow wells, BH/MW101 to BH/MW104, BH/MW106 to BH/MW113, BH/MW3 and BH/MW4 were observed with groundwater elevations of 101.15 m to 98.51 m asl. The deep wells, BH/MW105, BH/MW114 and BH/MW115 were observed with groundwater elevations of 84.43 and 81.29 m asl;
f) Based on the water level measurements obtained, the inferred direction of shallow groundwater flow across the Site is interpreted to be to the south direction;
g) The estimated hydraulic conductivity of the soil ranges from 5.34×10^{-5} m/s to 1.58×10^{-8} m/s with a geometric mean of 3.95×10^{-7} m/s;
h) Based on the assumptions outlined in this report, the estimated peak construction dewatering flow rate including rainfall for the proposed construction activity is 201,000 L/day;
i) Based on Pre-Consultation comments from Town of Oakville dated September 20, 2023, the long-term foundation drainage is not allowed to discharge into the City's sewer system, the proposed building should be designed and supported by "tanked" water-proofed continuous raft foundation without permanent dewatering;
j) The laboratory CofA shows that no exceedance under Table 1 – Limits for Sanitary and Combined Sewer Discharge;
k) When compared against the more stringent Table 2 – Limits for Storm Sewer Discharge, the sample indicated exceedances for total suspended solids (TSS), total copper (Cu) and total manganese (Mn); and,
l) If the groundwater encountered during excavation activities is discharged to the Region of Halton sanitary and combined sewer, no treatment will be required. A treatment is required prior to discharge to the Town of Oakville storm sewer.

It should be noted that the comments and recommendations in this report are based on the assumption that the present design concept described throughout the report will proceed to construction. Any changes to the design concept may result in a modification to the recommendations provided in this report. It is noted that these conclusions and recommendations should be read in conjunction with the entirety of the report.

10 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 conclusion and recommendations presented within this report reflect Site conditions existing at the time of the assessment. BIG must be contacted immediately if any unforeseen Site conditions are experienced during the dewatering activities. This will allow BIG 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 BIG, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience profession. No other warranty or presentation, either expressed or implied, is included or intended in this report.

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Yours truly,

B.I.G. Consulting Inc.

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Manager, Hydrogeology Services

Prem Manicks, P.Geo.
Partner

11 References

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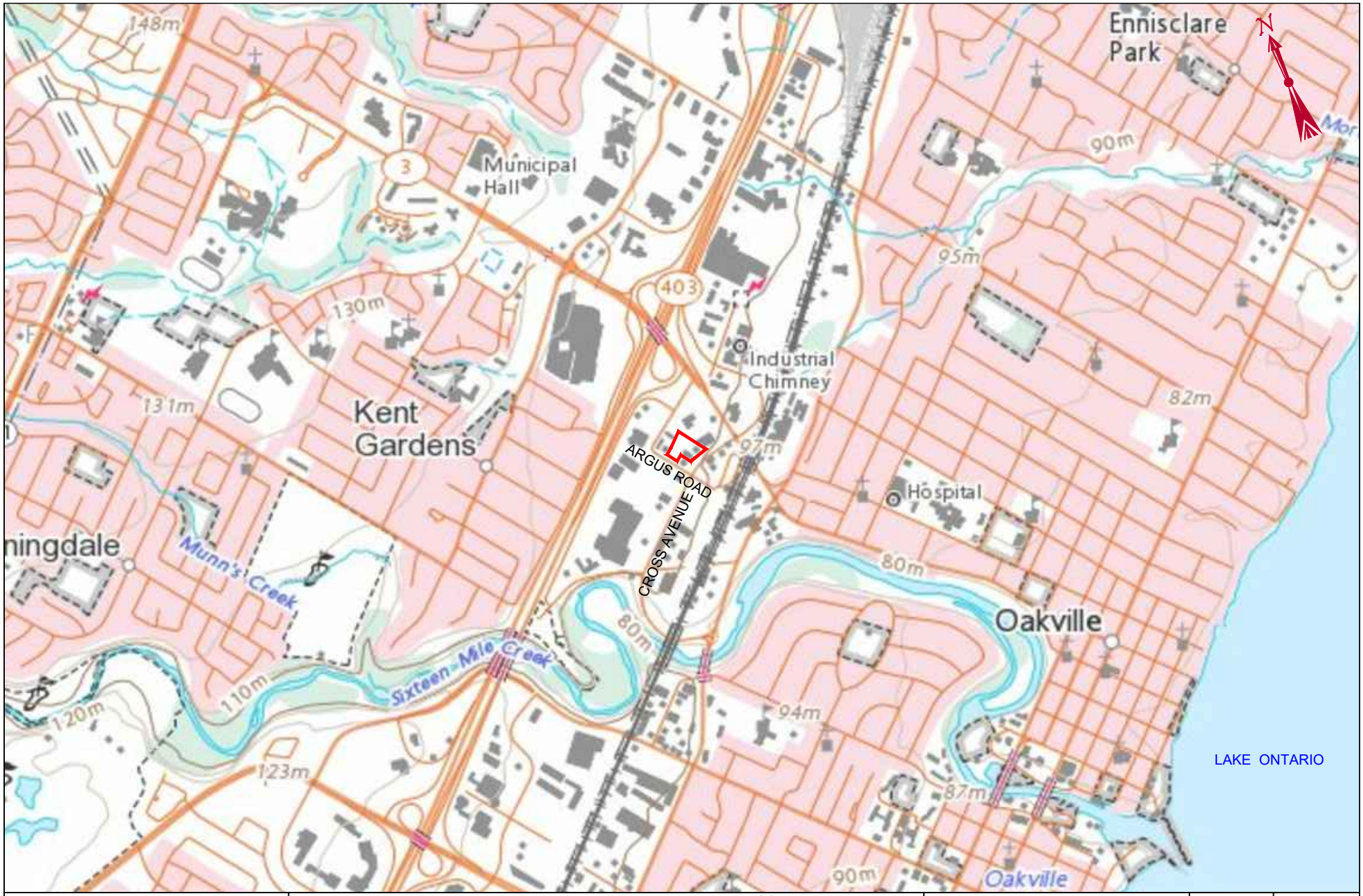
FIGURES



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LEGEND

SITE BOUNDARY

SCALE

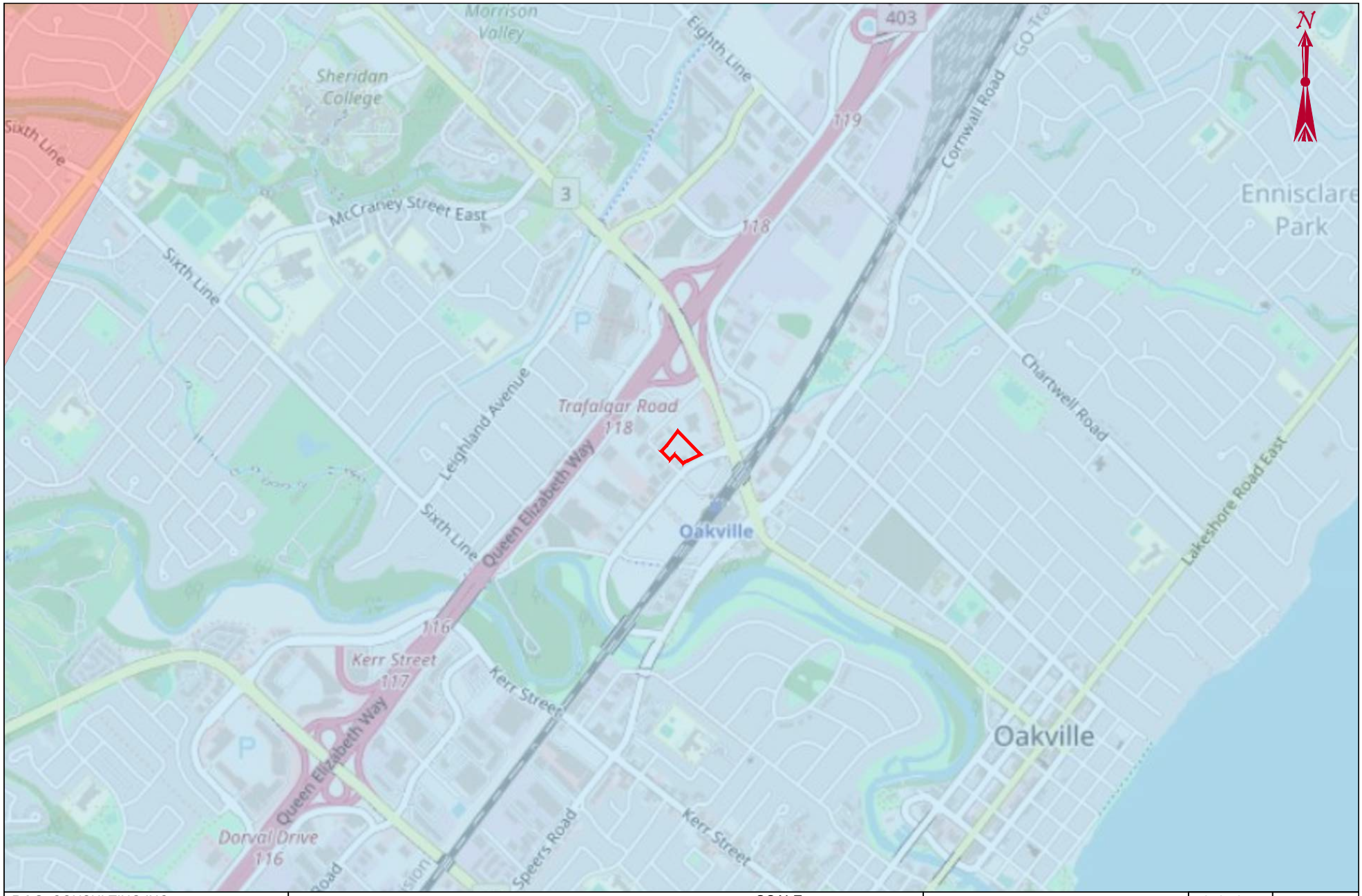
250m 0m 750m

IMAGERY OBTAINED FROM TOPORAMA, NATURAL RESOURCES CANADA, 2017

TITLE AND LOCATION

SITE LOCATION PLAN
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
217,227 CROSS AVENUE AND 571 ARGUS ROAD, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-349B	O.A.
SCALE	CK.
AS NOTED	S.L.
DATE	FIG NO.
FEBRUARY 2021	1



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LEGEND

- SITE BOUNDARY
- SOUTH SLOPE
- IROQUOIS PLAIN

SCALE

250m 0m 750m

NOTES:

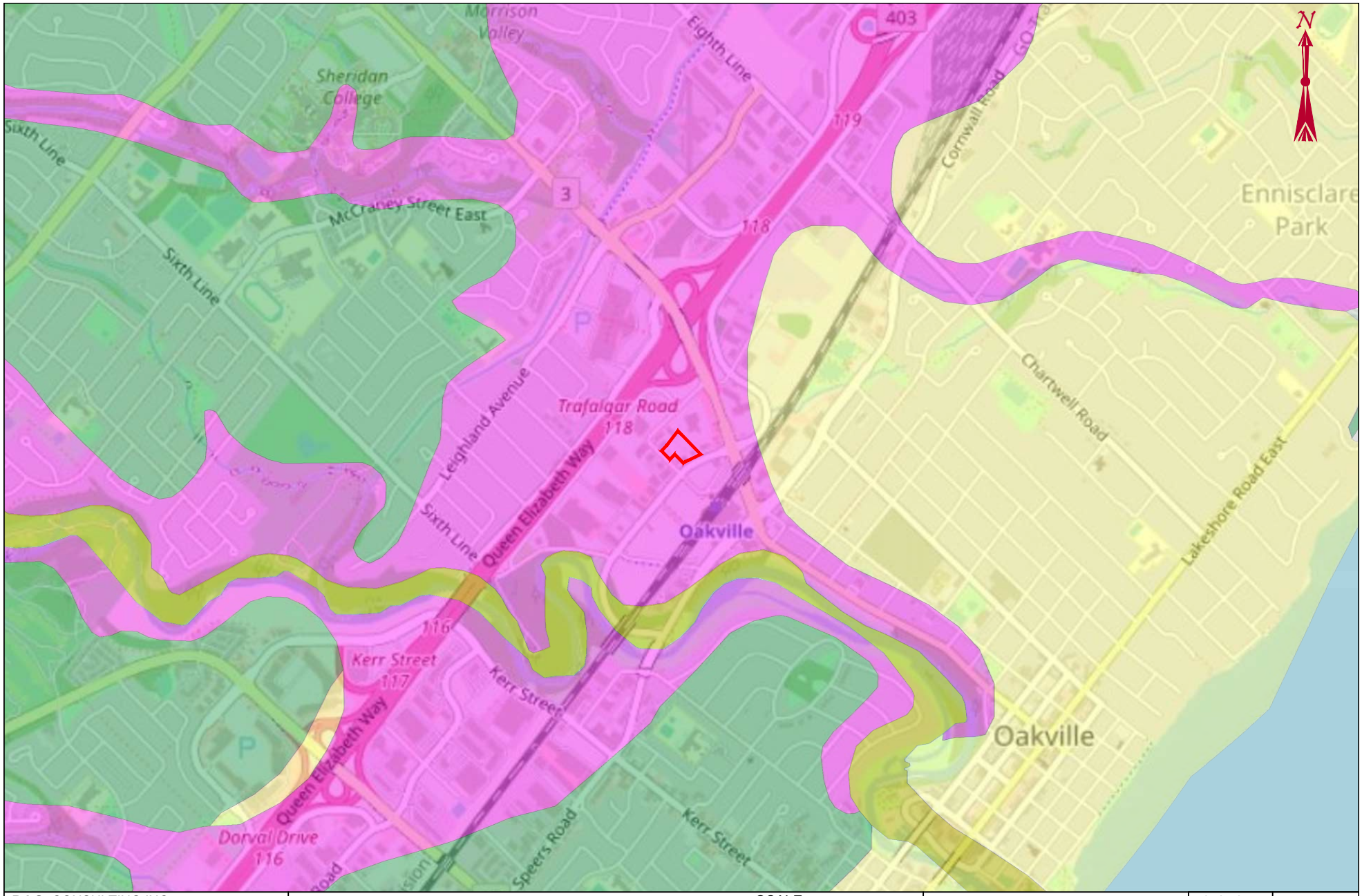
1. PHYISIOGRAPHIC REGIONS PRODUCED BY MINISTRY OF ENERGY, NORTHERN DEVELOPMENT AND MINES, 2012
2. IMAGERY OBTAINED FROM OPENSTREETMAP, 2016

TITLE AND LOCATION

PHYSIOGRAPHIC REGIONS OF SOUTHERN ONTARIO

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
217,227 CROSS AVENUE AND 571 ARGUS ROAD, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-349B	O.A.
SCALE	CK.
AS NOTED	S.L.
DATE	FIG NO.
FEBRUARY 2021	2



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LEGEND

- SITE BOUNDARY
- COARSE-TEXTURED GLACIOLACUSTRINE DEPOSITS
- TILL
- MODERN ALLUVIAL DEPOSITS
- PALEOZOIC BEDROCK

SCALE

250m 0m 750m

NOTES:

1. SURFICIAL GEOLOGY PRODUCED BY MINISTRY OF ENERGY, NORTHERN DEVELOPMENT AND MINES, 2012
2. IMAGERY OBTAINED FROM OPENSTREETMAP, 2016

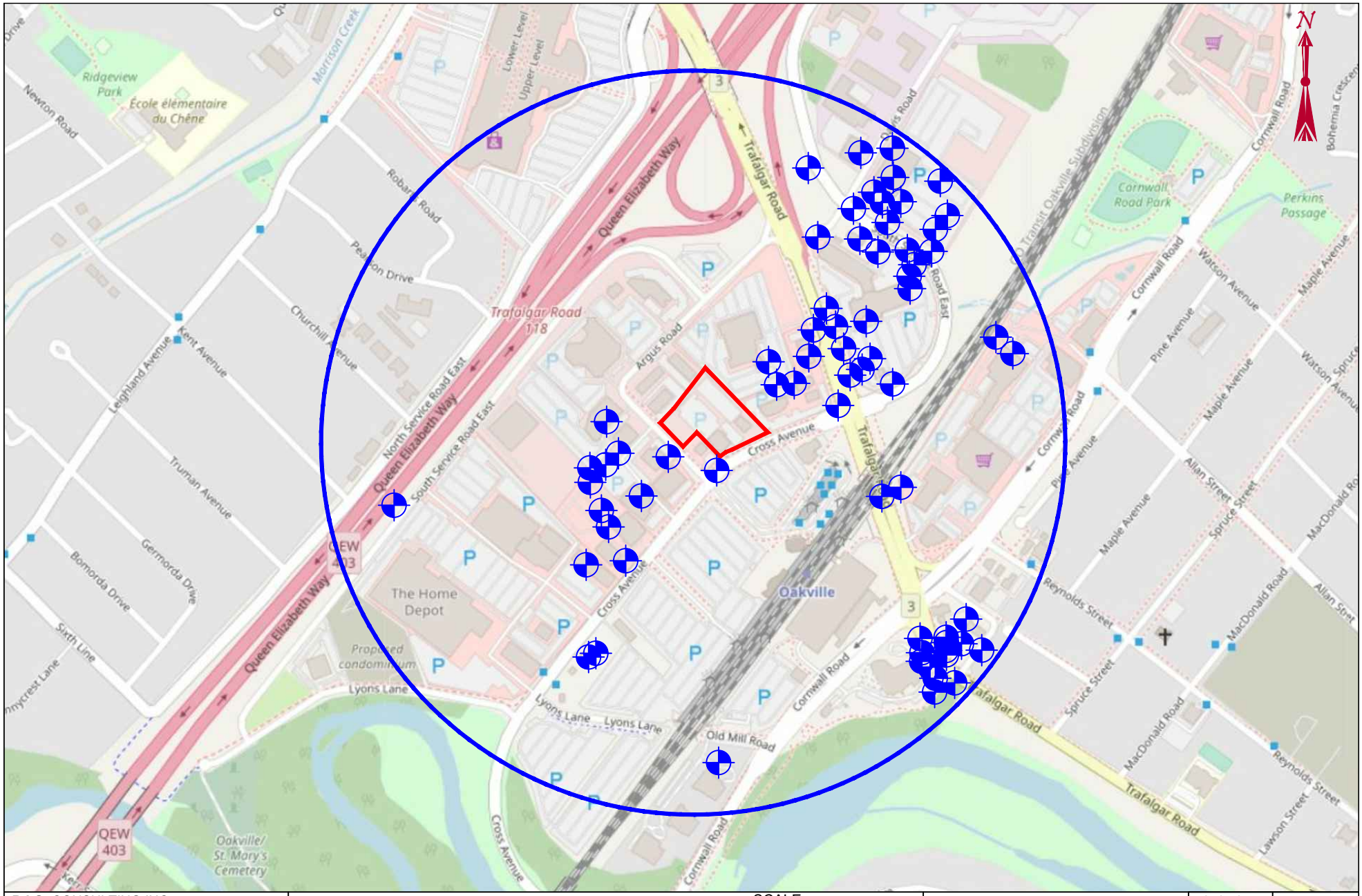
TITLE AND LOCATION

SURFICIAL GEOLOGY OF SOUTHERN ONTARIO

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

217,227 CROSS AVENUE AND 571 ARGUS ROAD, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-349B	O.A.
SCALE	CK.
AS NOTED	S.L.
DATE	FIG NO.
FEBRUARY 2021	3



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LEGEND

- SITE BOUNDARY
- WELL RECORD STUDY AREA BOUNDARY
- WELL RECORD LOCATION (2021)

SCALE

60 30 0 60 120 180 240 300

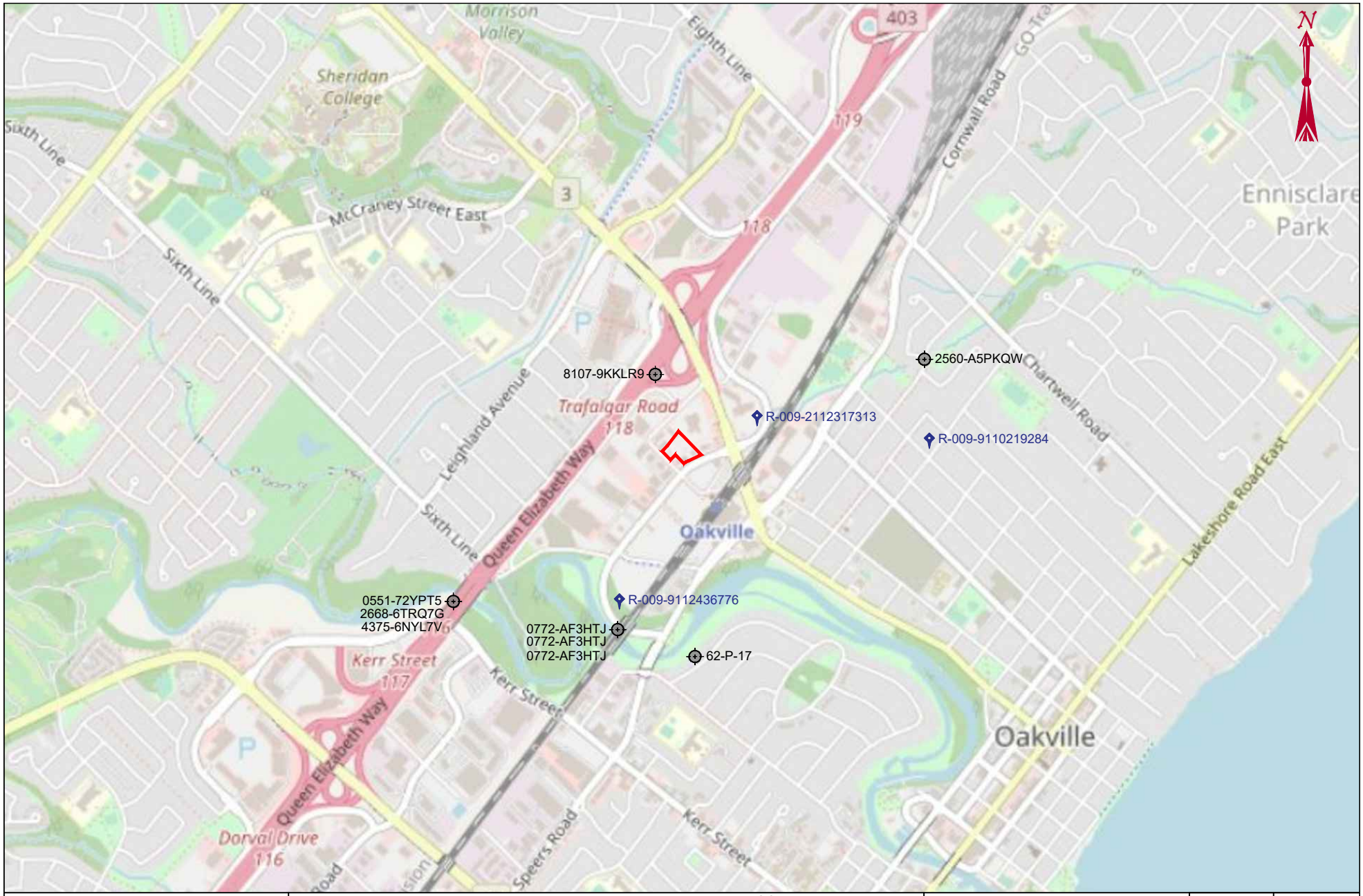
IMAGERY OBTAINED FROM OPENSTREETMAP, 2016

TITLE AND LOCATION

MECP WATER WELL RECORD LOCATIONS PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

217,227 CROSS AVENUE AND 571 ARGUS ROAD, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-349B	O.A.
SCALE	CK.
AS NOTED	S.L.
DATE	FIG NO.
FEBRUARY 2021	4



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LEGEND

- SITE BOUNDARY
- LOCATION OF PTTW RECORD
- LOCATION OF EASR RECORD

SCALE

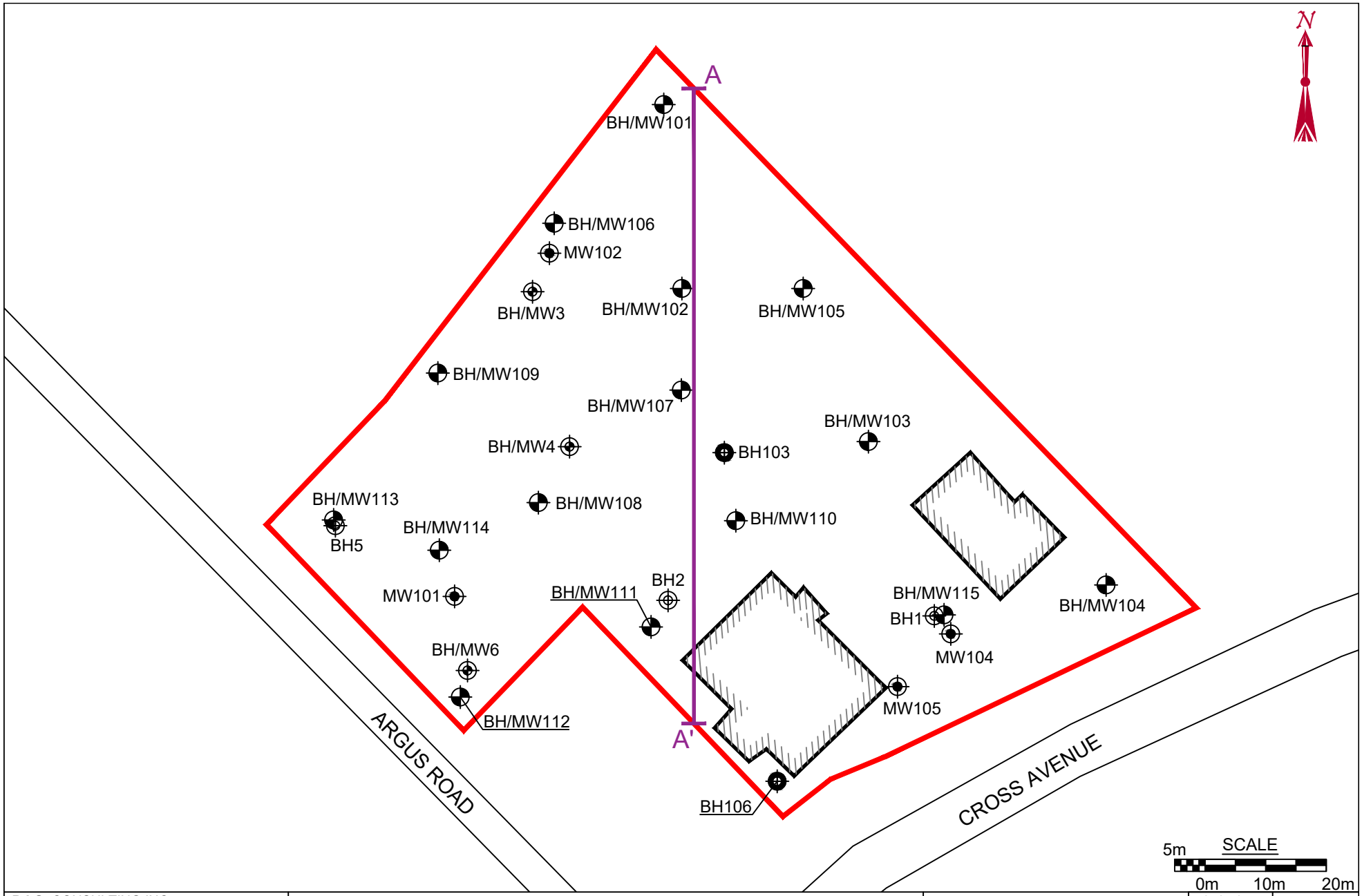
250m 0m 750m

IMAGERY OBTAINED FROM OPENSTREETMAP, 2016

TITLE AND LOCATION

PTTW AND EASR RECORD LOCATIONS
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
217,227 CROSS AVENUE AND 571 ARGUS ROAD, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-349B	O.A.
SCALE	CK.
AS NOTED	S.L.
DATE	FIG NO.
FEBRUARY 2021	5



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LEGEND

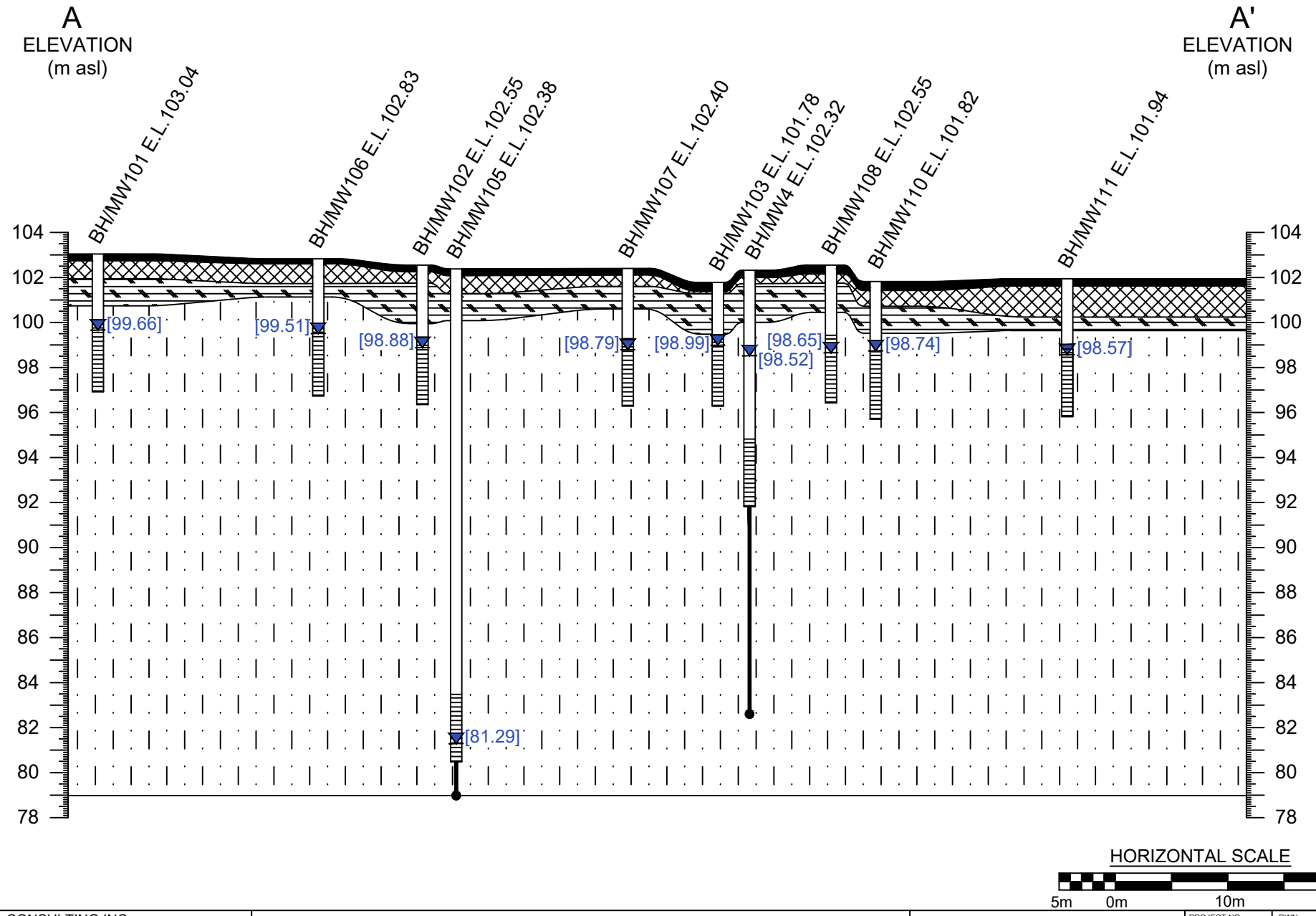
- SITE BOUNDARY
- APPROXIMATE BUILDING FOOTPRINT
- BOREHOLE/MONITORING WELL LOCATION (BIG 2021)
- BOREHOLE/PIEZOMETER LOCATION (BIG 2019)
- BOREHOLE LOCATION (BIG 2019)
- BOREHOLE/MONITORING LOCATION (TERRAPEX)
- BOREHOLE LOCATION (TERRAPEX)
- A A' GEOLOGICAL CROSS SECTION (SEE FIGURE 7)

TITLE AND LOCATION

BOREHOLE/MONITORING WELL LOCATION PLAN PRELIMINARY HYDROGEOLOGICAL INVESTIGATION

217,227 CROSS AVENUE AND 571 ARGUS ROAD, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-349B	O.A.
SCALE	CK.
AS NOTED	S.L.
DATE	FIG NO.
FEBRUARY 2021	6



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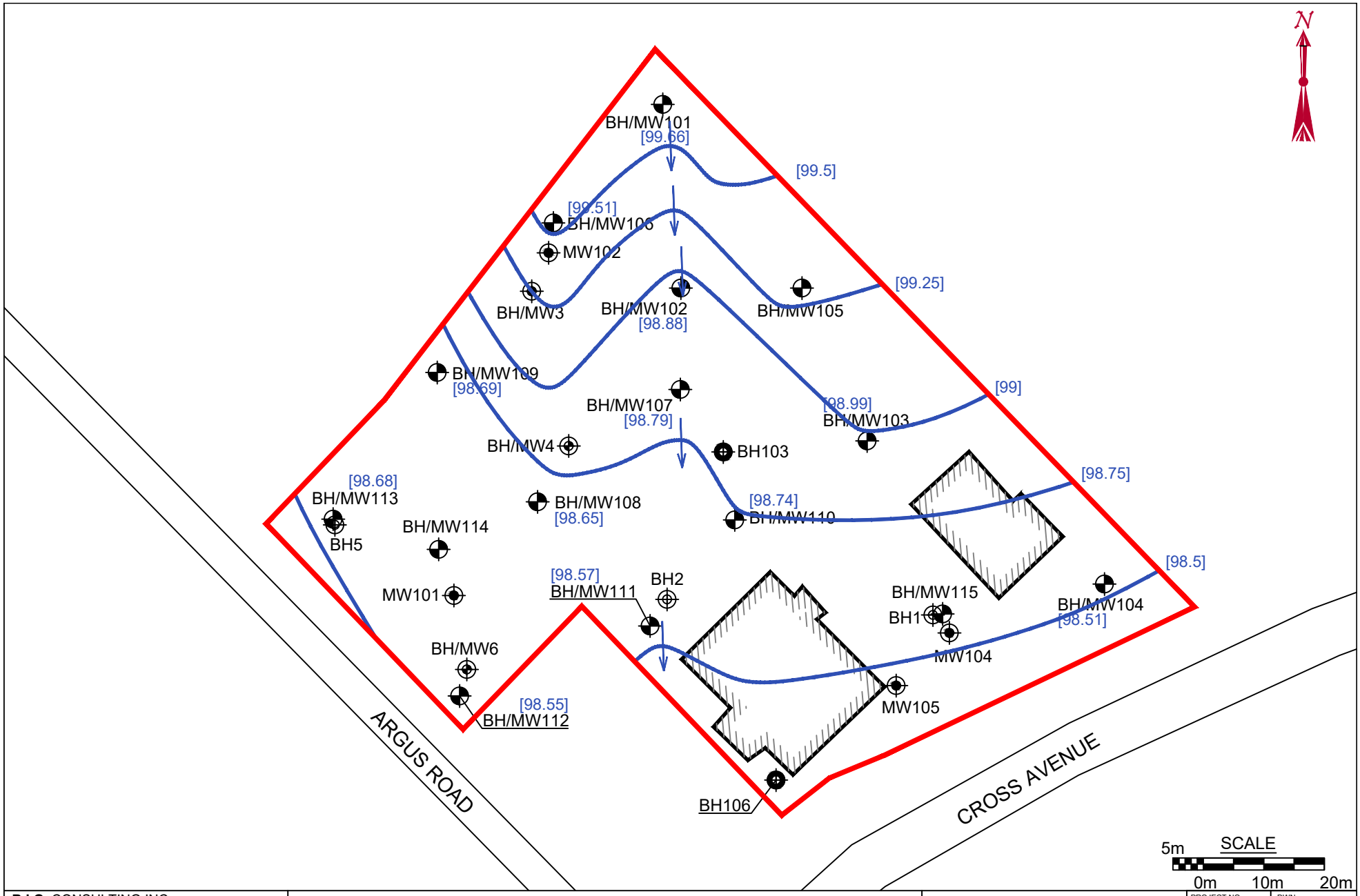
LEGEND

- ASPHALT / GRANULAR
- FILL
- CLAYEY SILT TILL
- SHALE BEDROCK
- WATER LEVEL
- [xx.xx] WATER LEVEL MEASUREMENT (FEBRUARY 08, 2021)

TITLE AND LOCATION

GEOLOGICAL CROSS SECTION A-A'
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
217,227 CROSS AVENUE AND 571 ARGUS ROAD, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-349B	O.A.
SCALE	CK.
AS NOTED	S.L.
DATE	FIG NO.
FEBRUARY 2021	7



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LEGEND

- SITE BOUNDARY
- APPROXIMATE BUILDING FOOTPRINT
- BOREHOLE/MONITORING WELL LOCATION (BIG 2021)
- BOREHOLE/PIEZOMETER LOCATION (BIG 2019)
- BOREHOLE LOCATION (BIG 2019)
- BOREHOLE/MONITORING LOCATION (TERRAPEX)
- BOREHOLE LOCATION (TERRAPEX)
- [XX.XX] WATER LEVEL MEASUREMENT (FEBRUARY 08,2021)
- GROUNDWATER CONTOUR
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

TITLE AND LOCATION

GROUNDWATER CONTOUR MAP
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
217,227 CROSS AVENUE AND 571 ARGUS ROAD, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-ENV-349B	O.A.
SCALE	CK.
AS NOTED	S.L.
DATE	FIG NO.
FEBRUARY 2021	8

APPENDIX A: BOREHOLE LOGS

RECORD OF BOREHOLE No. BH/MW101

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augering	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	13 Jan 21	Date Completed: 13 Jan 21	Revision No.: 1, 9/2/21

Lithology Plot	DESCRIPTION (Geodetic Ground Surface Elevation: 103.04 m)		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT: 100 mm asphalt concrete over 200 mm granular base	102.74										
	FILL: clayey silt, trace sand, trace gravel, mottled, grey, moist, very stiff to hard	0.3	SS	1	41	22						SS1 sampled for Metals and Inorganics and PAHs on January 13, 2021
		101.97	SS	2	100	60	1	102				SS2 sampled for VOCs and PHCs on January 13, 2021
	CLAYEY SILT TILL: trace sand, trace gravel, fragments of Shale, grey, moist, hard	1.1	SS	3	93	71	2	101				
		100.75										
	BEDROCK: Shale, highly weathered, occasional limestone seams, grey, damp, hard	2.3	SS	4	53	50/15						
			SS	5	63	50/8	3	100				
	-first water strike											Groundwater sampled for PHCs, VOCs, Metals and Inorganics on February 3, 2021
			SS	6	100	50/3	4	99				
							5	98				
		96.92	SS	7	100	50/3	6	97				
	End of Borehole	6.1										

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 5.18 m bgs measured upon completion of drilling.
3. Groundwater level reading at 3.38 m bgs on February 8, 2021.

FIELD TESTING: Penetration Testing (○ SPT ● DCPT); MTO Vane* (△ Intact ▲ Remould); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80

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▽ Groundwater depth on completion of drilling: 5.18 m.

▼ Groundwater depth observed on 08/02/2021 at a depth of: 3.38 m.

RECORD OF BOREHOLE No. BH/MW102

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augering	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	13 Jan 21	Date Completed: 13 Jan 21	Revision No.: 1, 9/2/21

Lithology Plot	DESCRIPTION (Geodetic Ground Surface Elevation: 102.55 m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (SPT / DCPT), MTO Vane* (Intact / Remould), Nilcon Vane* (Intact / Remould), * Undrained Shear Strength (kPa)	LAB TESTING: Rinse pH Values, Soil Vapour Reading (parts per million (ppm)), Lower Explosive Limit (LEL), Plastic / Liquid	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT: 100 mm asphalt concrete over 200 mm granular base 102.25	SS	1	90	50/15	0	102	50 / 15	19		SS1 sampled for Metals and Inorganics and PAHs on January 13, 2021
	FILL: sandy silt, some clay, mottled, brown/grey, very moist, compact 101.79	0.3									
	CLAYEY SILT TILL: trace sand, trace sand, trace gravel, fragments of Shale, grey, moist, very stiff to hard - sand seam, 100 mm thick	0.8	SS	2	46	24	1		16		SS2 sampled for VOCs and PHCs on January 13, 2021
			SS	3	90	50/15	101	50 / 15	13		
			SS	4	100	50/13	2	50 / 13	7		
	99.96						100				
	BEDROCK: Shale, highly weathered, occasional limestone fragments, grey, damp, hard	2.6	SS	5	100	50/3	3	50 / 3	6		
	-first water strike		SS	6	63	50/8	98	50 / 8	6		
	96.40		SS	7	60	50/5	6	50 / 5	6		
	End of Borehole	6.2									

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 5.18 m bgs measured upon completion of drilling.
3. Groundwater level reading at 3.67 m bgs on February 8, 2021.

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▽ Groundwater depth on completion of drilling: 5.18 m.

▼ Groundwater depth observed on 08/02/2021 at a depth of: 3.67 m.

RECORD OF BOREHOLE No. BH/MW103

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augering	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	13 Jan 21	Date Completed: 13 Jan 21	Revision No.: 1, 9/2/21

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 101.78 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	Penetration Testing: SPT, DCPT; MTO Vane* Intact/Remould; Nilcon Vane* Intact/Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading parts per million (ppm) 100 200 300 400; Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT: 100 mm asphalt concrete over 300 mm granular bases 101.38	SS	1	51	13			13			SS1 sampled for Metals and Inorganics and PAHs on January 13, 2021
	FILL: sand and gravel, brown, moist, compact 101.32 0.5 **CLAYEY SILT TILL:** some sand, trace gravel, fragments of Shale, reddish brown, moist, very stiff to hard	SS	2	84	26	1	101	15			
		SS	3	93	70	2	100	11			
	99.49										
	BEDROCK: Shale, highly weathered, occasional limestone fragments, grey, damp, hard 2.3	SS	4	87	50/15			50/15	6		
		SS	5	100	50/5	3	99	50/5	2		
						4	98				Groundwater sampled for Na/Cl on February 3, 2021
		SS	6	60	50/5		97	50/5	4		
	96.29					5					
	Borehole terminated at 5.49 m due to auger refussal on inferred Limestone bedrock 5.5										

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 4.57 m bgs measured upon completion of drilling.
3. Groundwater level reading at 2.79 m bgs on February 8, 2021.

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Groundwater depth on completion of drilling: 4.57 m.

Groundwater depth observed on 08/02/2021 at a depth of: 2.79 m.

Scale: 1 : 47

RECORD OF BOREHOLE No. BH/MW104

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augering	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	13 Jan 21	Date Completed: 13 Jan 21	Revision No.: 1, 9/2/21

LITHOLOGY PROFILE — SOIL SAMPLING — FIELD TESTING — LAB TESTING — INSTRUMENTATION INSTALLATION — COMMENTS

Field Testing: PenetrationTesting: ○ SPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: ★ Rinse pH Values 2 4 6 8 10 12; △ Soil Vapour Reading parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL); W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 100.96 m

DESCRIPTION	Elevation / Depth (m)
ASPHALT: 100 mm asphalt concrete over 200 mm granular bases	100.66 / 0.3
FILL: sand and gravel, brown, moist, compact ------- sandy silt, some clay, trace gravel	99.59 / 1.4
CLAYEY SILT TILL: some sand, trace gravel, fragments of Shale, brown, moist, hard	98.67 / 2.3
BEDROCK: Shale, highly weathered, occasional Limestone fragments, grey, moist, hard	94.84 / 6.1
End of Borehole	

Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Lab value (plotted)
SS	1	62	23	4
SS	2	62	13	12
SS	3	95	42	13
SS	4	63	50/8	7
SS	5	100	50/3	6
SS	6	100	50/5	7
SS	7	100	50/3	8

DEPTH (m): 1, 2, 3, 4, 5, 6 — ELEVATION (m): 100, 99, 98, 97, 96, 95

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 4.88 m bgs measured upon completion of drilling.
3. Groundwater level reading at 2.45 m bgs on February 8, 2021.

COMMENTS:

SS1 sampled for Metals and Inorganics and PAHs on January 13, 2021

Groundwater sampled for PHCs, VOCs and PAHs on February 3, 2021

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▽ Groundwater depth on completion of drilling: 4.88 m.

▼ Groundwater depth observed on 08/02/2021 at a depth of: 2.45 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

Scale: 1 : 47

RECORD OF BOREHOLE No. BH/MW105

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Hollow Stem Augering + Rock Coring	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	14 Jan 21 — Date Completed: 15 Jan 21	Revision No.:	1, 9/2/21

Legend: LITHOLOGY PROFILE; SOIL SAMPLING; FIELD TESTING (Penetration Testing: ○ SPT, ● DCPT; MTO Vane*: △ Intact, ▲ Remould; Nilcon Vane*: ◇ Intact, ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80); LAB TESTING (★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL); W_P W W_L Plastic Liquid 20 40 60 80); INSTRUMENTATION INSTALLATION; COMMENTS

Geodetic Ground Surface Elevation: 102.38 m

Elev. / Depth (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Penetration Testing	Lab Testing	Comments
102.08 / 0.3	**ASPHALT:** 100 mm asphalt concrete over 200 mm granular base							
101.31 / 1.1	**FILL:** clayey silt, trace to some sand and gravel, brown/grey, moist, hard to very stiff	SS	1	62	37	○	6	SS1 sampled for Metals and Inorganics and PAHs on January 14, 2021
		SS	2	70	23	○	14	
100.09 / 2.3	**CLAYEY SILT TILL:** trace sand, trace gravel, fragments of Shale, grey, moist, very stiff to hard	SS	3	84	55	○	9	SS3 sampled for VOCs and PHCs on January 14, 2021
	BEDROCK: Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist	SS	4	100	50/8	50/8	7	
		SS	5	100	50/5	50/5	7	
	-first water strike	SS	6	100	50/5	50/5	18	
		SS	7	100	50/5	50/5	16	
		SS	8	100	50/5	50/5	16	
	ROCK CORE BEGINS - Poor Quality	RC	1	78	27	○		

Depth scale (m): 1, 2, 3, 4, 5, 6, 7, 8, 9. Elevation scale (m): 102, 101, 100, 99, 98, 97, 96, 95, 94.

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Groundwater depth on completion of drilling: NOT MEASURED DUE TO DRILLING WATER m.

Groundwater depth observed on 08/02/2021 at a depth of: 21.09 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

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RECORD OF BOREHOLE No. BH/MW105

Project Number: **BIGC-ENV-349B** Drilling Location: **See BH Location Plan** Logged by: **TVH**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	- Good Quality **BEDROCK:** Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist	RC	2	100	81		93				
	- Good Quality	RC	3	99	82	10	92	○			
	- Excellent Quality	RC	4	99	91	11	91	○			
	- Excellent Quality	RC	5	99	97	12	90	○			
	- Excellent Quality	RC	6	99	96	13	89	○			
	- Excellent Quality	RC	7	99	95	14	88	○			
	- Excellent Quality	RC	8	97	98	15	87	○			
						16	86				
						17	85				
						18	84				
						19					

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RECORD OF BOREHOLE No. BH/MW105

Project Number: **BIGC-ENV-349B** Drilling Location: **See BH Location Plan** Logged by: **TVH**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist										
	- Good Quality	RC	9	98	83	20	83				
	- Excellent Quality	RC	10	99	93	21	82				
	- Excellent Quality	RC	11	99	92	22	81				
	78.96					23	80				
	Borehole terminated at 23.42 23.4						79				

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level not measured upon completion of drilling due to introduced drilling water.
3. Groundwater level reading at 21.09 m bgs on February 8, 2021.

FIELD TESTING: Penetration Testing — ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80

Scale: 1 : 47

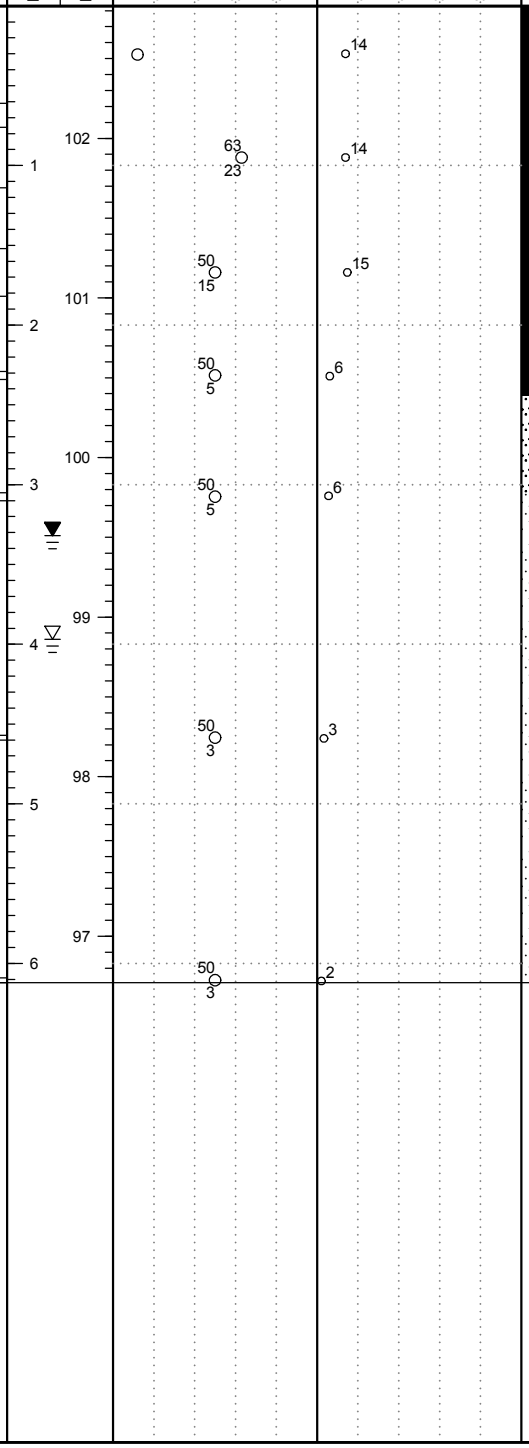
RECORD OF BOREHOLE No. BH/MW106

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	20 Jan 21	Date Completed: 20 Jan 21	Revision No.: 1, 9/2/21

Geodetic Ground Surface Elevation: 102.83 m

Depth (m)	Description	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%
	ASPHALT: 75 mm asphalt concrete over 150 mm granular base	102.61				
	FILL: clayey silt, trace sand, trace gravel, rootlets, mottled, brown, moist, stiff to hard	0.2	SS	1	92	12
		101.77	SS	2	95	63/23
	CLAYEY SILT TILL: trace sand, trace gravel, fragments of Shale, brown, moist, hard	1.1				
		101.15	SS	3	93	50/15
	BEDROCK: Shale, highly weathered, occasional Limestone fragments, grey, damp, hard	1.7	SS	4	100	50/5
			SS	5	100	50/5
	-first water strike					
			SS	6	100	50/3
		96.71	SS	7	100	50/3
	End of Borehole	6.1				

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 4.88 m bgs measured upon completion of drilling.
3. Groundwater level reading at 3.32 m bgs on February 8, 2021.



SS1 sampled for VOCs and PHCs on January 20, 2021

SS2 sampled for Metals and Inorganics and PAHs on January 20, 2021

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Groundwater depth on completion of drilling: 3.96 m.

Groundwater depth observed on 08/02/2021 at a depth of: 3.32 m.

Scale: 1 : 47

RECORD OF BOREHOLE No. BH/MW107

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	20 Jan 21	Date Completed: 20 Jan 21	Revision No.: 1, 9/2/21

Lithology Plot	DESCRIPTION (Geodetic Ground Surface Elevation: 102.40 m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (SPT / DCPT), MTO Vane* (Intact / Remould), Nilcon Vane* (Intact / Remould), * Undrained Shear Strength (kPa)	LAB TESTING: Rinse pH Values, Soil Vapour Reading (parts per million (ppm)), Lower Explosive Limit (LEL), Plastic / Liquid	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT: 120 mm asphalt concrete over 170 mm granular base (102.11)										
	FILL: clayey silt, trace gravel, rootlets, mottled, brown, moist, stiff (0.3; 101.64)	SS	1	59	12		102		16		SS1 sampled for Metals and Inorganics and PAHs on January 20, 2021
	CLAYEY SILT TILL: trace sand, trace gravel, oxidized fissures, mottled, brownish grey, moist, very stiff to hard (0.8; 100.57)	SS	2	92	28	1	101		12		
	BEDROCK: Shale, highly weathered, occasional Limestone fragments, grey, damp to moist, hard (1.8)	SS	3	70	51	2			11		
		SS	4	100	50/5		100	50/5	8		
		SS	5	60	50/5	3		50/5	6		
	-first water strike						99				
						4					Groundwater sampled for Na/Cl on February 3, 2021
		SS	6	100	50/5		98	50/5	23		
						5					
							97				
		SS	7	100	50/3	6		50/3	23		
	End of Borehole (96.28; 6.1)										

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 3.66 m bgs measured upon completion of drilling.
3. Groundwater level reading at 3.61 m bgs on February 8, 2021.

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Groundwater depth on completion of drilling: 3.66 m.

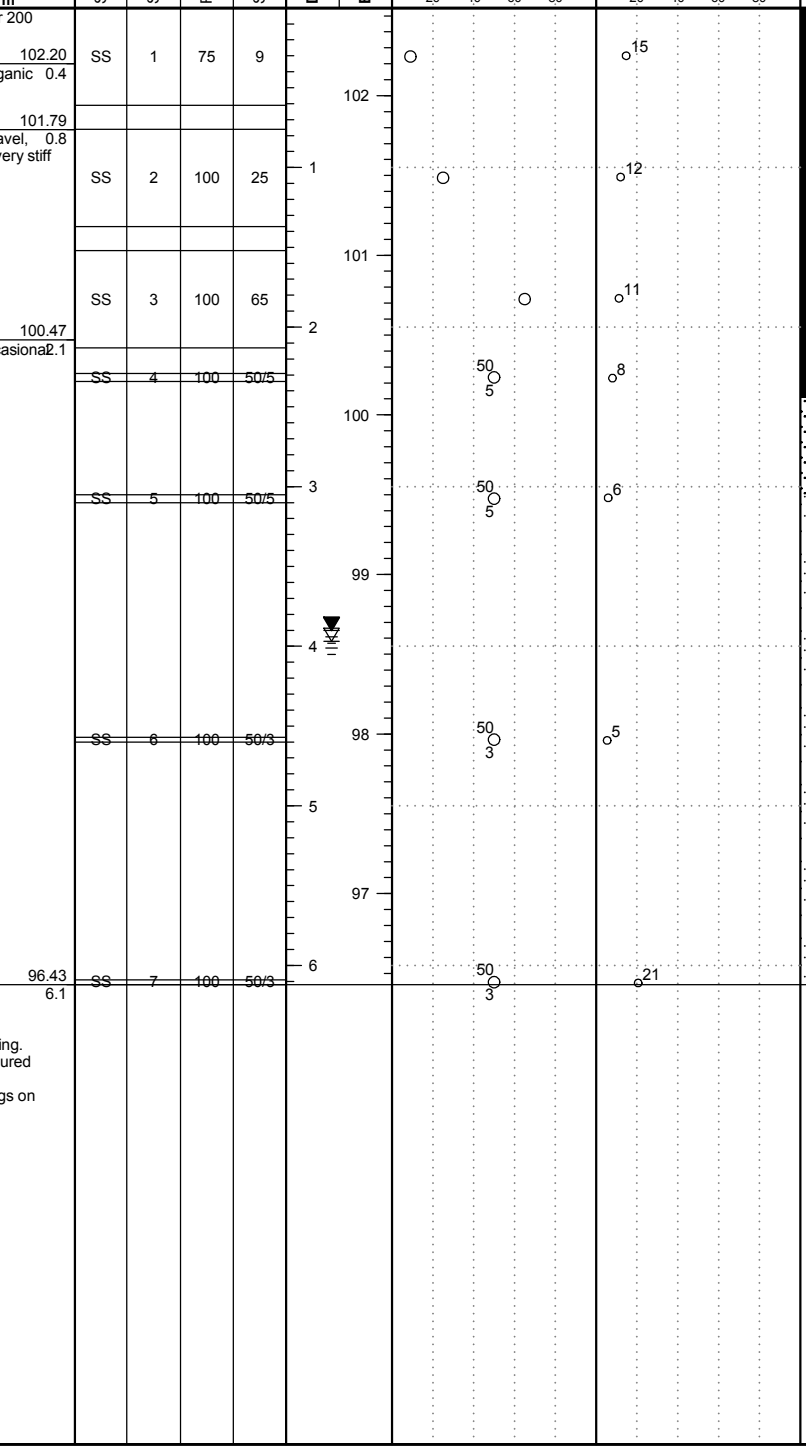
Groundwater depth observed on 08/02/2021 at a depth of: 3.61 m.

RECORD OF BOREHOLE No. BH/MW108

Project Number:	**BIGC-ENV-349B**	Drilling Location:	**See BH Location Plan**	Logged by:	**TVH**
Project Client:	**Distrikt Capital**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**TVH**
Project Name:	**Geotechnical Investigation**	Drilling Machine:	**Truck Mounted Drill Rig**	Reviewed by:	**SS**
Project Location:	**217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON**	Date Started:	**20 Jan 21** Date Completed: **20 Jan 21**	Revision No.:	**1, 9/2/21**

Lithology Plot	DESCRIPTION (Geodetic Ground Surface Elevation: 102.55 m)	Elev.	Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	COMMENTS
	ASPHALT: 150 mm asphalt concrete over 200 mm granular base	102.20		SS	1	75	9	
	FILL: clayey silt, trace gravel, rootlets, organic staining, mottled, brown, moist, stiff	101.79	0.4					SS1 sampled for Metals and Inorganics and PAHs on January 20, 2021
	CLAYEY SILT TILL: trace sand, trace gravel, oxidized fissures, mottled, brown, moist, very stiff to hard	100.47	0.8	SS	2	100	25	
				SS	3	100	65	
	BEDROCK: Shale, highly weathered, occasional Limestone fragments, grey, moist		2.1	SS	4	100	50/5	
				SS	5	100	50/5	
	-first water strike							Groundwater sampled for Metals and Inorganics on February 3, 2021
				SS	6	100	50/3	
		96.43		SS	7	100	50/3	
	End of Borehole		6.1					

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 3.96 m bgs measured upon completion of drilling.
3. Groundwater level reading at 3.90 m bgs on February 8, 2021.



INSTRUMENTATION INSTALLATION

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Groundwater depth on completion of drilling: 3.96 m.

Groundwater depth observed on 08/02/2021 at a depth of: 3.90 m.

Scale: 1 : 47

RECORD OF BOREHOLE No. BH/MW109

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	20 Jan 21	Date Completed: 20 Jan 21	Revision No.: 1, 9/2/21

Geodetic Ground Surface Elevation: 102.89 m

Depth (m)	Description	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%
	ASPHALT: 140 mm asphalt concrete over 160 mm granular base	102.59				
	FILL: clayey silt, trace gravel, rootlets, mottled brown, moist, stiff	102.43 / 0.5	SS	1	92	13
	CLAYEY SILT TILL: trace sand, trace gravel, fragments of Shale, oxidized fissures, mottled, brownish grey, moist, hard		SS	2	100	33
		101.06	SS	3	83	76/20
	BEDROCK: Shale, highly weathered, occasional Limestone fragments, grey, moist to damp, hard	1.8	SS	4	100	50/5
			SS	5	100	50/3
	-first water strike		SS	6	100	50/5
		96.77	SS	7	100	50/3
	End of Borehole	6.1				

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 5.18 m bgs measured upon completion of drilling.
3. Groundwater level reading at 4.20 m bgs on February 8, 2021.

FIELD TESTING: Penetration Testing (SPT, DCPT); MTO Vane* (Intact, Remould); Nilcon Vane* (Intact, Remould); * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading, parts per million (ppm) 100 200 300 400; Lower Explosive Limit (LEL); W_P W W_L; Plastic Liquid; 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS: SS1 sampled for Metals and Inorganics and PAHs on January 20, 2021

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Groundwater depth on completion of drilling: 5.18 m.

Groundwater depth observed on 08/02/2021 at a depth of: 4.20 m.

RECORD OF BOREHOLE No. BH/MW110

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	21 Jan 21	Date Completed: 21 Jan 21	Revision No.: 1, 9/2/21

Geodetic Ground Surface Elevation: 101.82 m

Depth (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Elevation (m)
0	**ASPHALT:** 120 mm asphalt concrete over 300 mm granular base	SS	1	79	21	101.40
0.4	**FILL:** sandy silt, some gravel, occasional glass fragments, rootlets, brown, moist, compact	SS	2	95	12	100.75
1.1	**CLAYEY SILT TILL:** trace sand, trace gravel, fragments of Shale, oxidized fissures, mottled, brownish grey, moist, stiff to hard	SS	3	100	37	99.53
2.3	**BEDROCK:** Shale, highly weathered, occasional Limestone fragments, grey, damp, hard	SS	4	100	50/5	
		SS	5	100	50/5	
	-first water strike	SS	6	60	50/5	
6.1		SS	7	100	50/3	95.70
	End of Borehole					

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 3.96 m bgs measured upon completion of drilling.
3. Groundwater level reading at 3.08 m bgs on February 8, 2021.

SS1 sampled for Metals and Inorganics and PAHs on January 21, 2021

SS2 sampled for VOCs and PHCs on January 21, 2021

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Groundwater depth on completion of drilling: 3.96 m.

Groundwater depth observed on 08/02/2021 at a depth of: 3.08 m.

RECORD OF BOREHOLE No. BH/MW111

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	21 Jan 21	Date Completed: 21 Jan 21	Revision No.: 1, 9/2/21

Lithology Plot	DESCRIPTION (Geodetic Ground Surface Elevation: 101.94 m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (SPT / DCPT); MTO Vane* (Intact / Remould); Nilcon Vane* (Intact / Remould); * Undrained Shear Strength (kPa)	LAB TESTING: Rinse pH Values; Soil Vapour Reading (parts per million (ppm)); Lower Explosive Limit (LEL); W_P Plastic; W; W_L Liquid	INSTRUMENTATION INSTALLATION	COMMENTS
	ASPHALT: 75 mm asphalt concrete over 250 mm granular base (101.71)										
	FILL: sandy silt, trace gravel, rootlets, organic staining, brown, moist, compact (0.2)	SS	1	95	15						SS1 sampled for Metals and Inorganics and PAHs on January 21, 2021
	clayey silt, firm	SS	2	100	8	1	101				
	(100.26)										
	CLAYEY SILT TILL: trace sand, trace gravel, fragments of Shale, oxidized fissures, mottled, grey, moist, hard (1.7)	SS	3	100	34	2	100				
	(99.65)										
	BEDROCK: Shale, highly weathered, occasional Limestone fragments, grey, moist (2.3)	SS	4	63	50/8						
		SS	5	100	50/5	3	99				
	-first water strike					4	98				Groundwater sampled for PAHs on February 3, 2021
		SS	6	60	50/5	5	97				
	(95.82)	SS	7	100	50/3	6	96				
	End of Borehole (6.1)										

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 3.96 m bgs measured upon completion of drilling.
3. Groundwater level reading at 3.37 m bgs on February 8, 2021.

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Groundwater depth on completion of drilling: 3.96 m.

Groundwater depth observed on 08/02/2021 at a depth of: 3.37 m.

RECORD OF BOREHOLE No. BH/MW112

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	21 Jan 21	Date Completed: 21 Jan 21	Revision No.: 1, 9/2/21

Lithology Plot	DESCRIPTION (Geodetic Ground Surface Elevation: 102.78 m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (SPT / DCPT), MTO Vane* (Intact / Remould), Nilcon Vane* (Intact / Remould), * Undrained Shear Strength (kPa)	LAB TESTING: Rinse pH Values, Soil Vapour Reading (parts per million (ppm)), Lower Explosive Limit (LEL), Plastic / Liquid	INSTRUMENTATION INSTALLATION	COMMENTS
	TOPSOIL: 150 mm — 102.63										
	FILL: clayey silt, trace gravel, rootlets, brown, moist, stiff — 0.2	SS	1	59	9						SS1 sampled for Metals and Inorganics and PAHs on January 21, 2021
	grey — 101.71	SS	2	100	21	1	102				SS2 sampled for VOCs and PHCs on January 21, 2021
	CLAYEY SILT TILL: trace sand, trace gravel, fragments of Shale, oxidized fissures, mottled, grey, moist, very stiffto hard — 1.1	SS	3	95	44	2	101				
	100.18	SS	4	100	75/25						
	BEDROCK: Shale, highly weathered, occasional Limestone fragments, grey, moist, hard — 2.6	SS	5	100	50/5	3	100				
	-first water strike	SS	6	60	50/5	4	99				Groundwater sampled for PHCs, VOCs, Metals and Inorganics and PAHs on February 3, 2021 (DUP11201)
	96.66	SS	7	100	50/3	5	98				
	End of Borehole — 6.1					6	97				

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 5.18 m bgs measured upon completion of drilling.
3. Groundwater level reading at 4.23 m bgs on February 8, 2021.

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Groundwater depth on completion of drilling: 5.18 m.

Groundwater depth observed on 08/02/2021 at a depth of: 4.23 m.

RECORD OF BOREHOLE No. BH/MW113

Project Number: **BIGC-ENV-349B**	Drilling Location: **See BH Location Plan**		Logged by: **TVH**
Project Client: **Distrikt Capital**	Drilling Method: **150 mm Solid Stem Augers**		Compiled by: **TVH**
Project Name: **Geotechnical Investigation**	Drilling Machine: **Truck Mounted Drill Rig**		Reviewed by: **SS**
Project Location: **217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON**	Date Started: **21 Jan 21**	Date Completed: **21 Jan 21**	Revision No.: **1, 9/2/21**

LITHOLOGY PROFILE — Geodetic Ground Surface Elevation: 103.45 m

Description	Elevation (m)	Depth (m)
GRAVEL: 50 mm	103.40	0.1
FILL: clayey silt, trace gravel, rootlets, organic staining, brown, moist, very stiff to stiff	102.38	1.1
CLAYEY SILT TILL: trace sand, trace gravel, fragments of Shale, oxidized fissures, mottled, grey, moist, stiff to hard	100.85	2.6
BEDROCK: Shale, highly weathered, occasional Limestone fragments, grey, moist; -first water strike	97.33	6.1
End of Borehole		

SOIL SAMPLING / FIELD TESTING / LAB TESTING

Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Soil Vapour Reading (ppm)
SS	1	100	19	14
SS	2	100	13	12
SS	3	100	44	11
				13
SS	4	100	90	
SS	5	100	50/5	5
SS	6	100	50/3	7
SS	7	100	50/5	21

Field testing legend: Penetration Testing: ○ SPT, ● DCPT; MTO Vane*: △ Intact, ▲ Remould; Nilcon Vane*: ◇ Intact, ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab testing legend: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL); W_P W W_L Plastic – Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

SS1 sampled for Metals and Inorganics and PAHs on January 21, 2021

SS2 sampled for VOCs and PHCs on January 21, 2021

Groundwater sampled for PAHs on February 3, 2021

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level at 5.48 m bgs measured upon completion of drilling.
3. Groundwater level reading at 4.77 m bgs on February 8, 2021.

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▽ Groundwater depth on completion of drilling: 5.48 m.

▼ Groundwater depth observed on 08/02/2021 at a depth of: 4.77 m.

Scale: 1 : 47

RECORD OF BOREHOLE No. BH/MW114

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Hollow Stem Augering + Rock Coring	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	21 Jan 21	Date Completed: 27 Jan 21	Revision No.: 1, 9/2/21

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 103.31 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	Penetration Testing: SPT ○ DCPT ●; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	TOPSOIL: 150 mm 103.16										
	FILL: clayey silt, trace gravel, mottled, grey, moist, very stiff to firm 0.2	SS	1	100	20		103	○	○ 11		SS1 sampled for Metals and Inorganics and PAHs on January 21, 2021
		SS	2	100	8	1	102	○	○ 19		SS2 sampled for Metals and Inorganics and PAHs on January 21, 2021
	101.63										
	CLAYEY SILT TILL: trace sand, trace gravel, frgments of Shalr, oxidized fissures, mottled, grey, moist, hard 1.7	SS	3	100	37	2	101	○	○ 11		
		SS	4	100	57			○	○ 11		
	100.56										
	BEDROCK: Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist to damp 2.8	SS	5	100	50/5	3	100	○ 50/5	○ 9		
	- first water strike	SS	6	60	50/5	4	99	○ 50/5	○ 7		
		SS	7	60	50/5	5	98	○ 50/5	○ 19		
	ROCK CORE BEGINS - Poor Quality	RC	1	98	35	6	97	○			
	- Poor Quality	RC	2	69	28	7	96	○			
						8	95				
						9					

Continued on Next Page

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Groundwater depth on completion of drilling: NOT MEASURED DUE TO DRILLING WATER m.

Groundwater depth observed on 08/02/2021 at a depth of: 18.88 m.

Scale: 1 : 47

RECORD OF BOREHOLE No. BH/MW114

Project Number: **BIGC-ENV-349B** Drilling Location: **See BH Location Plan** Logged by: **TVH**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist to damp					10	94				
	- Fair Quality	RC	3	98	62	11	93	○			
	- Good Quality	RC	4	100	87	12	92	○			
	- Good Quality	RC	5	100	76	13	91	○			
	- Good Quality	RC	6	100	83	14	90	○			
	- Excellent Quality	RC	7	100	98	15	89	○			
	- Good Quality	RC	8	97	89	16	88	○			
						17	87	○			
						18	86	○			
						19	85				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Notes to Record of Boreholes'.

Scale: 1 : 47

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW114

Project Number: **BIGC-ENV-349B** Drilling Location: **See BH Location Plan** Logged by: **TVH**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist to damp - Excellent Quality	RC	9	100	94	20	84 83				
	- Excellent Quality	RC	10	100	90	21	82				
	- Excellent Quality	RC	11	100	97	22 23	81				
	79.99 **Borehole terminated at 23.32** 23.3						80				

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level not measured upon completion of drilling due to introduced drilling water.
3. Groundwater level reading at 18.88 m bgs on February 8, 2021.

FIELD TESTING: Penetration Testing — ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80

Scale: 1 : 47

RECORD OF BOREHOLE No. BH/MW115

Project Number:	BIGC-ENV-349B	Drilling Location:	See BH Location Plan	Logged by:	TVH
Project Client:	Distrikt Capital	Drilling Method:	150 mm Hollow Stem Augering + Rock Coring	Compiled by:	TVH
Project Name:	Geotechnical Investigation	Drilling Machine:	Truck Mounted Drill Rig	Reviewed by:	SS
Project Location:	217 & 227 Cross Ave. and 571 Argus Rd., Oakville, ON	Date Started:	22 Jan 21	Date Completed: 26 Jan 21	Revision No.: 1, 9/2/21

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 101.72 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80		
	ASPHALT: 100 mm asphalt concrete over 300 mm granular bases 101.32	SS	1	59	16	0	101	○ 50	○ 15		SS1 sampled for Metals and Inorganics and PAHs on January 22, 2021
	FILL: clayey silt, trace gravel, rootlets, organic staining, dark brown, moist, very stiff 0.4 100.88										
	CLAYEY SILT TILL: trace sand. trace gravel, oxidized fissures, mottled, grey, moist, stiff to hard 0.8	SS	2	100	12	1		○ 50	○ 13		SS2 sampled for Metals and Inorganics and PAHs on January 22, 2021
		SS	3	84	32	2	100	○ 50	○ 12		
	99.28	SS	4	100	50/13			○ 50/13	○ 10		
	BEDROCK: Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist to damp 2.4	SS	5	100	50/5	3	99	○ 50/5	○ 6		
	- first water strike	SS	6	60	50/5	4	98	○ 50/5	○ 5		
		SS	7	60	50/5	5	97	○ 50/5	○ 5		
	ROCK CORE BEGINS - Poor Quality	RC	1	83	30	6	96				
	- Fair Quality	RC	2	98	74	7	95				
						8	94	○			
						9	93	○			

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Canada
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F: 416-551-2633

▽ Groundwater depth on completion of drilling: NOT MEASURED DUE TO DRILLING WATER m.

▼ Groundwater depth observed on 08/02/2021 at a depth of: 17.91 m.

Scale: 1 : 47

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW115

Project Number: **BIGC-ENV-349B** Drilling Location: **See BH Location Plan** Logged by: **TVH**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist to damp										
	- Fair Quality	RC	3	99	61	10	92				
	- Good Quality	RC	4	99	77	11	91				
	- Excellent Quality	RC	5	100	98	12	90				
	- Good Quality	RC	6	98	87	13	89				
	- Excellent Quality	RC	7	100	95	14	88				
	- Excellent Quality	RC	8	100	92	15	87				
						16	86				
						17	85				
						18 ▼	84				
						19	83				

FIELD TESTING: Penetration Testing — ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL) W_P W W_L Plastic Liquid 20 40 60 80

Scale: 1 : 47

Continued on Next Page

RECORD OF BOREHOLE No. BH/MW115

Project Number: **BIGC-ENV-349B** Drilling Location: **See BH Location Plan** Logged by: **TVH**

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (○ SPT ● DCPT); MTO Vane* (△ Intact ▲ Remould); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 20 40 60 80	LAB TESTING: ★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit (LEL); W_P W W_L; Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	BEDROCK: Shale, highly weathered to excellent qaulity, occasional Limestone layers, grey, moist to damp - Excellent Quality	RC	9	100	91	20	82	○			Groundwater sampled for Metals and Inorganics on February 3, 2021
	- Good Quality	RC	10	96	89	21	81	○			
	- Excellent Quality	RC	11	100	92	22	80	○			
	78.40					23	79				
	Borehole terminated at 23.32 23.3 Notes: 1. Borehole open upon completion of drilling. 2. Groundwater level not measured upon completion of drilling due to introduced drilling water. 3. Groundwater level reading at 17.91 m bgs on February 8, 2021.										

Scale: 1 : 47

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RECORD OF BOREHOLE No. BH1

METRIC 1 OF 1

PROJ. NO. BIGC-GEO-349A | LOCATION 571 Argus Road and 217 Cross Avenue, Oakville | ORIGINATED BY F.V.G

DATUM Geodetic | BOREHOLE TYPE Continous flight, 6 inches, Solid Stem Auger | COMPILED BY S.L

PROJ. NAME Geotechnical Investigation | DATE 2019.11.21 - 2019.11.21 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
101.55 0.0 101.5	**ASPHALT:** 90 mm										
0.1 101.1	**GRANULAR:** 350 mm		1	SS1	25						
0.4 100.5	**FILL:** clayey silt to silty clay, some sand, organic staining, dark brown to black, moist		2	SS2	6						
1.1 98.9	**CLAYEY SILT TILL/SILTY CLAY TILL:** brown, moist, hard - trace rootlets between 1.1 m and 1.5 m		3 4	SS3 SS4	55 80						
2.7 98.4	**SHALE:** highly weathered, grey, damp										
3.2	**Borehole terminated at 3.2 m** Notes: 1. Open and dry upon completion of drilling										

$+^3, \times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No. BH2

METRIC 1 OF 1

PROJ. NO. BIGC-GEO-349A | LOCATION 571 Argus Road and 217 Cross Avenue, Oakville | ORIGINATED BY F.V.G

DATUM Geodetic | BOREHOLE TYPE Continous flight, 6 inches, Solid Stem Auger | COMPILED BY S.L

PROJ. NAME Geotechnical Investigation | DATE 2019.11.21 - 2019.11.21 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
101.93											
101.9 / 0.0	**ASPHALT:** 75 mm										
0.1 / 101.5	**GRANULAR:** 330 mm		1	SS1	14						
0.4 / 101.0	**FILL:** clayey silt to silty clay, topsoil inclusion, some rootlets, dark brown to black, moist		2	SS2	9						
0.9 / 100.4	**SILT TO CLAYEY SILT:** trace rootlets, reddish brown, very moist, loose										
1.5 / 99.6	**CLAYEY SILT TILL/SILTY CLAY TILL:** brown, moist, hard - grey below 1.8 m		3	SS3	31						
2.3 / 98.7	**SHALE:** weathered, grey, damp		4 5	SS4 SS5	100 100						
3.2	- limestone at 3.2 m **Borehole terminated at 3.2 m** Notes: 1. Open and dry upon completion of drilling										

$+^3, \times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No. BH/MW3

METRIC 1 OF 1

PROJ. NO. BIGC-GEO-349A | LOCATION 571 Argus Road and 217 Cross Avenue, Oakville | ORIGINATED BY F.V.G

DATUM Geodetic | BOREHOLE TYPE Continous flight, 8 inches, Hollow Stem Auger | COMPILED BY S.L

PROJ. NAME Geotechnical Investigation | DATE 2019.11.21 - 2019.11.21 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
102.87											
102.8	**ASPHALT:** 65 mm										
0.1	**GRANULAR:** 330 mm		1	SS1	14						
102.5											
0.4	**FILL:** clayey silt, organic staining, dark brown, moist										
102.3											
0.6	**CLAYEY SILT TILL/SILTY CLAY TILL:** mottled brown, moist, very stiff to hard		2	SS2	60						
	- shale-till complex below 1.5 m, brownish grey, moist, hard		3	SS3	100						
101.1											
1.8	**SHALE:** weathered, grey, damp		4	SS4	100						
100.6											
2.3	**Borehole terminated at 2.3 m** Notes: 1. Open and dry upon completion of drilling 2. Water level at 1.70 m bgs (Elev. 101.17 m asl) on November 29, 2019										

$+^3, \times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No. BH/MW4

METRIC 1 OF 2

PROJ. NO. BIGC-GEO-349A | LOCATION 571 Argus Road and 217 Cross Avenue, Oakville | ORIGINATED BY F.V.G

DATUM Geodetic | BOREHOLE TYPE Continous flight, 8 inches, Hollow Stem Auger | COMPILED BY S.L

PROJ. NAME Geotechnical Investigation | DATE 2019.11.21 - 2019.11.25 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
102.32											
102.2	**ASPHALT:** 75 mm										
0.1	**GRANULAR:** 280 mm										
102.0			1	SS1	15						
0.4	**CLAYEY SILT TILL/SILTY CLAY TILL:** mottled brown, moist, very stiff to hard								○		
			2	SS2	34						
	- shale-till complex below 1.5 m, brownish grey, moist, hard		3	SS3	100				○		
100.0											
2.3	**SHALE:** weathered, grey, damp		4	SS4	100				○		
99.6											
2.7	- Run # 1: 2.7 m to 4.0 m RQD = 0 % Recovery = 54 % - highly weathered, fine-grained grey shale with limestone interbeds - limestone at 2.8 m and 3.0 m - vertical fracture at 2.9 m - mottling due to water intrusion at 3.0 m - medium to hard rock		1	CORE							
98.3											
4.0	- Run # 2: 4.0 m to 5.5 m RQD = 51 % Recovery = 98 % - highly weathered grey shale between 4.0 m and 4.9 m - limestone between 4.0 m to 4.4 m with 100 mm of interbedded shale at 4.1 m - mottling at 4.0 m - fracture filling material observed at 4.2 m - natural fractures between 4.7 m and 4.9 m		2	CORE							
96.8											
5.5	- unweathered grey shale between 4.9 m and 5.5 m - Run # 3: 5.5 m to 7 m RQD = 65 % Recovery = 100 % - grey shale, fine-grained, medium to hard - slightly weathered to unweathered sections between 5.5 m and 5.6 m, between 5.6 m and 6.2 m, and between 6.4 m and 7.0 m - highly weathered section between 5.6 m and 5.7 m		3	CORE							
95.3											
7.0	- completely weathered with major fractures between 5.7 m and 5.9 m, filled with grey clayey silt till - major fractures filled with grey clayey silt till between 6.3 m and 6.4 m - 50 mm of fracture filling clayey silt till observed at 6.7 m - Run # 4: 7 m and 8.5 m RQD = 72 % Recovery = 98 % - slightly weathered grey shale with 25 mm of limestone interbeds at 7.3 m, very fine-grained, hard		4	CORE							
93.8											
8.5	- clean vertical fracture at 7.3 m - rough fractures with fracture filling material between 7.4 m and 7.5 m and between 7.8 m and 7.9 m - red staining/banding between 7.5 m and 7.7 m		5	CORE							

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No. BH/MW4

METRIC 2 OF 2

PROJ. NO. BIGC-GEO-349A | LOCATION 571 Argus Road and 217 Cross Avenue, Oakville | ORIGINATED BY F.V.G

DATUM Geodetic | BOREHOLE TYPE Continous flight, 8 inches, Hollow Stem Auger | COMPILED BY S.L

PROJ. NAME Geotechnical Investigation | DATE 2019.11.21 - 2019.11.25 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (20 40 60 80 100): ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
92.2											
10.1	- Run # 5: 8.5 m and 10.1 m RQD = 70 % Recovery = 98 % - grey shale with limestone interbeds, very fine-grained, very hard rock - vertical fracture at 9.0 m - wide fracture filled with fracture filling material at 9.1 m - mottling between 9.1 m and 9.5 m - more than twelve (12+) horizontal mechanical fractures *(continued)*		6	CORE							
90.7	- Run # 6: 10.1 m and 11.6 m RQD = 80 % Recovery = 100 %										
11.6	- slightly weathered to unweathered grey shale with limestone interbeds, very hard rock - vertical fractures at 10.1 m and 11.5 m - very wide fracture filled with dark grey and very moist shale-till complex at 10.6 m - mottled and blotched discolourations of light to dark grey		7	CORE							
89.2	- Run # 7: 11.6 m and 13.1 m RQD = 88 % Recovery = 100 %										
13.1	- unweathered grey shale with minor limestone interbeds, hard rock - 75 mm of vertical fracture at 12.6 m - very narrow, slightly rough horizontal fractures in eroded/laminated shale between 12.7 m and 12.8 m, fractures filled with moist shale-till complex - more than eight (8+) horizontal mechanical fractures		8	CORE							
87.7	- Run # 8: 13.1 m and 14.6 m RQD = 97 % Recovery = 100 %										
14.6	- grey shale with limestone interbeds, very hard rock - no wide fractures - vertical fracture at 13.6 m - three (3) very narrow and smooth horizontal mechanical fractures		9	CORE							
86.1	- Run # 9: 14.6 m and 16.2 m RQD = 97 % Recovery = 100 % - unweathered grey shale with limestone interbeds, very fine-grained, very hard rock - blotched, light grey to dark grey throughout										
16.2	- red staining/banding between 14.6 m and 14.9 m - vertical fracture at 14.8 m for 150 mm - very narrow and smooth fractures with no fracture filling materials present		10	CORE							
84.6	- Run # 10: 16.2 m and 17.7 m RQD = 95 % Recovery = 85 % - unweathered grey shale with little to no limestone inlusions, very fine-grained, very hard rock										
17.7	- one (1) narrow and clean fracture with no fracture filling material - minimal horizontal fracturing, no vertical fractures										
	Borehole terminated at 17.7 m Notes: 1. Water at 16.2 m upon completion of drilling 2 Open upon completion of drilling 3. Water level at 3.56 m bgs (Elev. 98.76 m asl) on November 29, 2019										

$+^3, \times^3$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

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RECORD OF BOREHOLE No. BH5

METRIC 1 OF 1

PROJ. NO. BIGC-GEO-349A | LOCATION 571 Argus Road and 217 Cross Avenue, Oakville | ORIGINATED BY F.V.G

DATUM Geodetic | BOREHOLE TYPE Continous flight, 6 inches, Solid Stem Auger | COMPILED BY S.L

PROJ. NAME Geotechnical Investigation | DATE 2019.11.21 - 2019.11.21 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
103.39											
0.0	**FILL:** clayey silt, some sand, mottled brown, moist		1	SS1	14				○		
102.9											
0.5	**CLAYEY SILT TILL/SILTY CLAY TILL:** mottled brown, moist, hard										
			2	SS2	28				○		
			3	SS3	38				○		
			4	SS4	51				○		
	- shale-till complex below 2.7 m, brownish grey, moist, hard										
100.3											
3.1	**SHALE:** weathered, grey, damp		5	SS5	100				○		
99.4											
4.0	**Borehole terminated at 4.0 m** Notes: 1. Open and dry upon completion of drilling										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No. BH/MW6

METRIC 1 OF 1

PROJ. NO. BIGC-GEO-349A | LOCATION 571 Argus Road and 217 Cross Avenue, Oakville | ORIGINATED BY F.V.G

DATUM Geodetic | BOREHOLE TYPE Continous flight, 8 inches, Hollow Stem Auger | COMPILED BY S.L

PROJ. NAME Geotechnical Investigation | DATE 2019.11.21 - 2019.11.21 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
102.74								20 40 60 80 100	20 40 60		
0.0 / 102.7	**TOPSOIL:** 90 mm										
0.1	**FILL:** clayey silt, some sand, some rootlets, organic staining, dark brown, moist		1	SS1	8				○		
101.8											
0.9	**CLAYEY SILT TILL/SILTY CLAY TILL:** mottled brown, moist, very stiff to hard		2	SS2	21				○		
			3	SS3	65				○		
	- shale-till complex below 2.3 m, grey, moist, hard		4	SS4	33				○		
99.6											
3.1	**SHALE:** weathered, grey, damp		5	SS5	100				○		
99.0											
3.7	**Borehole terminated at 3.7 m** Notes: 1. Open and dry upon completion of drilling 2. Dry on November 29, 2019										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

APPENDIX B: MECP WWR, PTTW AND EASR SUMMARY TABLES

Table B-1: MECP WWR Summary Table

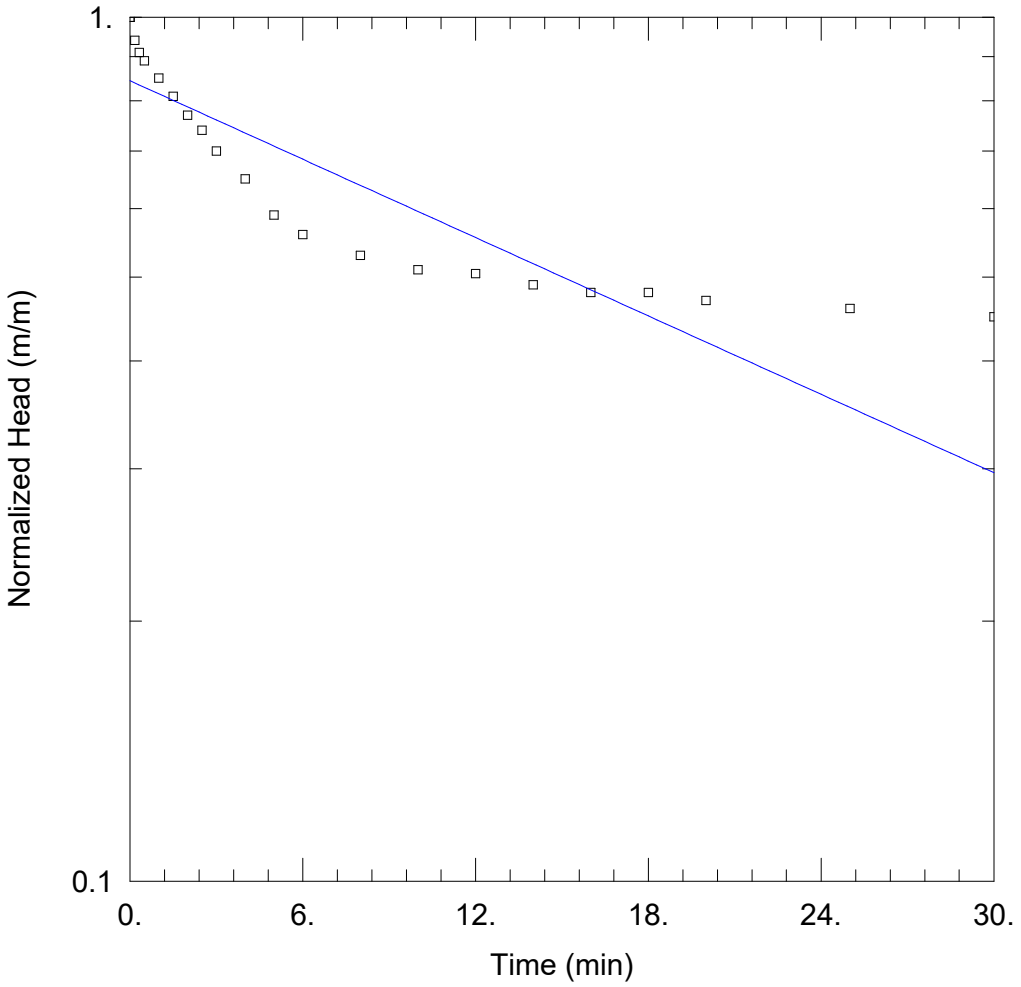
Count	Well ID	Date Completed	Depth (m)	Reported Water Level (m)	Status of Well
1.	2802422	07/21/1948	12.2	4.9	Water supply
2.	2810039	04/06/2004	5.1	N/A	Observation well
3.	2810078	09/03/2004	6.3	3.3	Observation well
4.	2810241	05/13/2005	N/A	N/A	Abandoned
5.	2810266	05/10/2005	5.2	N/A	Observation well
6.	2810285	02/01/2005	6.0	N/A	Observation well
7.	2810392	09/20/2005	4.5	N/A	Observation well
8.	2810455	12/13/2005	5.8	N/A	Observation well
9.	2810456	12/16/2005	N/A	N/A	Abandoned
10.	2810649	08/28/2006	7.6	N/A	Observation well
11.	7041205	01/12/2007	2.4	N/A	Observation well
12.	7100453	09/26/2007	4.7	N/A	Observation well
13.	7100453	09/26/2007	N/A	N/A	Observation well
14.	7101141	09/27/2007	N/A	N/A	Monitoring and test hole
15.	7101141	09/27/2007	N/A	N/A	Monitoring and test hole
16.	7125804	06/04/2009	9.1	N/A	Observation well
17.	7134031	09/16/2009	6.1	N/A	Observation well
18.	7152039	09/03/2010	4.0	N/A	Monitoring and test hole
19.	7152039	09/03/2010	N/A	N/A	Monitoring and test hole
20.	7152039	09/03/2010	N/A	N/A	Monitoring and test hole
21.	7152039	09/03/2010	N/A	N/A	Monitoring and test hole
22.	7152039	09/03/2010	N/A	N/A	Monitoring and test hole
23.	7152039	09/07/2010	N/A	N/A	Monitoring and test hole
24.	7152039	09/07/2010	N/A	N/A	Monitoring and test hole
25.	7152039	09/07/2010	N/A	N/A	Monitoring and test hole
26.	7152039	09/07/2010	N/A	N/A	Monitoring and test hole
27.	7152039	09/07/2010	N/A	N/A	Monitoring and test hole
28.	7152039	09/07/2010	N/A	N/A	Monitoring and test hole
29.	7152039	09/08/2010	N/A	N/A	Monitoring and test hole
30.	7152039	09/08/2010	N/A	N/A	Monitoring and test hole
31.	7152039	09/08/2010	N/A	N/A	Monitoring and test hole
32.	7152039	09/09/2010	N/A	N/A	Monitoring and test hole
33.	7152039	09/09/2010	N/A	N/A	Monitoring and test hole
34.	7161332	03/29/2011	3.4	N/A	Monitoring and test hole
35.	7161333	03/29/2011	3.4	N/A	Monitoring and test hole
36.	7161334	03/29/2011	3.4	N/A	Monitoring and test hole
37.	7173256	11/17/2011	5.5	N/A	Monitoring and test hole
38.	7173257	11/17/2011	4.6	N/A	Monitoring and test hole
39.	7173258	11/17/2011	4.3	N/A	Monitoring and test hole
40.	7173259	11/17/2011	4.3	N/A	Monitoring and test hole
41.	7173260	11/17/2011	4.3	N/A	Monitoring and test hole
42.	7187274	05/07/2012	N/A	1.3	Abandoned

Count	Well ID	Date Completed	Depth (m)	Reported Water Level (m)	Status of Well
43.	7187275	05/07/2012	N/A	1.5	Abandoned
44.	7187276	05/02/2012	N/A	1.5	Abandoned
45.	7187277	05/07/2012	N/A	1.5	Abandoned
46.	7187278	05/07/2012	N/A	1.5	Abandoned
47.	7187787	08/28/2012	3.4	N/A	Observation well
48.	7188619	04/13/2012	N/A	N/A	N/A
49.	7192191	05/18/2012	N/A	N/A	N/A
50.	7195037	06/19/2012	N/A	N/A	N/A
51.	7205225	06/21/2013	4.9	N/A	Monitoring and test hole
52.	7205226	06/21/2013	4.9	N/A	Monitoring and test hole
53.	7205227	06/20/2013	4.6	N/A	Monitoring and test hole
54.	7205228	06/20/2013	4.6	N/A	Monitoring and test hole
55.	7205229	06/20/2013	4.6	N/A	Monitoring and test hole
56.	7207704	07/15/2013	6.1	N/A	Monitoring and test hole
57.	7213467	11/21/2013	6.1	N/A	Monitoring and test hole
58.	7213468	11/18/2013	4.9	N/A	Monitoring and test hole
59.	7213469	11/28/2013	6.1	N/A	Monitoring and test hole
60.	7213470	11/18/2013	5.5	N/A	Monitoring and test hole
61.	7213474	11/20/2013	6.0	N/A	Monitoring and test hole
62.	7213475	11/20/2013	6.1	N/A	Monitoring and test hole
63.	7220358	03/18/2014	5.5	N/A	Monitoring and test hole
64.	7220359	03/18/2014	5.3	N/A	Monitoring and test hole
65.	7220360	03/17/2014	5.3	N/A	Monitoring and test hole
66.	7220361	03/17/2014	5.2	N/A	Monitoring and test hole
67.	7231230	09/08/2010	N/A	N/A	N/A
68.	7241968	02/11/2015	20.1	N/A	Observation well
69.	7247761	02/09/2015	N/A	N/A	N/A
70.	7253999	11/20/2015	6.1	N/A	Monitoring and test hole
71.	7254000	11/20/2015	6.1	N/A	Observation well
72.	7259855	09/09/2015	N/A	N/A	N/A
73.	7263647	04/23/2016	6.1	N/A	Monitoring and test hole
74.	7263648	04/23/2016	6.1	N/A	Monitoring and test hole
75.	7263649	04/23/2016	6.1	N/A	Monitoring and Test Hole
76.	7263650	04/23/2016	6.1	N/A	Monitoring and Test Hole
77.	7286766	N/A	N/A	N/A	N/A
78.	7318608	06/14/2018	N/A	N/A	N/A
79.	7322522	05/17/2018	6.1	N/A	Monitoring and Test Hole
80.	7322523	05/17/2018	5.0	N/A	Monitoring and test hole
81.	7322524	05/17/2018	6.4	N/A	Monitoring and test hole
82.	7325283	09/11/2018	N/A	N/A	N/A
83.	7327366	08/29/2018	N/A	N/A	N/A

Table B-2: MECP EASR Summary Table

Permit Number	Purpose	Address	Municipality	Water Source	Max L/Day	Active
8107-9KKLR9	Unknown	Queen Elizabeth Way (Hwy 403)	Oakville	Surface water	449,280,000	No
2560-A5PKQW	Dewatering construction	477 Maple Avenue	Oakville	Groundwater	390,000	No
0551-72YPT5	Dewatering construction	Northeast of Queen Elizabeth Way (Hwy 403) and Kerr Street	Oakville	Groundwater	1,962,744	No
2668-6TRQ7G	Dewatering construction	Northeast of Queen Elizabeth Way (Hwy 403) and Kerr Street	Oakville	Groundwater	1,962,744	No
4375-6NYL7V	Dewatering construction	Northeast of Queen Elizabeth Way (Hwy 403) and Kerr Street	Oakville	Groundwater	1,962,744	No
0772-AF3HTJ	Tunnel	Canadian National Railway and Cross Avenue	Oakville	Groundwater	20,000	No
0772-AF3HTJ	Mine – shaft or other	Canadian National Railway and Cross Avenue	Oakville	Groundwater	428,000	No
0772-AF3HTJ	Unknown	Canadian National Railway and Cross Avenue	Oakville	Groundwater	400,000	No
62-P-17	Lake	419 River Side Drive	Oakville	Surface water	1,083,940	No
R-009-2112317313	Construction dewatering	547 Trafalgar Road	Oakville	Groundwater	50,000 to 400,000	Yes
R-009-9112436776	Construction dewatering	Trans-Northern Pipelines Inc.	Oakville	Groundwater	50,000 to 400,000	Yes
R-009-9110219284	Construction dewatering	Part 57, Reference Plan 1009, Part 57	Oakville	Groundwater	50,000 to 400,000	No

APPENDIX C: SWRT RESULTS



WELL TEST ANLYSIS

Data Set: C:\...\MW104.aqt
Date: 03/03/21 Time: 10:05:54

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Distrikt Capital
Project: BIGC-ENV-349B
Location: Cross and Argus, Oakville, ON
Test Well: BH/MW104
Test Date: February 2, 2021

AQUIFER DATA

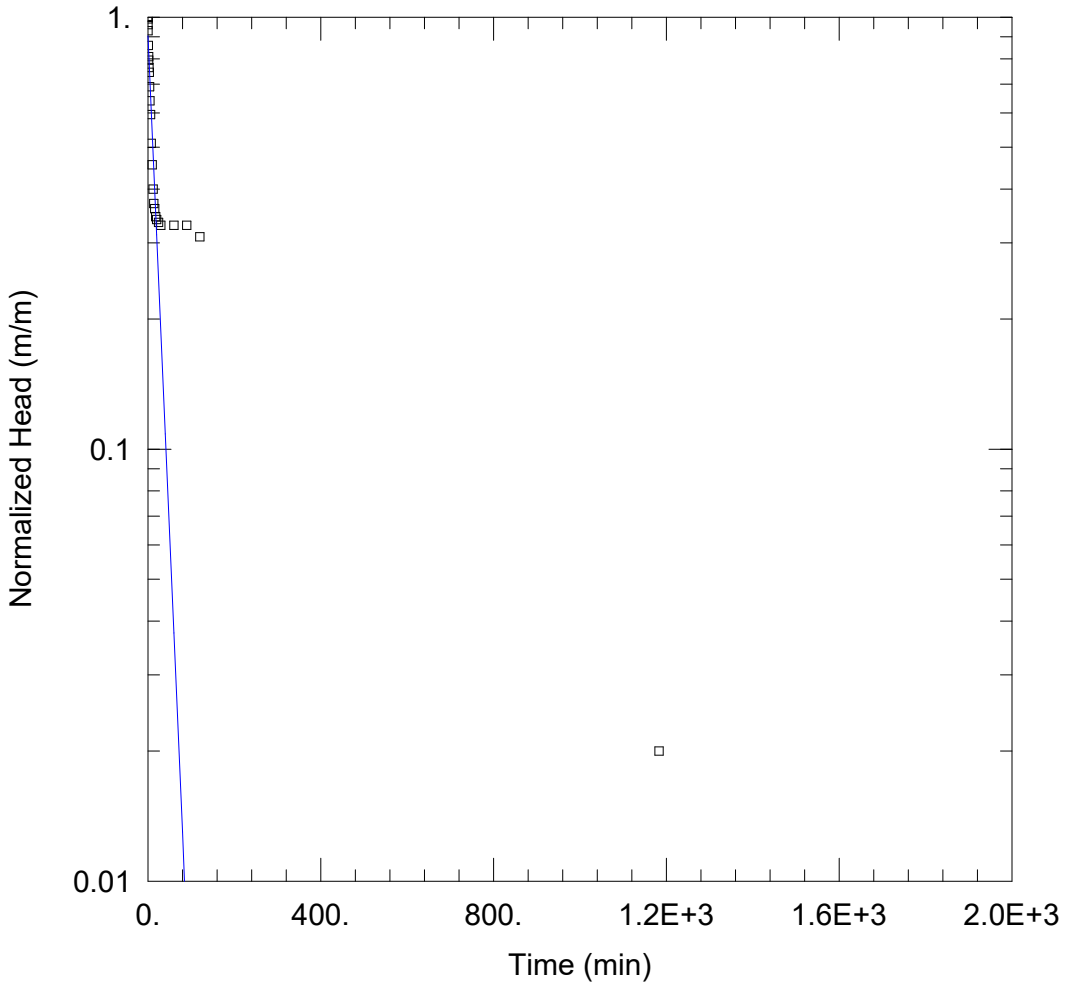
Saturated Thickness: 3.63 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW104)

Initial Displacement: 1. m
Total Well Penetration Depth: 3.63 m
Casing Radius: 0.025 m
Static Water Column Height: 3.63 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.314E-7 m/sec
y0 = 0.844 m



WELL TEST ANALYSIS

Data Set: C:\...\MW106.aqt
Date: 03/03/21 Time: 10:05:38

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Distrikt Capital
Project: BIGC-ENV-349B
Location: Cross and Argus, Oakville, ON
Test Well: BH/MW106
Test Date: February 1, 2021

AQUIFER DATA

Saturated Thickness: 2.5 m Anisotropy Ratio (Kz/Kr): 1.

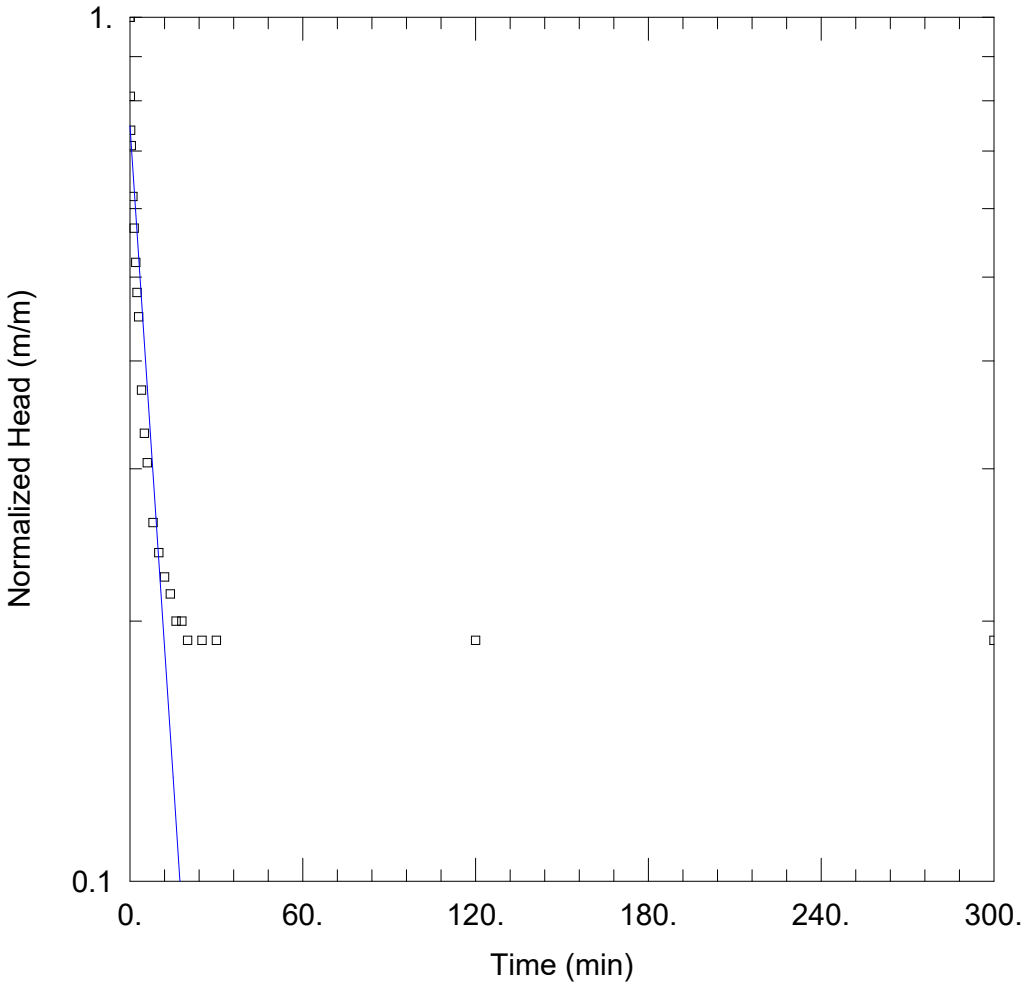
WELL DATA (BH/MW106)

Initial Displacement: 1. m
Total Well Penetration Depth: 2.5 m
Casing Radius: 0.025 m
Static Water Column Height: 2.5 m
Screen Length: 2.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.855E-7 m/sec y0 = 0.9044 m



WELL TEST ANALYSIS

Data Set: C:\...\MW110.aqt
Date: 03/03/21 Time: 10:05:17

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Distrikt Capital
Project: BIGC-ENV-349B
Location: Cross and Argus, Oakville, ON
Test Well: BH/MW110
Test Date: February 2, 2021

AQUIFER DATA

Saturated Thickness: 2.66 m Anisotropy Ratio (Kz/Kr): 1.

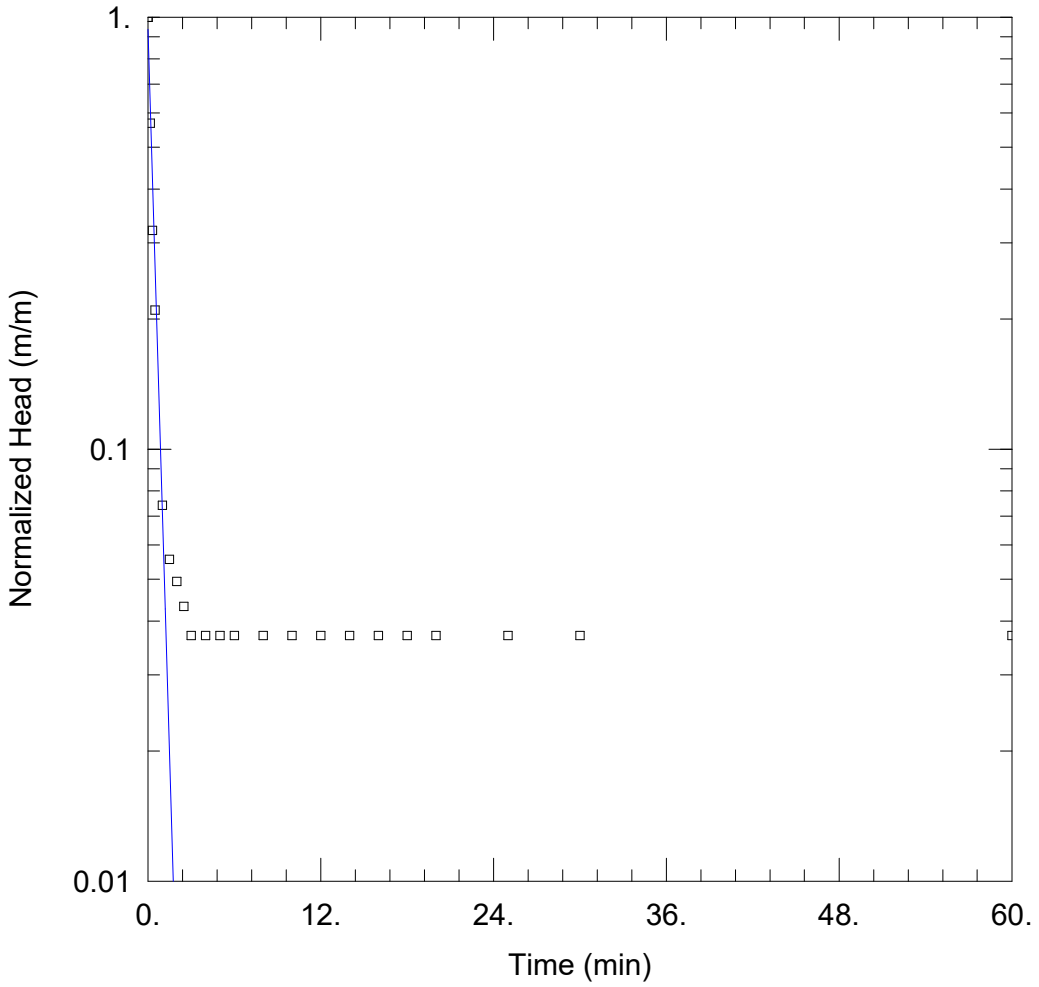
WELL DATA (BH/MW110)

Initial Displacement: 1. m
Total Well Penetration Depth: 2.66 m
Casing Radius: 0.025 m
Static Water Column Height: 2.66 m
Screen Length: 2.66 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.201E-6 m/sec y0 = 0.7479 m



WELL TEST ANALYSIS

Data Set: C:\...\MW113.aqt
Date: 03/03/21 Time: 10:04:55

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Distrikt Capital
Project: BIGC-ENV-349B
Location: Cross and Argus, Oakville, ON
Test Well: BH/MW113
Test Date: February 1, 2021

AQUIFER DATA

Saturated Thickness: 1.33 m Anisotropy Ratio (Kz/Kr): 1.

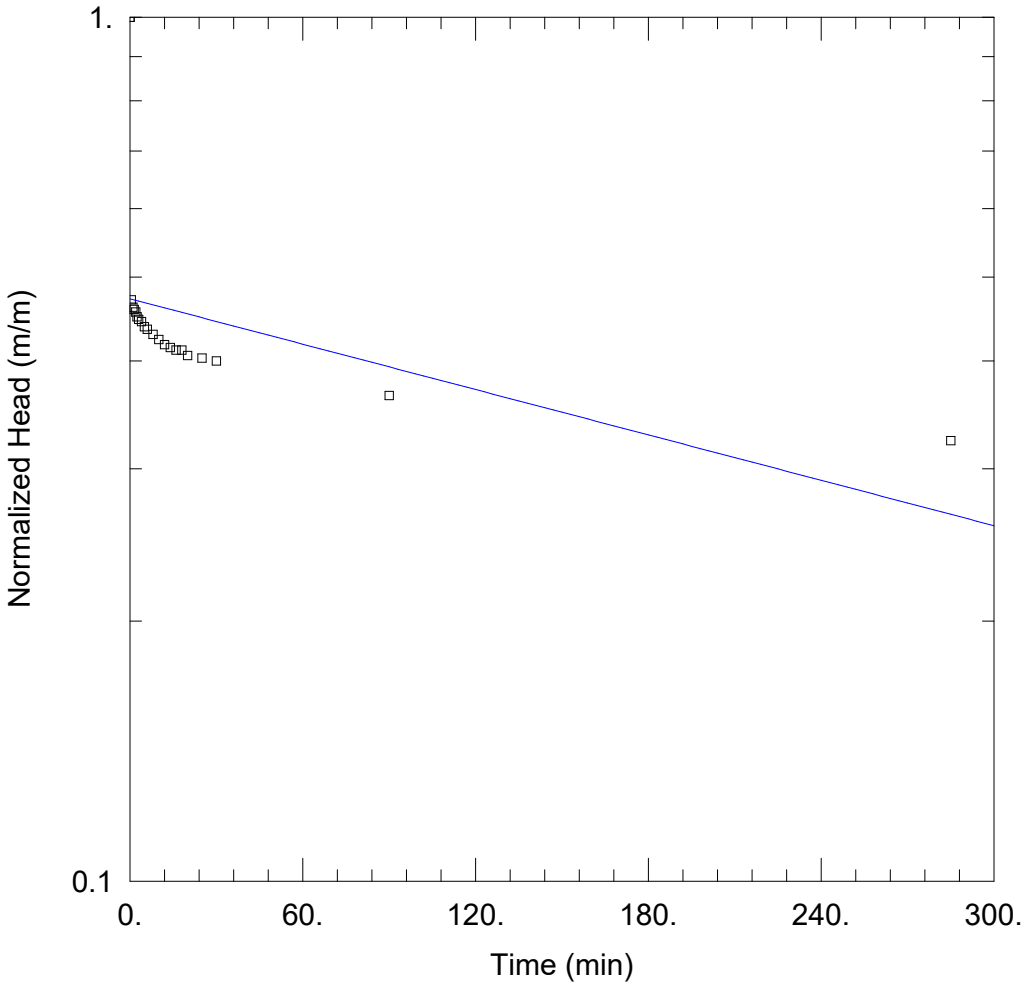
WELL DATA (BH/MW113)

Initial Displacement: 0.81 m
Total Well Penetration Depth: 1.33 m
Casing Radius: 0.025 m
Static Water Column Height: 1.33 m
Screen Length: 1.33 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.342E-5 m/sec y0 = 0.7584 m



WELL TEST ANALYSIS

Data Set: C:\...\MW114.aqt
Date: 03/03/21 Time: 10:04:37

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Distrikt Capital
Project: BIGC-ENV-349B
Location: Cross and Argus, Oakville, ON
Test Well: BH/MW114
Test Date: February 3, 2021

AQUIFER DATA

Saturated Thickness: 2.89 m Anisotropy Ratio (Kz/Kr): 1.

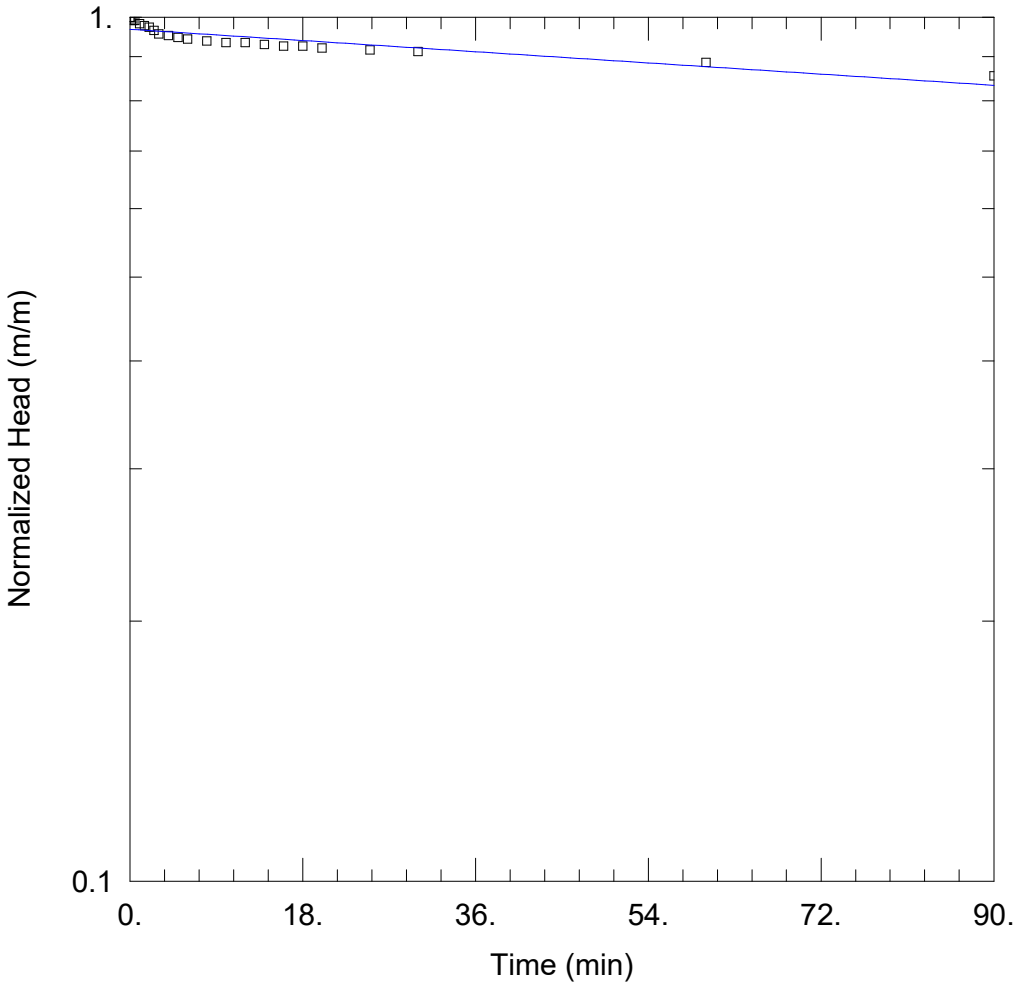
WELL DATA (BH/MW114)

Initial Displacement: 1.7 m
Total Well Penetration Depth: 2.89 m
Casing Radius: 0.025 m
Static Water Column Height: 2.89 m
Screen Length: 2.89 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.925E-8 m/sec y0 = 0.8025 m



WELL TEST ANALYSIS

Data Set: C:\...\MW115(2).aqt
Date: 03/03/21 Time: 10:04:08

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Distrikt Capital
Project: BIGC-ENV-349B
Location: Cross and Argus, Oakville, ON
Test Well: BH/MW115
Test Date: February 8, 2021

AQUIFER DATA

Saturated Thickness: 3.93 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW115)

Initial Displacement: 1.14 m
Total Well Penetration Depth: 3.93 m
Casing Radius: 0.025 m
Static Water Column Height: 3.93 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.576E-8 m/sec y0 = 1.103 m

APPENDIX D: WATER QUALITY LABORATORY CERTIFICATE OF ANALYSIS AND CHAIN OF CUSTODY

Your Project #: BIGC-ENV-349B
Site#: 217 Cross
Site Location: 217 Cross
Your C.O.C. #: 812029-01-01

Attention: Eileen Liu

B.I.G Consulting Inc.
12-5500 Tomken Road
Mississauga, ON
CANADA L4W 2Z4

Report Date: 2021/02/12
Report #: R6516360
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: C130104
Received: 2021/02/03, 17:37

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Sewer Use By-Law Semivolatile Organics	1	2021/02/05	2021/02/05	CAM SOP 00301	EPA 8270 m
Biochemical Oxygen Demand (BOD)	1	2021/02/04	2021/02/09	CAM SOP-00427	SM 23 5210B m
Carbonaceous BOD	1	2021/02/06	2021/02/11	CAM SOP-00427	SM 23 5210B m
Chromium (VI) in Water	1	N/A	2021/02/09	CAM SOP-00436	EPA 7199 m
Total Cyanide	1	2021/02/04	2021/02/04	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2021/02/04	2021/02/04	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2021/02/05	2021/02/05	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2021/02/05	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2021/02/03	CAM SOP-00552	MOE LSB E3371
Total Nonylphenol in Liquids by HPLC	1	2021/02/06	2021/02/07	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC	1	2021/02/06	2021/02/07	CAM SOP-00313	In-house Method
Animal and Vegetable Oil and Grease	1	N/A	2021/02/10	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2021/02/09	2021/02/09	CAM SOP-00326	EPA1664B m,SM5520B m
OC Pesticides (Selected) & PCB (1)	1	2021/02/09	2021/02/11	CAM SOP-00307	EPA 8081A/8082B m
OC Pesticides Summed Parameters	1	N/A	2021/02/04	CAM SOP-00307	EPA 8081A/8082B m
pH	1	2021/02/04	2021/02/04	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2021/02/04	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2021/02/05	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2021/02/04	2021/02/08	CAM SOP-00938	OMOE E3516 m
Total PAHs (2)	1	N/A	2021/02/08	CAM SOP - 00301	
Mineral/Synthetic O & G (TPH Heavy Oil) (3)	1	2021/02/09	2021/02/09	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2021/02/06	2021/02/08	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2021/02/06	CAM SOP-00228	EPA 8260C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement

Your Project #: BIGC-ENV-349B
Site#: 217 Cross
Site Location: 217 Cross
Your C.O.C. #: 812029-01-01

Attention: Eileen Liu

B.I.G Consulting Inc.
12-5500 Tomken Road
Mississauga, ON
CANADA L4W 2Z4

Report Date: 2021/02/12
Report #: R6516360
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: C130104
Received: 2021/02/03, 17:37

Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane
(2) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(3) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Christine Gripton, Senior Project Manager
Email: Christine.Gripton@bureauveritas.com
Phone# (519)652-9444
==========
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: C130104
Report Date: 2021/02/12

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-349B
Site Location: 217 Cross
Sampler Initials: AB

OIL & GREASE - A/V/M/T (WATER)

BV Labs ID			OTM123		
Sampling Date			2021/02/03 16:00		
COC Number			812029-01-01		
	UNITS	Criteria	BH/MW 113	RDL	QC Batch
Calculated Parameters					
Total Animal/Vegetable Oil and Grease	mg/L	150	ND	0.50	7182572
Petroleum Hydrocarbons					
Total Oil & Grease	mg/L	-	ND	0.50	7193034
Total Oil & Grease Mineral/Synthetic	mg/L	-	ND	0.50	7193048

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not detected

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

BV Labs Job #: C130104
Report Date: 2021/02/12

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-349B
Site Location: 217 Cross
Sampler Initials: AB

OAKVILLE STORM SEWER BYLAW (2009-031)

BV Labs ID				OTM123		
Sampling Date				2021/02/03 16:00		
COC Number				812029-01-01		
	UNITS	Criteria	Criteria-2	BH/MW 113	RDL	QC Batch
Inorganics						
Total BOD	mg/L	-	15	ND	2	7184367
pH	pH	6.0:10.0	6.5:8.5	7.46		7183500
Phenols-4AAP	mg/L	1	0.008	ND	0.0010	7184315
Total Suspended Solids	mg/L	350	15	**19**	10	7186632
Total Cyanide (CN)	mg/L	2	0.02	ND	0.0050	7184986
Miscellaneous Parameters						
Nonylphenol Ethoxylate (Total)	mg/L	-	0.01	ND	0.005	7188593
Nonylphenol (Total)	mg/L	-	0.001	ND	0.001	7188589
Metals						
Chromium (VI)	ug/L	-	40	ND	0.50	7183208
Mercury (Hg)	mg/L	0.05	0.0004	ND	0.00010	7186529
Total Arsenic (As)	ug/L	1000	20	5.7	1.0	7186481
Total Cadmium (Cd)	ug/L	1000	8	ND	0.090	7186481
Total Chromium (Cr)	ug/L	3000	80	12	5.0	7186481
Total Copper (Cu)	ug/L	3000	40	**61**	0.90	7186481
Total Lead (Pb)	ug/L	3000	120	2.2	0.50	7186481
Total Manganese (Mn)	ug/L	5000	50	**610**	2.0	7186481
Total Nickel (Ni)	ug/L	3000	80	16	1.0	7186481
Total Phosphorus (P)	ug/L	10000	400	370	100	7186481
Total Selenium (Se)	ug/L	5000	20	ND	2.0	7186481
Total Silver (Ag)	ug/L	5000	120	ND	0.090	7186481
Total Zinc (Zn)	ug/L	3000	40	33	5.0	7186481
Semivolatile Organics						
Di-N-butyl phthalate	ug/L	-	15	ND	2	7186355
Bis(2-ethylhexyl)phthalate	ug/L	-	8.8	ND	2	7186355
3,3'-Dichlorobenzidine	ug/L	-	0.8	ND	0.8	7186355
Pentachlorophenol	ug/L	-	2	ND	1	7186355
Phenanthrene	ug/L	-	-	ND	0.2	7186355

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Halton Sanitary & Combined Sewer Bylaw (2-03)
Criteria-2: The Town of Oakville Storm Sewer Discharge By Law 2009-031
ND = Not detected

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OAKVILLE STORM SEWER BYLAW (2009-031)

BV Labs ID				OTM123		
Sampling Date				2021/02/03 16:00		
COC Number				812029-01-01		
	UNITS	Criteria	Criteria-2	BH/MW 113	RDL	QC Batch
Anthracene	ug/L	-	-	ND	0.2	7186355
Fluoranthene	ug/L	-	-	ND	0.2	7186355
Pyrene	ug/L	-	-	ND	0.2	7186355
Benzo(a)anthracene	ug/L	-	-	ND	0.2	7186355
Chrysene	ug/L	-	-	ND	0.2	7186355
Benzo(b/j)fluoranthene	ug/L	-	-	ND	0.2	7186355
Benzo(k)fluoranthene	ug/L	-	-	ND	0.2	7186355
Benzo(a)pyrene	ug/L	-	-	ND	0.2	7186355
Indeno(1,2,3-cd)pyrene	ug/L	-	-	ND	0.2	7186355
Dibenzo(a,h)anthracene	ug/L	-	-	ND	0.2	7186355
Benzo(g,h,i)perylene	ug/L	-	-	ND	0.2	7186355
Dibenzo(a,i)pyrene	ug/L	-	-	ND	0.2	7186355
Benzo(e)pyrene	ug/L	-	-	ND	0.2	7186355
Perylene	ug/L	-	-	ND	0.2	7186355
Dibenzo(a,j) acridine	ug/L	-	-	ND	0.4	7186355
7H-Dibenzo(c,g) Carbazole	ug/L	-	-	ND	0.4	7186355
1,6-Dinitropyrene	ug/L	-	-	ND	0.4	7186355
1,3-Dinitropyrene	ug/L	-	-	ND	0.4	7186355
1,8-Dinitropyrene	ug/L	-	-	ND	0.4	7186355
Calculated Parameters						
Total PAHs (18 PAHs)	ug/L	-	2	ND	1	7182573
Volatile Organics						
Benzene	ug/L	10	2	ND	0.40	7184452
Chloroform	ug/L	40	2	ND	0.40	7184452
1,2-Dichlorobenzene	ug/L	-	5.6	ND	0.80	7184452
1,4-Dichlorobenzene	ug/L	80	6.8	ND	0.80	7184452
cis-1,2-Dichloroethylene	ug/L	-	5.6	ND	1.0	7184452
trans-1,3-Dichloropropene	ug/L	-	5.6	ND	0.80	7184452
Ethylbenzene	ug/L	160	2	ND	0.40	7184452

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Halton Sanitary & Combined Sewer Bylaw (2-03)
Criteria-2: The Town of Oakville Storm Sewer Discharge By Law 2009-031
ND = Not detected

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OAKVILLE STORM SEWER BYLAW (2009-031)

BV Labs ID				OTM123		
Sampling Date				2021/02/03 16:00		
COC Number				812029-01-01		
	UNITS	Criteria	Criteria-2	BH/MW 113	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	2000	5.2	ND	4.0	7184452
1,1,2,2-Tetrachloroethane	ug/L	-	17	ND	0.80	7184452
Tetrachloroethylene	ug/L	1000	4.4	ND	0.40	7184452
Toluene	ug/L	16	2	ND	0.40	7184452
Trichloroethylene	ug/L	400	7.6	ND	0.40	7184452
Total Xylenes	ug/L	-	4.4	ND	0.40	7184452
Pesticides & Herbicides						
Aldrin	ug/L	-	-	ND	0.005	7193127
Dieldrin	ug/L	-	-	ND	0.005	7193127
a-Chlordane	ug/L	-	-	ND	0.005	7193127
g-Chlordane	ug/L	-	-	ND	0.005	7193127
o,p-DDT	ug/L	-	0.04	ND	0.005	7193127
p,p-DDT	ug/L	-	0.04	ND	0.005	7193127
Lindane	ug/L	-	40	ND	0.003	7193127
Hexachlorobenzene	ug/L	-	0.04	ND	0.005	7193127
Mirex	ug/L	-	40	ND	0.005	7193127
Microbiological						
Escherichia coli	CFU/100mL	-	200	<10	10	7183860
Surrogate Recovery (%)						
2,4,6-Tribromophenol	%	-	-	94		7186355
2-Fluorobiphenyl	%	-	-	90		7186355
D14-Terphenyl (FS)	%	-	-	96		7186355
D5-Nitrobenzene	%	-	-	111		7186355
D8-Acenaphthylene	%	-	-	96		7186355
2,4,5,6-Tetrachloro-m-xylene	%	-	-	91		7193127
Decachlorobiphenyl	%	-	-	103		7193127
4-Bromofluorobenzene	%	-	-	95		7184452
D4-1,2-Dichloroethane	%	-	-	108		7184452
D8-Toluene	%	-	-	94		7184452

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Halton Sanitary & Combined Sewer Bylaw (2-03)
Criteria-2: The Town of Oakville Storm Sewer Discharge By Law 2009-031
ND = Not detected

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BV Labs Job #: C130104
Report Date: 2021/02/12

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-349B
Site Location: 217 Cross
Sampler Initials: AB

RESULTS OF ANALYSES OF WATER

BV Labs ID			OTM123		
Sampling Date			2021/02/03 16:00		
COC Number			812029-01-01		
	UNITS	Criteria	BH/MW 113	RDL	QC Batch
Inorganics					
Total Carbonaceous BOD	mg/L	300	ND	2	7188422
Fluoride (F-)	mg/L	10	0.20	0.10	7183467
Total Kjeldahl Nitrogen (TKN)	mg/L	100	2.3	0.10	7185488
Dissolved Sulphate (SO4)	mg/L	1500	250	1.0	7184723

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not detected

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BV Labs Job #: C130104
Report Date: 2021/02/12

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-349B
Site Location: 217 Cross
Sampler Initials: AB

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

BV Labs ID			OTM123		
Sampling Date			2021/02/03 16:00		
COC Number			812029-01-01		
	UNITS	Criteria	BH/MW 113	RDL	QC Batch
Calculated Parameters					
Aldrin + Dieldrin	ug/L	0.08	ND	0.005	7182829
Chlordane (Total)	ug/L	40	ND	0.005	7182829
DDT+ Metabolites	ug/L	-	ND	0.005	7182829
Heptachlor + Heptachlor epoxide	ug/L	-	ND	0.005	7182829
o,p-DDD + p,p-DDD	ug/L	-	ND	0.005	7182829
o,p-DDE + p,p-DDE	ug/L	-	ND	0.005	7182829
o,p-DDT + p,p-DDT	ug/L	-	ND	0.005	7182829
Total Endosulfan	ug/L	-	ND	0.005	7182829
Total PCB	ug/L	0.4	ND	0.05	7182829

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The Town of Oakville Storm Sewer Discharge By Law 2009-031
ND = Not detected

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BV Labs Job #: C130104
Report Date: 2021/02/12

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-349B
Site Location: 217 Cross
Sampler Initials: AB

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.7°C

Revised report (2021/02/12): Amended to include Oakville Storm bylaw criteria.

Sample OTM123 [BH/MW 113] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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BV Labs Job #: C130104
Report Date: 2021/02/12

QUALITY ASSURANCE REPORT

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-349B
Site Location: 217 Cross
Sampler Initials: AB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7184452	4-Bromofluorobenzene	2021/02/06	101	70 - 130	102	70 - 130	99	%				
7184452	D4-1,2-Dichloroethane	2021/02/06	102	70 - 130	104	70 - 130	105	%				
7184452	D8-Toluene	2021/02/06	101	70 - 130	100	70 - 130	95	%				
7186355	2,4,6-Tribromophenol	2021/02/05	106	10 - 130	90	10 - 130	75	%				
7186355	2-Fluorobiphenyl	2021/02/05	98	30 - 130	99	30 - 130	103	%				
7186355	D14-Terphenyl (FS)	2021/02/05	100	30 - 130	98	30 - 130	99	%				
7186355	D5-Nitrobenzene	2021/02/05	118	30 - 130	121	30 - 130	119	%				
7186355	D8-Acenaphthylene	2021/02/05	99	30 - 130	97	30 - 130	92	%				
7193127	2,4,5,6-Tetrachloro-m-xylene	2021/02/11	93	50 - 130	83	50 - 130	80	%				
7193127	Decachlorobiphenyl	2021/02/11	86	50 - 130	93	50 - 130	104	%				
7183208	Chromium (VI)	2021/02/09	98	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L	NC	20		
7183467	Fluoride (F-)	2021/02/04	113	80 - 120	106	80 - 120	ND, RDL=0.10	mg/L	1.9	20		
7183500	pH	2021/02/04			102	98 - 103			0.32	N/A		
7184315	Phenols-4AAP	2021/02/04	104	80 - 120	98	80 - 120	ND, RDL=0.0010	mg/L	NC	20		
7184367	Total BOD	2021/02/09					ND,RDL=2	mg/L	NC	30	101	80 - 120
7184452	1,1,2,2-Tetrachloroethane	2021/02/06	97	70 - 130	100	70 - 130	ND, RDL=0.40	ug/L	NC	30		
7184452	1,2-Dichlorobenzene	2021/02/06	96	70 - 130	97	70 - 130	ND, RDL=0.40	ug/L	NC	30		
7184452	1,4-Dichlorobenzene	2021/02/06	112	70 - 130	112	70 - 130	ND, RDL=0.40	ug/L	NC	30		
7184452	Benzene	2021/02/06	93	70 - 130	95	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7184452	Chloroform	2021/02/06	100	70 - 130	102	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7184452	cis-1,2-Dichloroethylene	2021/02/06	102	70 - 130	105	70 - 130	ND, RDL=0.50	ug/L	NC	30		
7184452	Ethylbenzene	2021/02/06	92	70 - 130	93	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7184452	Methylene Chloride(Dichloromethane)	2021/02/06	100	70 - 130	103	70 - 130	ND, RDL=2.0	ug/L	NC	30		
7184452	Tetrachloroethylene	2021/02/06	92	70 - 130	91	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7184452	Toluene	2021/02/06	93	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7184452	Total Xylenes	2021/02/06					ND, RDL=0.20	ug/L	NC	30		
7184452	trans-1,3-Dichloropropene	2021/02/06	107	70 - 130	106	70 - 130	ND, RDL=0.40	ug/L	NC	30		
7184452	Trichloroethylene	2021/02/06	103	70 - 130	105	70 - 130	ND, RDL=0.20	ug/L	NC	30		
7184723	Dissolved Sulphate (SO4)	2021/02/05	NC	75 - 125	104	80 - 120	ND, RDL=1.0	mg/L	1.4	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7184986	Total Cyanide (CN)	2021/02/04	92	80 - 120	96	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
7185488	Total Kjeldahl Nitrogen (TKN)	2021/02/08	NC	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	2.4	20	98	80 - 120
7186355	1,3-Dinitropyrene	2021/02/05	46	30 - 130	124	30 - 130	ND, RDL=0.4	ug/L				
7186355	1,6-Dinitropyrene	2021/02/05	51	30 - 130	116	30 - 130	ND, RDL=0.4	ug/L				
7186355	1,8-Dinitropyrene	2021/02/05	40	30 - 130	110	30 - 130	ND, RDL=0.4	ug/L				
7186355	3,3'-Dichlorobenzidine	2021/02/05	8.9 (1)	30 - 130	117	30 - 130	ND, RDL=0.8	ug/L	NC	40		
7186355	7H-Dibenzo(c,g) Carbazole	2021/02/05	98	30 - 130	98	30 - 130	ND, RDL=0.4	ug/L	NC	40		
7186355	Anthracene	2021/02/05	98	30 - 130	98	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Benzo(a)anthracene	2021/02/05	107	30 - 130	105	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Benzo(a)pyrene	2021/02/05	99	30 - 130	101	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Benzo(b/j)fluoranthene	2021/02/05	108	30 - 130	110	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Benzo(e)pyrene	2021/02/05	115	30 - 130	115	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Benzo(g,h,i)perylene	2021/02/05	121	30 - 130	120	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Benzo(k)fluoranthene	2021/02/05	112	30 - 130	113	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Bis(2-ethylhexyl)phthalate	2021/02/05	115	30 - 130	111	30 - 130	ND,RDL=2	ug/L	NC	40		
7186355	Chrysene	2021/02/05	113	30 - 130	115	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Dibenzo(a,h)anthracene	2021/02/05	122	30 - 130	120	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Dibenzo(a,i)pyrene	2021/02/05	82	30 - 130	100	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Dibenzo(a,j) acridine	2021/02/05	111	30 - 130	107	30 - 130	ND, RDL=0.4	ug/L	NC	40		
7186355	Di-N-butyl phthalate	2021/02/05	114	30 - 130	103	30 - 130	ND,RDL=2	ug/L	NC	40		
7186355	Fluoranthene	2021/02/05	122	30 - 130	119	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Indeno(1,2,3-cd)pyrene	2021/02/05	127	30 - 130	123	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Pentachlorophenol	2021/02/05	103	30 - 130	76	30 - 130	ND,RDL=1	ug/L	NC	40		
7186355	Perylene	2021/02/05	110	30 - 130	110	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186355	Phenanthrene	2021/02/05	105	30 - 130	102	30 - 130	ND, RDL=0.2	ug/L	6.2	40		
7186355	Pyrene	2021/02/05	123	30 - 130	120	30 - 130	ND, RDL=0.2	ug/L	NC	40		
7186481	Total Arsenic (As)	2021/02/05	99	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	5.5	20		
7186481	Total Cadmium (Cd)	2021/02/05	95	80 - 120	96	80 - 120	ND, RDL=0.090	ug/L	14	20		
7186481	Total Chromium (Cr)	2021/02/05	95	80 - 120	93	80 - 120	ND, RDL=5.0	ug/L	NC	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7186481	Total Copper (Cu)	2021/02/05	96	80 - 120	92	80 - 120	ND, RDL=0.90	ug/L	2.7	20		
7186481	Total Lead (Pb)	2021/02/05	91	80 - 120	95	80 - 120	ND, RDL=0.50	ug/L	2.7	20		
7186481	Total Manganese (Mn)	2021/02/05	NC	80 - 120	92	80 - 120	ND, RDL=2.0	ug/L	4.9	20		
7186481	Total Nickel (Ni)	2021/02/05	89	80 - 120	90	80 - 120	ND, RDL=1.0	ug/L	8.5	20		
7186481	Total Phosphorus (P)	2021/02/05	101	80 - 120	98	80 - 120	ND, RDL=100	ug/L	NC	20		
7186481	Total Selenium (Se)	2021/02/05	96	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	20		
7186481	Total Silver (Ag)	2021/02/05	91	80 - 120	94	80 - 120	ND, RDL=0.090	ug/L	NC	20		
7186481	Total Zinc (Zn)	2021/02/05	NC	80 - 120	96	80 - 120	ND, RDL=5.0	ug/L	3.9	20		
7186529	Mercury (Hg)	2021/02/05	96	75 - 125	97	80 - 120	ND, RDL=0.00010	mg/L	NC	20		
7186632	Total Suspended Solids	2021/02/08					ND, RDL=10	mg/L	0	25	95	85 - 115
7188422	Total Carbonaceous BOD	2021/02/11					ND,RDL=2	mg/L	11	30	93	85 - 115
7188589	Nonylphenol (Total)	2021/02/07	112	50 - 130	112	50 - 130	ND, RDL=0.001	mg/L	NC	40		
7188593	Nonylphenol Ethoxylate (Total)	2021/02/07	97	50 - 130	99	50 - 130	ND, RDL=0.005	mg/L	NC	40		
7193034	Total Oil & Grease	2021/02/09			99	85 - 115	ND, RDL=0.50	mg/L	2.0	25		
7193048	Total Oil & Grease Mineral/Synthetic	2021/02/09			91	85 - 115	ND, RDL=0.50	mg/L	2.7	25		
7193127	a-Chlordane	2021/02/11	110	50 - 130	100	50 - 130	ND, RDL=0.005	ug/L	0.18	30		
7193127	Aldrin	2021/02/11	97	50 - 130	87	50 - 130	ND, RDL=0.005	ug/L	NC	30		
7193127	Dieldrin	2021/02/11	128	50 - 130	124	50 - 130	ND, RDL=0.005	ug/L	NC	30		
7193127	g-Chlordane	2021/02/11	110	50 - 130	100	50 - 130	ND, RDL=0.005	ug/L	0.12	30		
7193127	Hexachlorobenzene	2021/02/11	91	50 - 130	91	50 - 130	ND, RDL=0.005	ug/L	NC	30		
7193127	Lindane	2021/02/11	102	50 - 130	98	50 - 130	ND, RDL=0.003	ug/L	2.0	30		
7193127	Mirex	2021/02/11	117	30 - 130	99	30 - 130	ND, RDL=0.005	ug/L	3.0	40		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7193127	o,p-DDT	2021/02/11	123	50 - 130	108	50 - 130	ND, RDL=0.005	ug/L	0.58	30		
7193127	p,p-DDT	2021/02/11	87	50 - 130	95	50 - 130	ND, RDL=0.005	ug/L	8.3	30		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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BV Labs Job #: C130104
Report Date: 2021/02/12

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-349B
Site Location: 217 Cross
Sampler Initials: AB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Farhana Rahman

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

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Exceedance Summary Table – Halton Sanitary Sewer

Result Exceedances

Sample ID	BV Labs ID	Parameter	Criteria	Result	DL	UNITS
No Exceedances						

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Exceedance Summary Table – Oakville Storm Sewer

Result Exceedances

Sample ID	BV Labs ID	Parameter	Criteria	Result	DL	UNITS
BH/MW 113	OTM123-08	Total Copper (Cu)	40	61	0.90	ug/L
BH/MW 113	OTM123-08	Total Manganese (Mn)	50	610	2.0	ug/L
BH/MW 113	OTM123-07	Total Suspended Solids	15	19	10	mg/L

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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MICRO

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CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#31796 B.I.G Consulting Inc.	Company Name:	BIG Consulting Inc	Quotation #:	B64476	BV Labs Job #:	Bottle Order #: 812029
Attention:	Accounts Payable	Attention:	Eileen Liu	P.O. #:			
Address:	12-5500 Tomken Road Mississauga ON L4W 2Z4	Address:	Same as Invoice to	Project:	BIGC-ENV-349B		
				Project Name:		COC #:	Project Manager:
Tel:	(416) 214-4880 Fax:	Tel:	Fax:	Site #:	217 Cross	C#812029-01-01	Christine Gripton
Email:	ldougherty@brownfieldigi.com; admin@brownfieldigi.co	Email:	eliu@brownfieldigi.com	Sampled By:	AP		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BV LABS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)	Other Regulations	Special Instructions
☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___	☐ CCME ☒ Sanitary Sewer Bylaw ☐ Reg 558 ☒ Storm Sewer Bylaw ☐ MISA Municipality Halton / Oakville ☐ PWQO ☐ Reg 406 Table ☐ Other	

Include Criteria on Certificate of Analysis (Y/N)? Y

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	ANALYSIS REQUESTED (PLEASE BE SPECIFIC): Halton Sanitary + Oakville Storm	# of Bottles	Comments
1		BH/MW 117	21/02/03	~~16:00~~	GW		X	19	
2									
3									
4									
5									
6									
7									
8									
9									
10									

03-Feb-21 17:37
Christine Gripton
C130104
DSG env-1305

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only			
AP	21/02/03	17:30	Rx/ALEXANDRA FODOR	2021/02/03	17:37		Time Sensitive	Temperature (°C) on Recei 8/5/6 & ICE	Custody Seal Present / Intact	Yes ✓ / ✓

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

APPENDIX E: CONSTRUCTION DEWATERING ESTIMATE RATE CALCULATIONS

Construction Dewatering Rate Estimate

217 & 227 Cross Avenue and 571 Argus Road, Oakville, Ontario
Five (5) levels of underground parking, unconfined aquifer, groundwater seepage to square excavation (radial source)

Table E-1: Construction Dewatering Rate Estimates

Description	Symbol	Values	Unit	Explanation
Input				
Lowest Ground Elevation		100.96	m asl	Based on borehole logs
Highest Groundwater Level		101.15	m asl	Highest groundwater elevation on February 8, 2021
Footing Elevation		83.96	m asl	Assumed 17 m below ground
Aquifer Bottom		80.96	m asl	Assumed 3 m below footing elevation
Hydraulic Conductivity		3.95E-07	m/s	Geometric mean K
Length of Excavation	x	94.0	m	Based on aerial extent of the Site
Width of Excavation	a	106.0	m	Based on aerial extent of the Site
Output				
Top of Aquifer		101.15	m asl	Water table for unconfined aquifer
Target Water Level		82.96	m asl	Assumed 1.0 m below footing elevation
Water Level above aquifer bottom before dewatering	H	20.2	m	
Target water level above aquifer bottom	h	2.0	m	
Equivalent radius	R_e	63.7	m	Equal perimeter
Radius of Influence	L (R_0)	97.95	m	Sichardt's Formula (C=3000 for radial source)
Construction dewatering flow rate - Steady State	Q	100.40	m^3/day	Construction Dewatering flow – Dupuit Equation
Maximum construction dewatering flow rate (safety factor of 2)	2Q	200.8	m^3/day	During the initial period and after rains
Construction Dewatering Flow Rate - Steady State	Q	**100,400**	L/day	
Maximum Construction Flow Rate (safety factor of 2)	2Q	**201,000**	L/day	