SUPPLEMENTAL HYDROGEOLOGICAL INVESTIGATION

1260 & 1280 Dundas Street West, Oakville, Ontario

Client

Delmanor West Oak Inc.
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Project Number

BIGC-GEO-185E

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1 Introduction

1.1 Project Description

B.I.G. Consulting Inc. (BIG) was retained by Ms. Kara Green on behalf of Delmanor West Oak Inc. (Client), to provide hydrogeological investigation to support the proposed development of the site located at 1260 and 1280 Dundas Street West, Oakville, Ontario (Site).

The Site is located south of Fourth Line and east of Dundas Street West, in Oakville, Ontario, as shown on Figure 1. The Site measures approximately 36,500 m^2 in size and is currently vacant. A chain link fence is located along the western, eastern and northern Site boundaries. The Site is covered with grass and trees.

It should be noted that BIG previously conducted a "*Hydrogeological Investigation, 1260 & 1280 Dundas Street West, Oakville, Ontario*", dated December 13, 2019. At the time of the previous investigation, no building plan was available, the estimation of construction and long-term dewatering rates were based on the assumption of the entire site will be developed with a mid-rise retirement residence with one (1) potential level of basement. Given the architectural drawings prepared by Icke Brochu Architects Inc. (Icke Brochu), dated September 10, 2021, the proposed development has been revised to an eight (8)-storey apartment building with one (1) level of basement and four (4) blocks of slab-on-grade Independent Living Units (ILU), additional drilling and re-assessment of the dewatering rates are required.

BIG previously conducted a slope stability assessment at the Site at 1280 Dundas Street West, dated June 20, 2018. An Updated Slope Stability Assessment which addresses the comments from Conservation Halton (CH) will be issued under a separate cover.

This report addresses the hydrogeological aspects of the proposed project. The geotechnical, infiltration rate and updated slope stability assessment reports will be issued under separate covers. The field investigation for the hydrogeological assessment was carried out concurrently with that for the geotechnical, infiltration rate and updated slope stability assessments.

1.2 Project Objectives

The main objectives of the Supplemental Hydrogeological Investigation were to:

a) Re-assess any potential construction dewatering flow rates;
b) Re-assess foundation sub-drain discharge volumes, if applicable; and,
c) Prepare a Supplemental Hydrogeological Investigation Report.

1.3 Scope of Work

As part of the report titled "*Hydrogeological Investigation, 1260 & 1280 Dundas Street West, Oakville, Ontario*", dated December 13, 2019. BIG utilized the existing boreholes and monitoring wells (BH104, BH105, BH107 to BH110) drilled for environmental and geotechnical purposes in 2019, advanced four (4) boreholes (BH101 to BH103 and BH106) to a maximum depth of 6.7 m below ground surface (bgs), installed monitoring wells (MW101 to MW103 and MW106), conducted Single Well Response Test (SWRT), collected a groundwater sample for laboratory testing, provided assessment of groundwater-surface interaction in the vicinity of the existing pond and determined the connectivity between the pond and central.

To achieve the investigation objectives, BIG proposed and completed 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 nine (9) boreholes (BH201 to BH209) to a maximum depth of 20.3 m bgs and installation of nine (9) monitoring wells (MW201 to MW209);
d) Perform slug test at selected monitoring wells to assess the hydraulic characteristics of the saturated soils at the Site;
e) Evaluate the information collected during the field investigation program, including borehole geological information, particle size distribution, groundwater level measurements and groundwater water quality;
f) Preparation of site plan, cross section, geological mapping, and groundwater contour mapping for the Site;
g) Re-assessment of construction dewatering flow rates;
h) Re-assessment of long-term foundation sub-drain flow rates;
i) The preparation of a Supplemental Hydrogeological Investigation Report.

1.4 Previous Report

1.4.1 BIG Preliminary Geotechnical Investigation

BIG completed a Slope Stability Assessment at the Site at 1280 Dundas Street West, dated June 20, 2018 consisted of advancement of seven (7) boreholes up to maximum depth of 12.6 m bgs, installation of five (5) piezometers (BH/MW2 to BH/MW4, BH/MW6 and BH/MW7). It concluded that the building walls and footing must be at least 7 m away from the top of the existing slope. Footings must to be founded below an imaginary 3 horizontal to 1 vertical line drawn up from the face of the slope at the bedrock surface.

2 Regional Setting

2.1 Regional Physiography

The Study area is located in the South Slope physiographic region of Southern Ontario known as the till plains (drumlinized) (Chapman & Putnam, 2007). Figure 2 shows the physiographic regions of southern Ontario around the Site.

The topography of the area is generally described as a gradual downward slope towards Lake Ontario. The overburden immediately below ground surface within the South Slope generally consists of clayey silt till and silty clay till and at depth consists of alternating deposits of dense lacustrine sands and silts and over consolidated lacustrine clays and clay tills overlying the bedrock.

2.2 Regional Geology

The surficial geology of the immediate area around the Site is described as till consisting of clay to silt-textured till (derived from glaciolacustrine deposits or shale). The surficial geology for the Site and surrounding areas is shown on Figure 3.

Bedrock of the region corresponds to the Queenston Formation consisting of shale, limestone, dolostone, and siltstone. The bedrock is expected at depths of approximately 1.5 to 6.1 m bgs at the Site.

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.

3 Site Setting

3.1 Site Topography and Drainage

The Site is irregular in shape and has an area of 36,500 m^2 in size and is currently vacant. The Site is covered with grass and trees. Based on the elevation survey conducted by BIG, the Site has an elevation range between 151.77 m and 149.95 m above sea level (asl).

3.2 Local Surface Water Features

The Site does not feature any surface water bodies on or immediately adjacent to the Site. The closest surface water body to the Site is the Sixteen Mile Creek approximately 80 m north of the Site. Lake Ontario is located approximately 6 km southeast of the Site. The Site is not within the provincial environmental significant area.

3.3 MECP Water Well Review

Well Records from the MECP Water Well Record (WWR) Database 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 that there were twenty (20) well records within a 500-m radius of the Site. All identified well records are marked on Figure 4. A summary of the Water Well Records is included in Appendix B. A review of the records indicate that the majority of the wells were classified as supply wells. Two (2) supply water wells were identified for the Site and eight (8) supply water wells were identified within 500 m. The wells are located within residential development and commercial areas, no private well water user is expected.

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

The MECP maintains a database of all active Permit to Take Water (PTTW) and Environmental Activity and Sector Registry (EASR) items related to Construction Dewatering. There are expired Permit to Take Water registrations within 1 km of the Site and are summarized in Table B-2, Appendix B. There are no expired or existing EASR registration within 1 km of the Site. The location for each registration is shown on Figure 5.

4 Field Program

4.1 Borehole and Monitoring Well Details

BIG advanced nine (9) boreholes (BH201 to BH209) to a maximum depth of 20.3 m bgs between September 16 and 23, 2021 and instrumented all boreholes with a monitoring well (MW201 to MW209). The boreholes were advanced by using a truck mounted drill rig using steam 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 and for laboratory testing.

The following monitoring wells were previously installed at the Site:

a) Four (4) monitoring wells (BH/MW101 to BH/MW103 and BH/MW106) installed by BIG in 2019.
b) Five (5) monitoring wells (BH/MW2 to BH/MW4, BH/MW6 and BH/MW7) installed by BIG in 2018.

Figure 6 is a detailed Borehole/Monitoring Well Location Plan of the Site. The borehole records and monitoring well construction details are included 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 boundaries indicated on the borehole 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.

Layer	Description
Topsoil	A surficial veneer of topsoil was encountered at all borehole locations. The thickness of the topsoil ranged from 50 mm to 180 mm. Topsoil across the Site is expected to be variable and may vary in thickness.
Fill	Fill was encountered below the surficial topsoil in BH/MW201 and BH/MW203 to BH/MW209 and extended to depths of between 0.2 m and 1.5 m bgs. The fill generally consisted of silty clay to clayey silt with inclusions of gravel and trace organic staining or some rootlets.
Clayey silt to silty clay (glacial) till	Clayey silt to silty clay (glacial) till was encountered below the surficial topsoil in BH/MW202 or underneath the fill in BH/MW201 and BH/MW203 to BH/MW209. Sand and gravel sized particles, and weathered shale are present throughout the clayey silt to silty clay (glacial) till matrix. The till extended to a depth ranging from 1.5 to 7.6 m bgs, which turned into a till/shale complex transition zone. This zone is typically present above the shale bedrock and is characterized by a mixture of clayey silt to silty clay till and highly weathered to weathered shale.
Shale bedrock	Shale bedrock was contacted below the till/shale complex deposit in all boreholes. The bedrock was encountered at a depth of approximately 1.5 to 7.7 m below ground surface.

4.3 Water Level Monitoring

Water levels at each of the borehole and monitoring well locations were recorded both during the initial drilling and after installation. A summary of all water level observations is included below in Table 4-1. Groundwater was observed in all monitoring wells on September 30, 2021 except BH/MW101 and BH/MW103, depths to water ranged from 1.46 m to 6.51 m bgs. Groundwater produces a continuous surface across the Site that is situated at an elevation of between 149.46 m and 144.80 m above sea level (asl).

Table 4-1: Monitoring Well Details and Water Level Elevations

Well ID	Ground Elevation (m asl)	Well Depth (m bgs)	November 19, 2019		November 25, 2019		December 2, 2019		September 30, 2021	
			Water Level (m bgs)	Elevation (m asl)	Water Level (m bgs)	Elevation (m asl)	Water Level (m bgs)	Elevation (m asl)	Water Level (m bgs)	Elevation (m asl)
BH/MW101	150.97	3.0	2.83	148.14	Dry	Dry	Dry	Dry	Dry	Dry
BH/MW102	151.08	6.7	6.58	144.50	4.50	146.58	3.90	147.18	4.29	146.79
BH/MW103	151.60	3.0	Dry	Dry	3.32	148.28	3.09	148.51	Dry	Dry
BH/MW106	150.62	3.0	0.74	149.88	0.69	149.93	0.18	150.44	1.46	149.16
BH/MW2	151.77	9.0	4.54	147.23	4.34	147.43	4.20	147.57	Inaccessible	
BH/MW3	151.12	8.6	3.81	147.31	3.60	147.52	3.50	147.62	4.26	146.86
BH/MW4	151.34	7.6	3.59	147.75	3.44	147.90	3.29	148.05	4.05	147.29
BH/MW6	151.31	9.6	3.58	147.73	2.23	149.08	2.01	149.30	6.51	144.80
BH/MW7	150.86	6.2	1.13	149.73	1.06	149.80	0.63	150.23	5.62	145.24
BH/MW201	151.71	6.1	-	-	-	-	-	-	2.25	149.46
BH/MW202	151.18	19.8	-	-	-	-	-	-	5.19	145.99
BH/MW203	150.81	6.1	-	-	-	-	-	-	3.97	146.84
BH/MW204	150.76	6.1	-	-	-	-	-	-	2.14	148.62
BH/MW205	150.79	6.1	-	-	-	-	-	-	1.96	148.83
BH/MW206	150.85	6.1	-	-	-	-	-	-	2.30	148.55
BH/MW207	151.27	6.1	-	-	-	-	-	-	2.40	148.87
BH/MW208	151.77	6.1	-	-	-	-	-	-	5.54	146.23
BH/MW209	150.93	6.1	-	-	-	-	-	-	3.50	147.43

An interpreted shallow groundwater contour map for the monitoring well water level measurements recorded on September 30, 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 in the east direction.

Seasonal variability can produce significant changes to the static water level. It has been observed that ground water can rise and lower in response to changing weather and climate. It is also likely that some wells may take prolonged periods of time to equilibrate and provide true representative groundwater levels.

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. Single Well Response Test (SWRT) analysis was conducted at selected monitoring well.

During the SWRT, a slug of water was instantaneously removed from the well and the response to the water level was recorded. The hydraulic conductivity values for each of the tested wells were calculated from the SWRT data using Aqtesolv Software and the Hvorlsev 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 4-2:

Table 4-2: Summary of Hydraulic Conductivity (K) Testing Results

Monitoring Well	Well Depth (m bgs)	Hydraulic conductivity (m/s)
BH/MW106	3.0	3.53×10^{-7}
BH/MW102	6.7	2.57×10^{-9}
BH/MW201	6.1	5.18×10^{-10}
BH/MW202	18.3	1.54×10^{-9}
BH/MW203	6.1	7.06×10^{-7}
BH/MW204	6.1	5.95×10^{-6}
BH/MW205	6.1	4.27×10^{-5}
BH/MW206	6.1	4.86×10^{-7}
BH/MW207	6.1	1.68×10^{-6}
BH/MW209	6.1	7.53×10^{-9}
Highest K value within the vicinity of the basement (BH/MW203) (m/s)		7.06×10^{-7}

The SWRT provides 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 Oakville Storm Sewer during dewatering activities, one (1) groundwater sample was collected from BH/MW106 on November 19, 2019. 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 Sewers and Combined Sewers Discharge requirements of The Regional Municipality of Halton Sewer Use By-Law (By-Law No. 2-03); 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 (COA) and chain of custody are enclosed in Appendix D.

The laboratory COA show that there were no exceedances against the Table 1- Limits for Sanitary Sewers and Combined Sewers Discharge.

When compared against the more stringent Table 2 – Limits for Storm Sewer Discharge, the sample indicated exceedances for total suspended solid (TSS) and total manganese. A summary of the exceedances is provided in Table 4-3.

Table 4-3: Summary of Analytical Results

Parameter	Limits for Halton Sanitary and Combined Sewer Discharge (mg/L) (Table 1)	Limits for Oakville Storm Sewer Discharge (mg/L) (Table 2)	Concentration for BH/MW106 (mg/L) (November 19, 2019)
Total Suspended Solids (TSS)	350	15	**63**
Total Manganese (Mn)	5	0.05	**0.18**

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

If the groundwater encountered during excavation activities is discharged to the Town of Oakville storm sewer, it will require pre-treatment prior to discharge. Discharge water to the sanitary and combined sewer does not require pre-treatment prior to discharge.

5 Temporary Construction Dewatering

5.1 Construction Dewatering Requirements

Based on the architectural drawings prepared by Icke Brochu, dated September 10, 2021, the proposed development will consist of an eight (8)-storey apartment building with one (1) level of basement and four (4) blocks of slab-on-grade ILU. Based on A101, Site Plan & Statistics, prepared by Ick Brochu, dated September 10, 2021, the finished grade for the slab-on-grade ILU blocks will be raised approximately 0.5 to 1.2 m. The depths to ground water ranged from 1.46 m to 6.51 m bgs on September 30, 2021. Based on the groundwater levels and finished grade of the slab-on-grade ILU blocks, groundwater will not be encountered at the slab-on-grade ILU blocks. The construction and long-term dewatering estimates are considered for the proposed basement at the apartment building.

Based on A402, Building Elevations, prepared by Icke, dated September 10, 2021, the basement finished floor elevation (FFE) is 148.75 m asl and the basement is situation in the northwest portion of the Site. The conventional footing elevation is assumed approximately 2.0 m below the FFE. The groundwater table ranged from 149.46 m and 144.80 m asl on September 30, 2021. For conservative purpose, the construction dewatering calculation is based on an open cut excavation of the present time. To excavate under dry conditions, the water level is anticipated to be lowered approximately 1.0 m below the excavation depth.

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.

Table 6-1 Dewatering Estimate Assumptions

Input Parameter	Values	Notes
Surface Elevation (m asl)	152.15	Based on A401, Building Elevations, prepared by Icke Brochu, dated September 10, 2021
Basement FFE (m asl)	148.75	Based on A401, Building Elevations, prepared by Icke Brochu, dated September 10, 2021
Footing Elevation (m asl)	146.75	Assumed 2 m below FFE
Dewatered Elevation Target (m asl)	145.75	Approximate 1 m below footing elevation
Groundwater Elevation (m asl)	149.46	Highest groundwater elevation measured on Site within the basement area (September 30, 2021)
Estimated Excavation Area	70 m x 30 m	Based on A201, Basement Floor Plan, prepared by Icke Brochu, dated September 10, 2021
Hydraulic Conductivity (m/s)	7.06×10^{-7}	Highest K value in the vicinity of basement

5.2 Dewatering Flow Rate Equation

The Dupuit equation for steady flow from a linear source on both sides of a rectangular slot of an excavation through an unconfined aquifer resting on a horizontal impervious surface was used to obtain a flow rate estimate, and is expressed as follows:

$$Q_w = \frac{K(x + a)(H^2 - h^2)}{Lo}$$

Where:

Q_w = Rate of pumping (m^3/s)
x = Length of excavation (m)
a = Width of excavation (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)
Lo = Distance to Line Source (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.

5.3 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 linear flow is calculated based on the Sichardt equation, which is described as follows:

$$\mathrm{Ro} = 1750\ (\mathrm{H} - \mathrm{h})\sqrt{\mathrm{K}}$$

Where:

K = Hydraulic conductivity (m/s)
H = Static Saturated Head (m)
h = Dynamic Saturated Head (m)

Based on the Sichardt equation and the highest K value, the ROI is approximately 5.5 m from the side of the excavation for linear flow (Lo=Ro/2). The ROI calculation is provided in Appendix E.

5.4 Rainfall

The dewatering rates at the Site should also include removing direct input of rainwater into excavation.

A 10 mm rain event was utilized for the estimate. Given that the total area of the excavation is approximately 70 m x 30 m, the estimated volume of direct rainwater to be collected in the excavation is approximately 21,000 L for a 10 mm rainfall event. The calculation for the rainfall input estimate is included in Table E-1, in Appendix E. This rate should be considered contingency volume subject to the timing and season of the construction.

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 6-2 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 3 (L/day)	Total Construction Dewatering Flow Rate including Rainfall (L/day)
Excavation Area	32,000	96,000	117,000

Construction dewatering flow rate estimates are provided in Table E-2, in Appendix E.

The peak construction dewatering flow rate includes a factor of safety of three (3) to account for 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 volumes does exceed the 50,000 L/day limit, an EASR for construction dewatering is 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 (increase to planned excavation depths, widening of excavations, etc.), the dewatering estimates must be revised to include and reflect future changes

5.6 Environmental Activity and Sector Registry

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). Therefore, it is necessary to register the construction dewatering under the EASR guidelines, the peak construction discharge rate for is 117,000 L/day. The limit for water taking under an EASR is 400,000 L/day.

6 Long Term Discharge Estimate

6.1 Long-Term Dewatering Assumptions

Given that the groundwater level is above foundation depths for the development, a permanent foundation sub-drain is recommended for conventional footing. It is assumed that the below grade structure will feature a perimeter drain and sub-drain system installed at approximately 0.5 m below the basement floor elevation. Table 6-1 presents the assumptions used to calculate the long-term drainage rate estimates.

Table 7-1 Dewatering Estimate Assumptions

Input Parameter	Site	Notes
Surface Elevation (m asl)	152.15	Based on A401, Building Elevations, prepared by Icke Brochu, dated September 10, 2021
Basement FFE (m asl)	148.75	Based on A401, Building Elevations, prepared by Icke Brochu, dated September 10, 2021
Groundwater Elevation (m asl)	149.46	Highest groundwater elevation measured on Site within the basement area (September 30, 2021)
Foundation Elevation	148.25 m asl	Assumed 0.5 m below the basement floor level
Sub-drain Elevation Target	148.25 m asl	Assumed 0.5 m below the basement floor level
Drainage Dimensions	70 m x 30 m	Based on A201, Basement Floor Plan, prepared by Icke Brochu, dated September 10, 2021
Hydraulic Conductivity (m/s)	7.06×10^{-7}	Highest K value in the vicinity of basement

6.2 Rainfall

The long-term discharge volume should also account for rainwater seepage into the foundation drain.

A 10 mm rain event was utilized for the estimate. It was also assumed that the radius of impact for rainwater seepage would be approximately 10 m from the side of basement. The estimated volume of rainwater seepage to be collected in the drainage system is approximately 11,000 L for a 10 mm rainfall event. The calculation for the rainfall input estimate is included in Table F-1, in Appendix F. This rate should be considered contingency volume subject to the climate of the area.

6.3 Long-Term Perimeter Drain Flow Rate Estimate

Based on the assumptions provided in this report (outlined in Section 6.1), the results of the long-term discharge volume estimate are summarized below:

Table 7-2 Summary of Long-Term Discharge Flow Rate.

Flow Rate (Flow into Sub-drain after initial dewatering stages)	Long-Term Peak Flow Rate including Rainfall (L/day)	Notes
Flow into sub-drain after initial dewatering stages	20,000	Long term sub-drain flow value rounded based on Dupuit's equation including flow from all sides. Safety factor of 3 was used.

The results for the estimation are available in Appendix F, Table F-2. The maximum flow rate estimates represent short term events and are not indicative of long-term continuous contributions to the drainage system. Intermittent cycling of sump pumps and seasonal fluctuation in groundwater regimes should be considered for pump specifications.

It should be noted that the dewatering estimate provided in this report are based on the proposed building information available at this time.

The laboratory COA show that there were no exceedances against the Table 1- Limits for Sanitary Sewers and Combined Sewers Discharge.

When compared against the more stringent Table 2 – Limits for Storm Sewer Discharge, the sample indicated exceedances for total suspended solid (TSS) and total manganese.

If the groundwater encountered during excavation activities is discharged to the Town of Oakville storm sewer, it will require pre-treatment prior to discharge. Discharge water to the sanitary and combined sewer does not require pre-treatment prior to discharge.

7 Potential Groundwater Impacts

7.1 Impacts to Nearby Groundwater Users

The Site lies within a sub-urban area of Oakville, based on the MECP WWR database, two (2) supply water wells were identified for the Site and eight (8) supply water wells were identified within 500 m. The wells are located within residential and commercial areas, no private well water user is expected. There are no expected impacts to nearby groundwater user's due to active dewatering.

8 Conclusions

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

a) Based on the architectural drawings prepared by Icke Brochu, dated September 10, 2021, the proposed development will consist of an eight (8)-storey apartment building with one (1) level of partial basement and four (4) blocks of Independent Living Units (ILU);
b) The Site is located within a physiographic region of South Slope known as the till plains (drumlinized);
c) The surficial geology around the Site is described as till consisting of clay to silt-textured till (derived from glaciolacustrine deposits or shale);
d) The MECP Water Well Records indicate that there are twenty (20) well records within a 500-m radius of the Site. Two (2) supply water wells were identified for the Site and eight (8) supply water wells were identified within 500 m. The wells are located within residential and commercial areas, no private well water user is expected;
e) Groundwater produces a continuous surface across the Site that is situated at an elevation of between 149.46 m and 144.80 m asl (September 30, 2021 readings);
f) Based on the water level measurements obtained, the inferred direction of groundwater flow within the shallow overburden formation across the Site is towards the east;
g) The highest hydraulic conductivity for the overburden within the vicinity of the basement is 7.06 x 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 activities is approximately 117,000 L/day;
i) An EASR registration is recommended prior to construction activities;
j) The long-term peak flow rate of the foundation sub-drain including rainfall is estimated to be approximately 20,000 L/day;
k) The laboratory CofA shows that no exceedance under Table 1 – Limits for Sanitary Sewers and Combined Sewers Discharge;
l) When compared against the more stringent Table 2 – Limits for Storm Sewer Discharge, the sample indicated exceedances for total suspended solid (TSS) and total manganese; and,
m) If the groundwater encountered during excavation activities is discharged to the Town of Oakville storm sewer, it will require pre-treatment prior to discharge. Discharge water to the sanitary and combined sewer does not require pre-treatment prior to discharge.

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.

9 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.

This report was prepared for the exclusive use of Delmanor West Oak Inc. This report may not be reproduced in whole or in part, without the prior written consent of BIG, or used or relied upon in whole or in part by other parties for any purpose. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. BIG accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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

Yours truly,

B.I.G. Consulting Inc.

Peilin (Eileen) Liu, M.Env.Sc., P.Geo
Project Manager

Prem Manicks, P.Geo.
Partner

10 References

Basement Floor Plan and Building Elevations. Drawing No: A201 and A401, prepared by Icke Brochu Architects Inc. for Delmanor West Oak Inspired Retirement Living, dated September 10, 2021.

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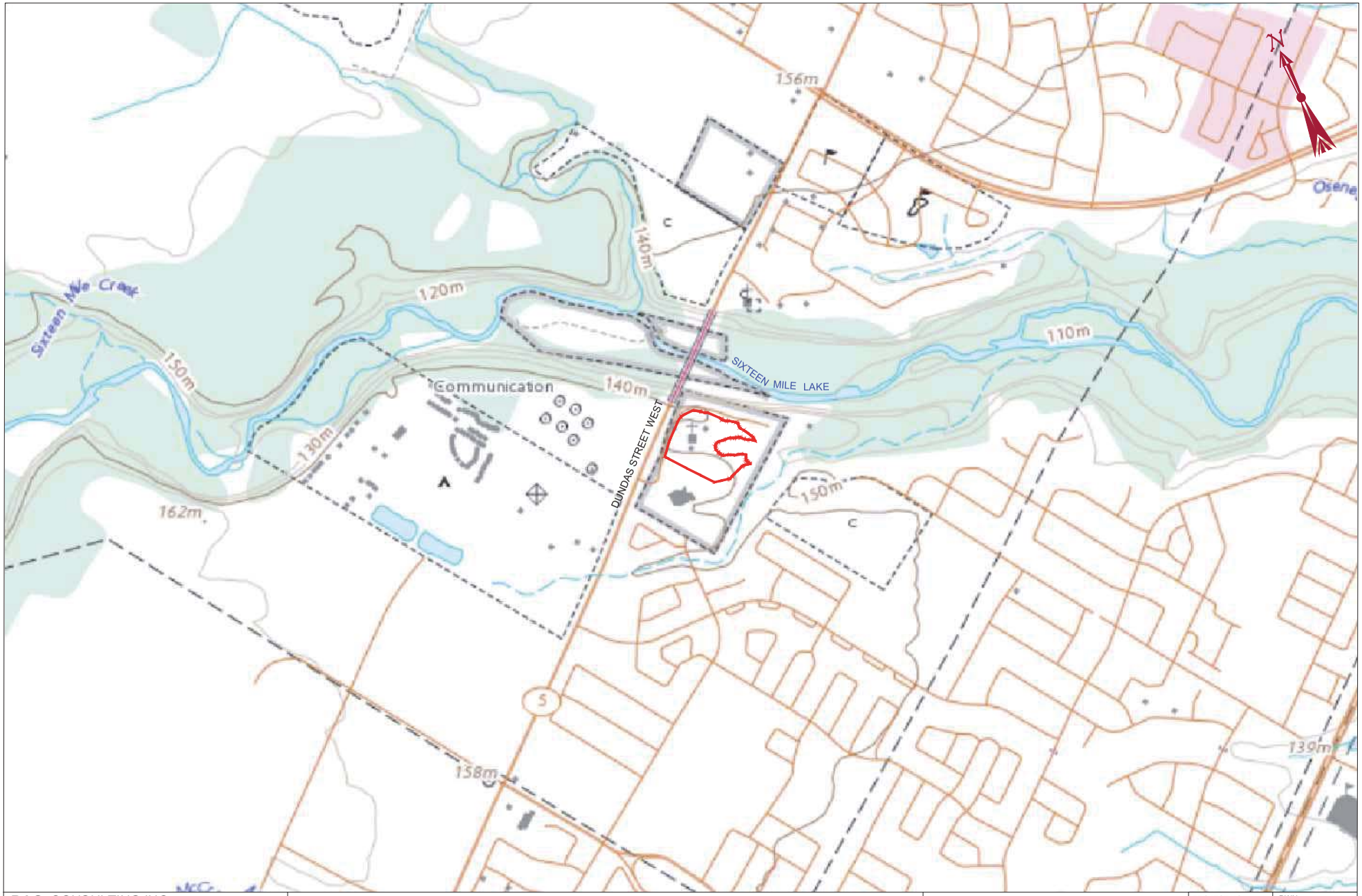
FIGURES



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LEGEND

SITE BOUNDARY

SCALE

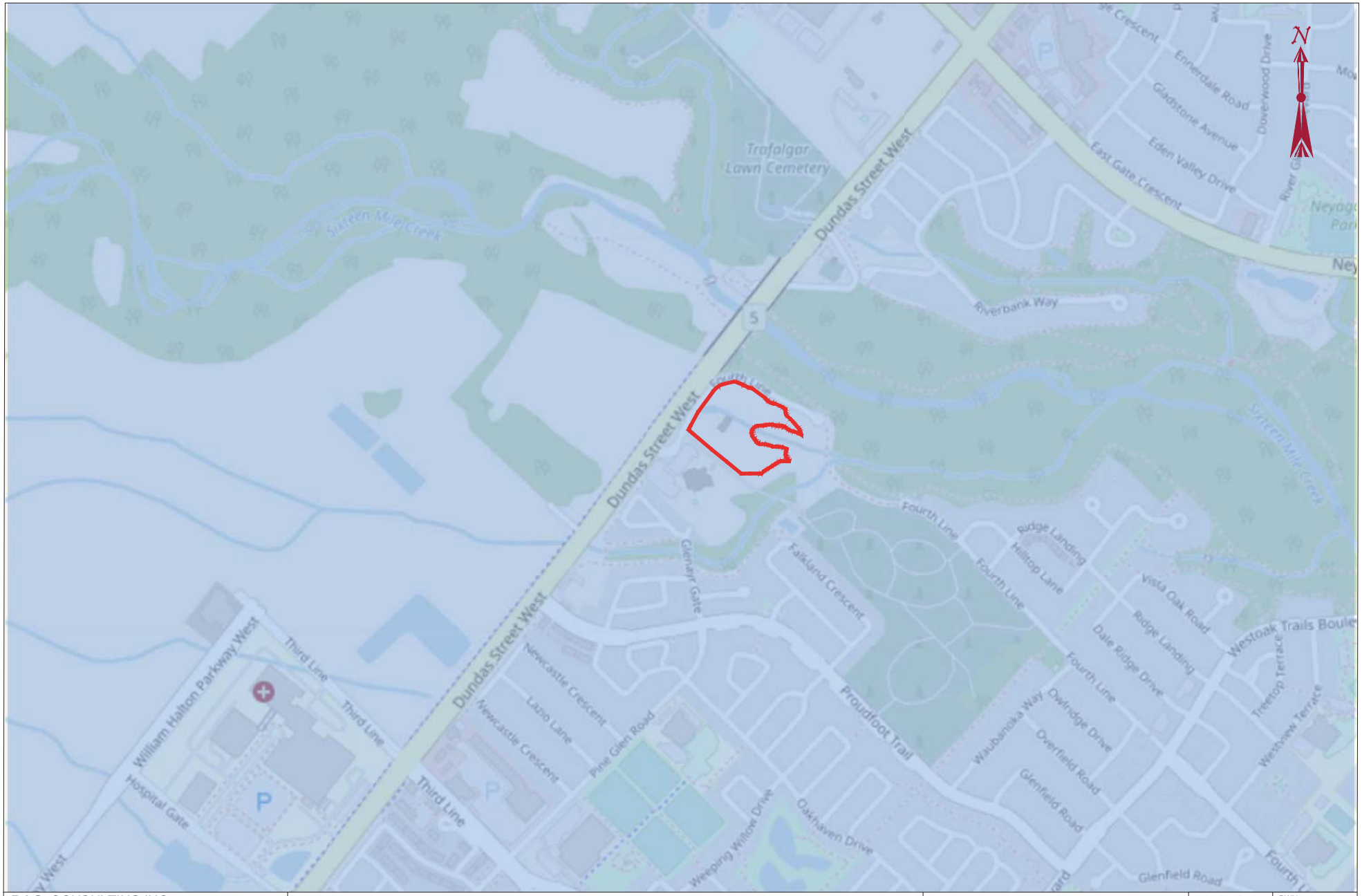
100m 0m 100m 200m 300m 400m 500m

IMAGERY OBTAINED FROM TOPORAMA, NATURAL RESOURCES CANADA, 2017

TITLE AND LOCATION

SITE LOCATION PLAN
HYDROGEOLOGICAL INVESTIGTION
1260-1280 DUNDAS STREET WEST, OAKVILE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185E	O.A.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
MARCH 2022	1



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LEGEND

SITE BOUNDARY

SOUTH SLOPE

NOTES:

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

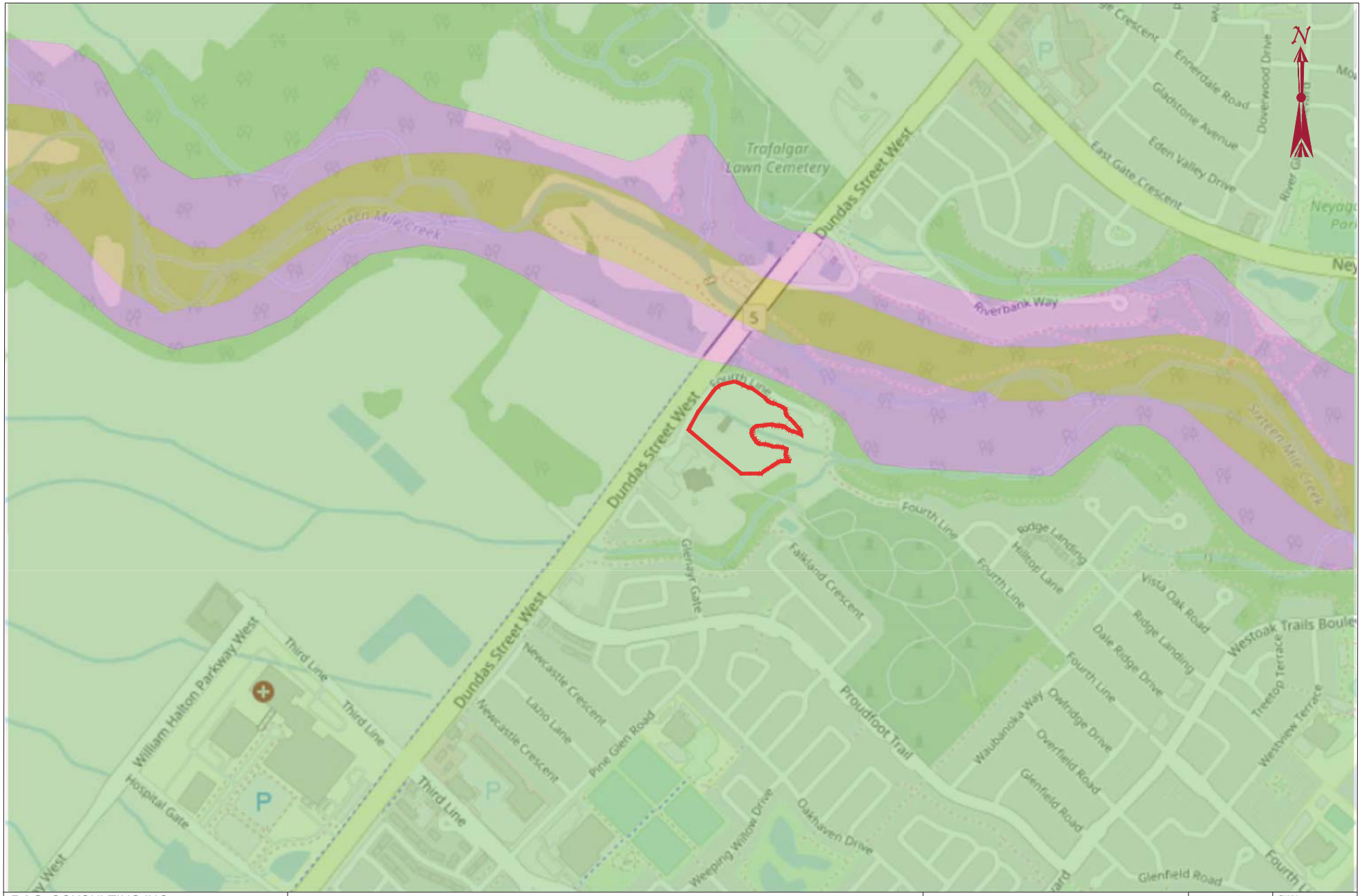
SCALE

100m 0m 100m 200m 300m 400m 500m

TITLE AND LOCATION

PHYSIOGRAPHIC REGIONS OF SOUTHERN ONTARIO
HYDROGEOLOGICAL INVESTIGTION
1260-1280 DUNDAS STREET WEST, OAKVILE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185E	O.A.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
MARCH 2022	2



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LEGEND

- SITE BOUNDARY
- TILL
- PALEOZOIC BEDROCK
- MODERN ALLUVIAL DEPOSITS

NOTES:

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

SCALE

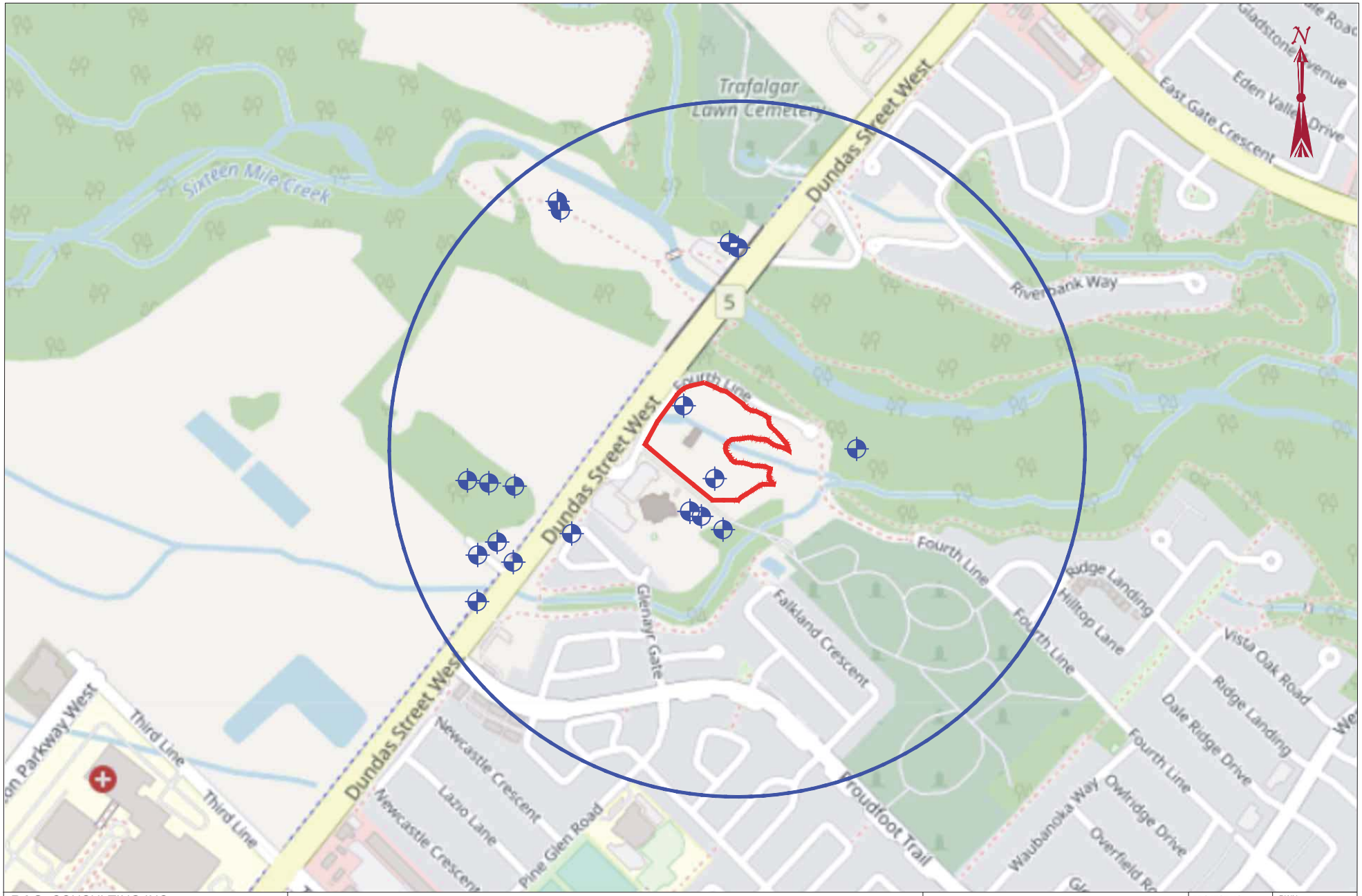
100m 0m 100m 200m 300m 400m 500m

TITLE AND LOCATION

SURFICIAL GEOLOGY OF SOUTHERN ONTARIO HYDROGEOLOGICAL INVESTIGTION

1260-1280 DUNDAS STREET WEST, OAKVILE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185E	O.A.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
MARCH 2022	3



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LEGEND

- SITE BOUNDARY
- WELL RECORD STUDY AREA BOUNDARY
- WELL RECORD LOCATION (2019)

SCALE

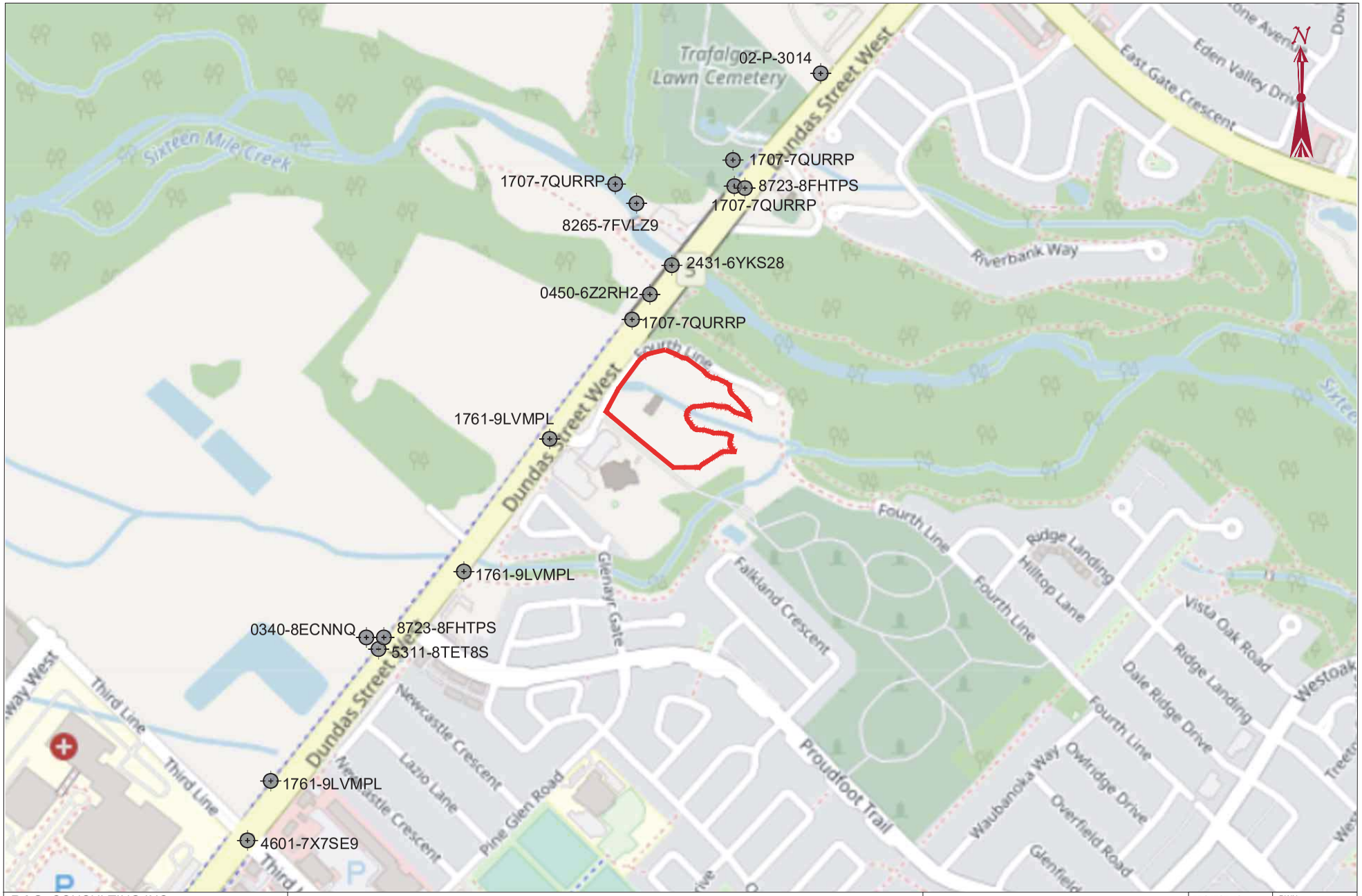
0m 100m 400m

IMAGERY OBTAINED FROM OPENSTREETMAP, 2016

TITLE AND LOCATION

MECP WATER WELL LOCATIONS
HYDROGEOLOGICAL INVESTIGTION
1260-1280 DUNDAS STREET WEST, OAKVILE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185E	O.A.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
MARCH 2022	4



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LEGEND

SITE BOUNDARY

APPROXIMATE LOCATION OF PTTW RECORD

SCALE

0m 100m 400m

IMAGERY OBTAINED FROM OPENSTREETMAP, 2016

TITLE AND LOCATION

PTTW RECORD LOCATIONS
HYDROGEOLOGICAL INVESTIGTION
1260-1280 DUNDAS STREET WEST, OAKVILE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185E	O.A.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
MARCH 2022	5

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LEGEND

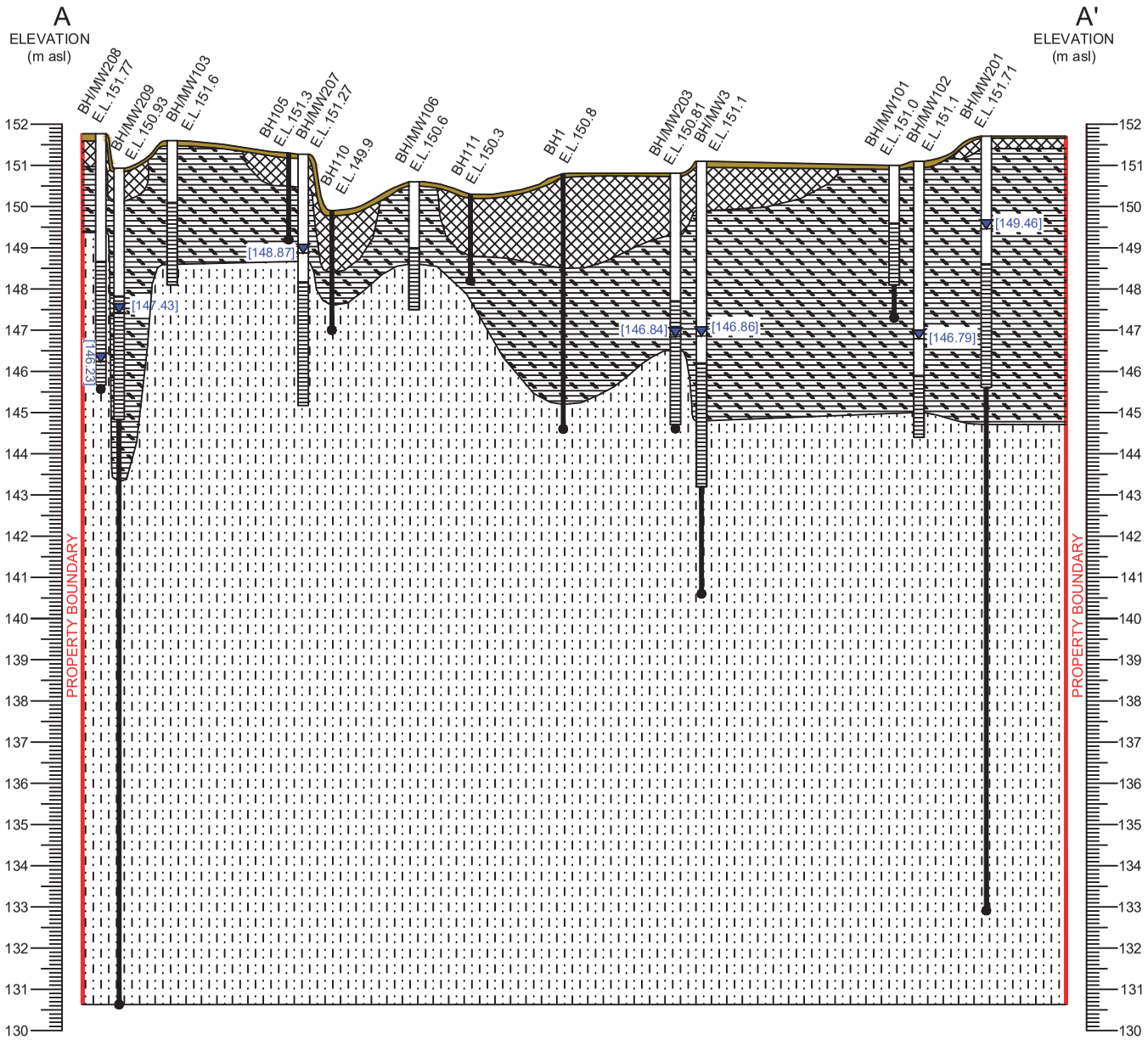
- SITE BOUNDARY
- EXISTING BUILDING
- APPROXIMATE BOREHOLE LOCATION (BIG, 2018)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION (BIG, 2018)
- APPROXIMATE BOREHOLE LOCATION (BIG, 2019)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION (BIG, 2019)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION AT 6 MBGS (BIG, 2021)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION AT 20 MBGS (BIG, 2021)
- A A' CROSS SECTION A-A'

NOTE: PLAN A101 OBTAINED FROM DELMANOR, DATED SEPTEMBER 10, 2021.

TITLE AND LOCATION

BOREHOLE/MONITORING WELL LOCATION PLAN
HYDROGEOLOGICAL INVESTIGATION
1260-1280 DUNDAS STREET WEST, OAKVILE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185E	O.A.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
MARCH 2022	6



N

HORIZONTAL SCALE

0m 10m 40m

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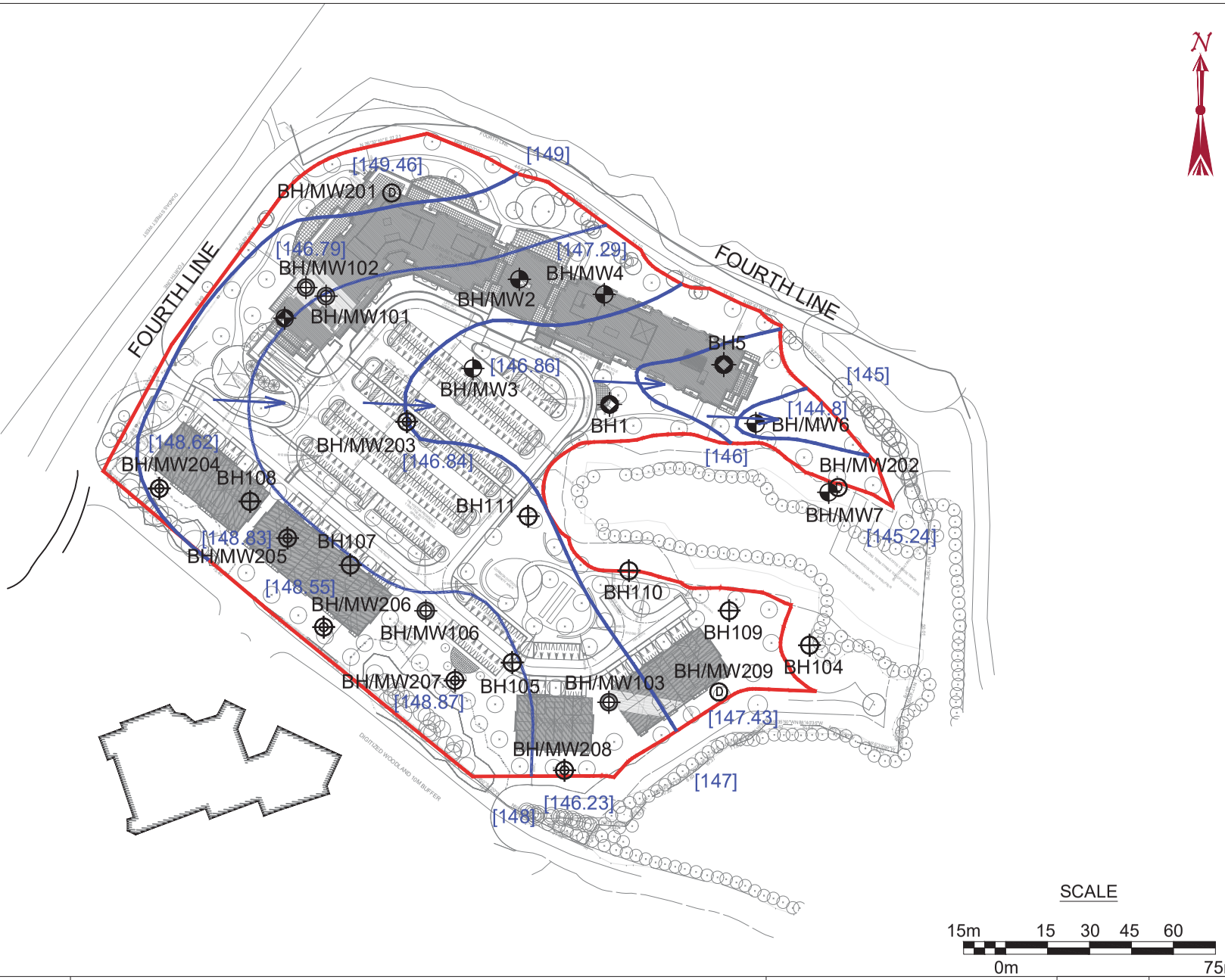
LEGEND

- TOP SOIL
- FILL
- CLAYEY SILT TILL / SILTY CLAY TILL
- SHALE
- WATER LEVEL
- [xx.xx] WATER LEVEL MEASUREMENT (SEPTEMBER 30, 2021)

TITLE AND LOCATION

GEOLOGICAL CROSS SECTION A-A'
HYDROGEOLOGICAL INVESTIGTION
1260-1280 DUNDAS STREET WEST, OAKVILE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185E	O.A.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
MARCH 2022	7



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LEGEND

- SITE BOUNDARY
- EXISTING BUILDING
- APPROXIMATE BOREHOLE LOCATION (BIG, 2018)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION (BIG, 2018)
- APPROXIMATE BOREHOLE LOCATION (BIG, 2019)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION (BIG, 2019)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION AT 6 MBGS (BIG, 2021)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION AT 20 MBGS (BIG, 2021)
- [152] GROUNDWATER ELEVATION (MASL)
- INTERPRETED DIRECTION OF GROUNDWATER FLOW
- GROUNDWATER CONTOUR
- [XXX.XX] WATERLEVEL MEASUREMENT (September 30, 2021)

NOTE: PLAN A101 OBTAINED FROM DELMANOR, DATED SEPTEMBER 10, 2021.

TITLE AND LOCATION

GROUNDWATER CONTOUR MAP
HYDROGEOLOGICAL INVESTIGATION
1260-1280 DUNDAS STREET WEST, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185E	O.A.
SCALE	CK.
AS NOTED	E.L.
DATE	FIG NO.
MARCH 2022	8

APPENDIX A: BOREHOLE LOGS

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RECORD OF BOREHOLE No BH/MW101

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

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
151.0											
150.9 / 0.1	**TOPSOIL:** 100 mm										
	CLAYEY SILT TILL/SILTY CLAY TILL: trace gravel, disturbed above 0.6 m, rootlets, brown, moist, very stiff to hard (Pocket Penetrometer: > 225 kPa)		1	SS1	6						PAHs, Pesticides, Herbicides Analysis; Metals & Inorganics Analysis
			2	SS2	24		150				
			3	SS3	32		149				
	- brown to red weathered shale inclusions below 2.29 m		4	SS4	43		148				
147.3			5	SS5	48						
3.7	**Borehole terminated at 3.7 m** Notes: 1. Open to 3.7 m bgs upon completion of drilling. 2. Dry upon completion of drilling. 3. Well was dry on November 25, 2019. 4. Well was dry on December 2, 2019.										

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

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RECORD OF BOREHOLE No BH/MW102

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

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
151.1											
151.0 / 0.1	**TOPSOIL:** 125 mm										
	CLAYEY SILT TILL/SILTY CLAY TILL: disturbed upper 300 mm, rootlets, reddish brown, moist, very stiff to hard (Pocket Penetrometer: > 225 kPa)		1	SS1	9						
			2	SS2	32		150				
			3	SS3	41		149				
			4	SS4	52		148				
	- rock fragments below 3.05 m		5	SS5	81	▽	147				
	- reddish brown and grey below 4.57 m		6	SS6	36		146				
145.0 / 6.1	-shale-till complex below 6.0 m **SHALE:** weathered, red, damp		7	SS7	100		145				
144.4 / 6.7	**Borehole terminated at 6.7 m** Notes: 1. Open to 6.7 m bgs upon completion of drilling. 2. Dry upon completion of drilling. 3. Water level was 4.5 m bgs on November 25, 2019. 4. Water level was 3.9 m bgs on December 2, 2019.										

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

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RECORD OF BOREHOLE No BH/MW103

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

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
151.6											
151.5 / 0.1	**TOPSOIL:** 125 mm										
	CLAYEY SILT TILL/SILTY CLAY TILL: disturbed upper 300 mm, brown, moist, very stiff to hard		1	SS1	6		151				
			2	SS2	19						
			3	SS3	36		150				
	- reddish brown, shale inclusions below 2.29 m		4	SS4	46		149				
148.6											
3.0	**SHALE:** weathered, red, damp		5	SS5	100						
148.1											
3.5	**Borehole terminated at 3.5 m** Notes: 1. Open to 3.5 m bgs upon completion of drilling. 2. Dry upon completion of drilling. 3. Water level was at 3.32 m bgs November 25, 2019. 4. Water level was as 3.09 m bgs on December 2, 2019.										

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

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RECORD OF BOREHOLE No BH104

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

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
150.6											
150.0 / 0.6	**TOPSOIL:** 50 mm										
	FILL: clayey silt to silty clay, trace organic staining, brown, moist		1	SS1	7		150				Metals & Inorganics, Pesticides, Herbicides Analysis PAHs Analysis
			2	SS2	8						
149.1											
1.5	**CLAYEY SILT TILL/SILTY CLAY TILL:** reddish brown, moist, stiff to hard (Pocket Penetrometer: > 225 kPa)		3	SS3	26		149				
			4	SS4	59		148				
147.7	-weathered shale inclusion below 2.7 m										
2.9	**SHALE:** highly weathered, red, damp		5	SS5	100		147				
146.9											
3.7	**Borehole terminated at 3.7 m** Notes: 1. Open to 3.7 m bgs upon completion of drilling. 2. Dry upon completion of drilling.										

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

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RECORD OF BOREHOLE No BH105

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

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
151.3											
151.2 / 0.1	**TOPSOIL:** 125 mm										
	FILL: clayey silt to silty clay, trace rootlets, brown, moist		1	SS1	4		151				PAHs, Pesticides, Herbicides Analysis
150.5 / 0.8	**CLAYEY SILT TILL/SILTY CLAY TILL:** reddish brown, moist, very stiff to hard		2	SS2	22		150		○		Metals & Inorganics Analysis
149.2			3	SS3	44				○		
2.1	**Borehole terminated at 2.1 m** Notes: 1. Open to 2.1 m bgs upon completion of drilling. 2. 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/MW106

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

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
150.6											
150.5 / 0.1	**TOPSOIL:** 100 mm										
	CLAYEY SILT TILL/SILTY CLAY TILL: disturbed upper 400 mm, rootlets, cobble, brown, moist, very stiff to hard (Pocket Penetrometer: > 225 kPa)		1	SS1	6		150				
			2	SS2	28						
			3	SS3	100		149				
148.6 / 2.0	-shale-till complex below 1.9 m **SHALE:** weathered, red, damp - limestone layers between 2 m and 3.1 m						148				
147.5											
3.1	**Borehole terminated at 3.1 m** Notes: 1. Open to 3.1 m bgs upon completion of drilling. 2. Dry upon completion of drilling. 3. Water level at 0.69 m bgs on November 25, 2019. 4. Water level at 0.18 m bgs on December 2, 2019.										

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

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RECORD OF BOREHOLE No BH107

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

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
150.8											
150.7 / 0.1	**TOPSOIL:** 125 mm										
	CLAYEY SILT TILL/SILTY CLAY TILL: disturbed upper 400 mm, rootlets, brown, moist, very stiff to hard (Pocket Penetrometer: > 225 kPa)		1	SS1	10		150				Metals & Inorganics, Pesticides, Herbicides Analysis PAHs Analysis
			2	SS2	34						
			3	SS3	32		149				
148.5 / 2.3	-shale-till complex below 2.2 m **SHALE:** weathered, red, damp		4	SS4	100		148				
147.7											
3.1	**Borehole terminated at 3.1 m** Notes: 1. Open to 3.1 m bgs upon completion of drilling. 2. Dry upon completion of drilling.										

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

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RECORD OF BOREHOLE No BH108

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.18 - 2019.11.18 | CHECKED BY F.C.

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
150.8											
150.7 / 0.1	**TOPSOIL:** 125 mm										
	CLAYEY SILT TILL/SILTY CLAY TILL: disturbed above 0.6 m, rootlets, reddish brown, moist, very stiff to hard		1	SS1	6		150		○		
			2	SS2	28						
149.3 / 1.5	**SHALE:** weathered, red, damp		3	SS3	100		149		○		
148.7 / 2.1	**Borehole terminated at 2.1 m** Notes: 1. Open to 2.1 m bgs upon completion of drilling. 2. Dry upon completion of drilling.										

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

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RECORD OF BOREHOLE No BH109

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.18 - 2019.11.18 | CHECKED BY F.C.

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
150.3											
150.0 / 0.1	**TOPSOIL:** 125 mm										
	FILL: silty clay to clayey silt, trace gravel, brown, pockets of black topsoil, very moist		1	SS1	10		150		○		
			2	SS2	11		149				
148.5									○		
1.8 / 148.2	**CLAYEY SILT TILL/SILTY CLAY TILL:** trace gravel, reddish brown, very moist, stiff		3	SS3	12						
2.1	**Borehole terminated at 2.1 m**										

Notes:
1. Open to 2.1 m bgs upon completion of drilling.
2. Dry upon completion of drilling.

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

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RECORD OF BOREHOLE No BH110

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.18 - 2019.11.18 | CHECKED BY F.C.

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
149.9											
149.8	**TOPSOIL:** 150 mm										
0.2	**FILL:** silty clay to clayey silt silt, some rootlets, reddish brown, very moist to moist		1	SS1	7						PAHs, Pesticides, Herbicides Analysis; Metals & Inorganics Analysis
			2	SS2	11		149				
148.4											
1.5	**CLAYEY SILT TILL/SILTY CLAY TILL:** silt pockets, reddish brown, moist, very stiff to hard (Pocket Penetrometer: > 225 kPa)		3	SS3	29		148				
147.6											
2.3	**SHALE-TILL COMPLEX:** red, damp, hard		4	SS4	100						
147.0											
2.9	-weathered shale at 2.9 m										
	Borehole terminated at 2.9 m										

Notes:
1. Open to 2.9 m bgs upon completion of drilling.
2. Dry upon completion of drilling.

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\circ^{3\%}$ STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH111

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.18 - 2019.11.18 | CHECKED BY F.C.

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
150.3											
150.2 / 0.1	**TOPSOIL:** 125 mm										
	FILL: silty clay to clayey silt, organic inclusions, some rootlets, reddish brown, moist		1	SS1	7		150				Metals & Inorganics Analysis
			2	SS2	11						PAHs, Pesticides, Herbicides Analysis
148.8							149				
1.5	**CLAYEY SILT TILL/SILTY CLAY TILL:** trace gravel, reddish brown, very moist, stiff to very stiff		3	SS3	27						
148.2											
2.1	**Borehole terminated at 2.1 m**										

Notes:
1. Open to 2.1 m bgs upon completion of drilling.
2. Dry upon completion of drilling.

$+^3, \times^3$: Numbers refer to Sensitivity

$\circ^{3\%}$ STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH1

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY A.B.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.22 - 2018.05.22 | 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
150.8											
150.7 / 0.1	**TOPSOIL:** 100 mm										
	FILL: clayey silt, trace gravel and organics, mottled reddish brown, moist		1	SS1	10				○		
	- trace rootlets at 0.8 m		2	SS2	4		150		○		
			3	SS3	8		149		○		
148.5 / 2.3	- 75 mm black organic layer at 2.0 m **CLAYEY SILT TILL:** trace gravel, reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		4	SS4	37		148		○		
147.8 / 3.1	**CLAYEY SILT TILL:** trace gravel, red shale inclusion, reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		5	SS5	57				○		
			6	SS6	55		147		○		
	- grey and very stiff below 4.6 m (Pocket Penetrometer: 200 kPa)		7	SS7	23		146		○ ○		
145.2 / 5.6	Till/Shale Complex below 5.5 m **SHALE:** weathered, red, damp		8	SS8	100		145				
144.7 / 6.1	**Borehole terminated at 6.2 m** Notes: 1. Open to 6.2 m bgs upon completion of drilling 2. Water at 4.1 m bgs upon completion of drilling		9	SS9	100				○		

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

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RECORD OF BOREHOLE No BH/MW2

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY A.B./F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.22 - 2018.05.23 | 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/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
151.8											
~~150.9~~ 0.1	**TOPSOIL:** 100 mm										
151.0	**FILL:** clayey silt, trace gravel, some rootlets, topsoil inclusions above 0.3 m, reddish brown, moist		1	SS1	6				○		
0.8	- 150 mm topsoil inclusion at 0.15m						151				
	CLAYEY SILT TILL: trace gravel, mottled, reddish brown, moist, very stiff, (Pocket Penetrometer: > 225 kPa)		2	SS2	18				○		
	- red shale inclusions and hard below 1.5 m		3	SS3	33		150		○		
			4	SS4	41		149		○		
			5	SS5	43				○		
147.2						▽	148				
4.6	**CLAYEY SILT TILL:** trace gravel, red shale inclusion, grey, moist, hard, (Pocket Penetrometer: > 225 kPa)		6	SS6	31		147		○		
			7	SS7	29		146		○		
			8	SS8	36		145		○		
144.4									○		
7.4	**SHALE:** weathered, red, damp		9	SS9	100		144				
			10	SS10	100		143		○		
141.1							142				
10.7	-----Run #1: 10.7 to 11.2 m RQD=81% Recovery=84%		1	CORE			141		○		
140.6	- red shale, interbedded grey shale										
11.2	- fractive along horizontal plane - minimal vertical cracking										
	-----Run #2: 11.2 to 12.6 m RQD=92% Recovery=100%		2	CORE			140				
139.1	- red shale, interbedded grey shale - minimal vertical fractures										
12.6	**Borehole terminated at 12.6 m**										

Notes:
1. Open to 12.6 m upon completion of drilling
2. Water at 3.2 m upon completion of drilling
3. Water level at 3.0 m bgs on June 13, 2018
4. Water level at 4.2 m bgs on December 2, 2019.

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

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RECORD OF BOREHOLE No BH/MW3

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY A.B.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.22 - 2018.05.22 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE
151.1							
150.9 / 0.0	**TOPSOIL:** 150 mm						151
0.2	**FILL:** clayey silt, trace gravel, rootlets, asphalt fragments, brown, moist		1	SS1	11		
149.9			2	SS2	7		150
1.2	**CLAYEY SILT TILL:** trace gravel, mottled, brown, moist, firm to very stiff, (Pocket Penetrometer: 225 kPa) - mottled, red shale inclusions and very stiff to hard below 1.5 m		3	SS3	27		149
148.1			4	SS4	33		
3.1	**CLAYEY SILT TILL:** trace gravel, mottled, red shale inclusion, orange-brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		5	SS5	65	▽	148
	- oxidized red and grey at 4.6		6	SS6	60		147
144.8	- Till/Shale Complex below 6.1 m		7	SS7	100		146
6.3	**SHALE:** weathered, red, damp		8	SS8	100		145
142.0							144
9.1	-----Run #1: 9.1 to 9.6 m RQD=22% Recovery=77% - weathered red shale - some mottling - vertical and horizontal fractures		1	CORE			143
141.5							142
9.6	-----Run #2: 11.2 to 12.6 m RQD=92% Recovery=100% - red shale, interbedded grey shale - minimal vertical fractures		2	CORE			141
140.0							140
11.2	**Borehole terminated at 11.2 m** Notes: 1. Open to 11.2 m bgs upon completion of drilling 2. Water at 2.5 m bgs upon completion of drilling 3. Water level at 2.7 m bgs on June 13, 2018. 4. Water level at 3.495 m bgs on December 2, 2019.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × 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/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

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

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RECORD OF BOREHOLE No BH/MW4

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.23 - 2018.05.23 | 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
151.3											
151.2 / 0.1	**TOPSOIL:** 125 mm		1	SS1	10		151		○		
	FILL: clayey silt, trace gravel, brown, moist										
	- mottled, inclusions of black organics, orange-brown at 0.8 m		2	SS2	6				○		
149.8							150				
1.5	**CLAYEY SILT TILL:** trace gravel, mottled, reddish brown, moist, very stiff to hard, (Pocket Penetrometer: > 225 kPa)		3	SS3	24				○		
			4	SS4	43		149		○		
			5	SS5	51	▽	148		○		
146.8											
4.6	**CLAYEY SILT TILL:** trace gravel, red shale inclusion, oxidized fissures, brown/reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		6	SS6	49		147		○		
	- grey and very stiff to hard at 6.1 m. (Pocket Penetrometer: > 225 kPa)		7	SS7	25		146				
143.7							145		○		
143.6 / 7.6	**SHALE:** weathered, red, damp		8	SS8	100		144		○		
	Borehole terminated at 7.6 m										

Notes:
1. Water at 3.0 m bgs upon completion of drilling
2. Open to 7.6 m bgs upon completion of drilling
3. Water level at 2.6 m bgs on June 13, 2018.
4. Water level at 3.295 m bgs on December 2, 2019.

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

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RECORD OF BOREHOLE No BH5

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.23 - 2018.05.23 | 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
151.2											
151.0 / 0.1	**TOPSOIL:** 125 mm										
	FILL: clayey silt, trace gravel, top soil inclusion, brown, moist		1	SS1	3		151		○		
150.2	- 125 mm granular fill at 0.8 m										
0.9	**CLAYEY SILT TILL:** trace gravel, reddish brown, moist, very stiff to hard, (Pocket Penetrometer: > 225 kPa)		2	SS2	26		150		○		
			3	SS3	44				○		
148.9							149				
2.3	**CLAYEY SILT TILL:** trace gravel, red shale inclusion, reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		4	SS4	54				○		
			5	SS5	54		148		○		
			6	SS6	42		147		○		
	- grey and very stiff below 6.1 m (Pocket Penetrometer 175 kPa)		7	SS7	18		146		○		
143.5							145				
7.6 / 143.3	**SHALE:** weathered, red, damp		8	SS8	100		144		○		
7.9	**Borehole terminated at 7.9 m** Notes: 1. Open to 7.9 m bgs upon completion of drilling 2. Water not measured 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

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.24 - 2018.05.24 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE
151.3							
150.9	**TOPSOIL:** 125 mm						
0.1	**POSSIBLE FILL:** clayey silt, trace gravel, rootlets, organic stains, reddish brown, moist		1	SS1	6		151
150.6							
0.8	**CLAYEY SILT TILL:** trace gravel, shale inclusion, reddish brown, moist, very stiff to hard (Pocket Penetrometer: > 225 kPa)		2	SS2	28		
			3	SS3	26	▽	150
	- hard below 2.3 m		4	SS4	31		149
			5	SS5	43		148
146.7							147
4.6	**CLAYEY SILT TILL:** trace gravel, red shale inclusions, brown, moist, very stiff to hard, (Pocket Penetrometer: > 225 kPa) - grey below 5.0 m		6	SS6	29		
			7	SS7	15		146
143.7							145
143.6	**SHALE:** weathered, red, damp		8	SS8	100		144
7.7	-----Run #1: 7.7 to 8.1 m RQD=40% Recovery=78% - weathered red shale, interbedded grey shale - one vertical fracture		1	CORE			
143.2							143
8.1	-----Run #2: 8.1 to 9.6 m RQD=94% Recovery=98% - red shale, interbedded grey shale - minimal vertical fractures - some horizontal fractures along planes - some interbedded clayey silt at 9.1 m		2	CORE			
141.7							142
9.6	**Borehole terminated at 9.6 m**						

Notes:
1. Open to 9.6 m bgs upon completion of drilling
2. Water at 1.09 m bgs upon completion of drilling
3. Water level at 2.8 m bgs on June 13, 2018.
4. Water level at 2.01 m bgs on December 2, 2019.

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH kPa
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × 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/m^3

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

$+^3, \times^3$: Numbers refer to Sensitivity

$\circ^{3\%}$ STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH/MW7

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.24 - 2018.05.24 | 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
150.9											
150.8 / 0.1	**TOPSOIL:** 100 mm										
	POSSIBLE FILL: clayey silt, reworked and distributed, trace rootlets and organic staining, brown, moist		1	SS1	3	▽			○		
150.1 / 0.8	**CLAYEY SILT TILL:** trace gravel, shale inclusions, reddish brown, moist, stiff to very stiff, (Pocket Penetrometer: > 225 kPa) - very stiff below 1.5 m		2	SS2	26		150		○		
			3	SS3	44		149		○		
	- hard below 2.3 m		4	SS4	54		148		○		
			5	SS5	54		147		○		
146.3 / 4.6	**CLAYEY SILT TILL:** red shale inclusions, reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		6	SS6	42		146		○		
144.8							145				
144.7 / 6.2	**SHALE:** weathered, red, damp		7	SS7	18				○		
	Borehole terminated at 6.2 m Notes: 1. Open to 6.2 m bgs upon completion of drilling 2. Water not measured completion of drilling 3. Water level at 2.0 m bgs on June 13, 2018. 4. Water level at 0.63 m bgs on December 2, 2019.										

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

RECORD OF BOREHOLE No. BH/MW201

Project Number:	BIGC-GEO-185E	Drilling Location:	See Borehole Location Plan	Logged by:	MV
Project Client:	Delmanor West Oak Inc.	Drilling Method:	96 mm Mud Rotary/ HQ Core	Compiled by:	MV
Project Name:	Geotechnical and Hydrogeological Assessment Update	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1280 Dundas Street, Oakville	Date Started:	16 Sep 21	Date Completed: 21 Sep 21	Revision No.: 0, 21/10/21

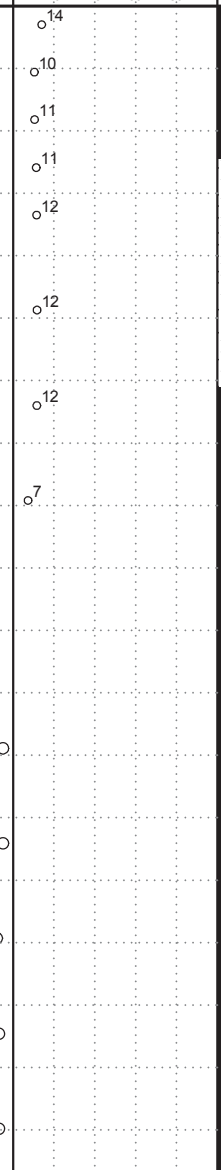
Geodetic Ground Surface Elevation: 151.71 m

DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	DEPTH (m)	ELEVATION (m)
TOPSOIL: 50 mm with grass cover 151.66	SS	1	79	8	0	151
FILL: clayey silt / silty clay, reddish brown, damp 151.06						
CLAYEY SILT TO SILTY CLAY TILL: reddish brown, dry to damp	SS	2	92	16	1	
shale fragments below 1.20 m	SS	3	54	60	2	150
trace gravel, damp, stiff below 2.29 m	SS	4	84	11	3	149
	SS	5	100	47	4	148
some oxidised fissures below 4.57 m	SS	6	100	36	5	147
grey, moist below 6.10 m	SS	7	100	21	6	146
144.09						
TILL/SHALE COMPLEX: reddish brown, dry to damp 144.06 7.7	SS	8	50	50/10	7	145
SHALE BEDROCK: highly weathered, reddish brown to pale grey, dry	RC	1	97	71	8	144
ROCK CORE BEGINS					9	143
Fair Quality	RC	2	97	57	10	142
clay seam from 9.45 to 9.75 m					11	141
Fair Quality	RC	3	99	95	12	140
highly weathered clay seam from 10.56 to 10.75 m					13	139
Excellent Quality	RC	4	100	95	14	138
Excellent Quality	RC	5	99	92	15	137
highly fractured zones from 15.56 to 15.64 m and 15.7 to 15.78 m	RC	6	99	93	16	136
Excellent Quality	RC	7	99	93	17	135
Excellent Quality					18	134
132.96						133
End of Borehole 18.75 m 18.8						

Notes:
1. Borehole open completion of drilling.
2. Groundwater level reading not measured upon completion of drilling due to introduced drilling water.
3. Groundwater level reading 2.25 m on September 30, 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

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Groundwater depth on completion of drilling: Drilling Water m.

Cave in depth recorded on completion of drilling: Open m.

Groundwater depth observed on 30/09/2021 at a depth of: 2.25 m.

RECORD OF BOREHOLE No. BH/MW202

Project Number:	BIGC-GEO-185E	Drilling Location:	See Borehole Location Plan	Logged by:	MV
Project Client:	Delmanor West Oak Inc.	Drilling Method:	96 mm Mud Rotary/ HQ Core	Compiled by:	MV
Project Name:	Geotechnical and Hydrogeological Assessment Update	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1280 Dundas Street, Oakville	Date Started:	21 Sep 21	Date Completed: 22 Sep 21	Revision No.: 0, 21/10/21

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 20 40 60 80 Liquid	INSTRUMENTATION INSTALLATION	COMMENTS
	Geodetic Ground Surface Elevation: 151.18 m										
	TOPSOIL: 85 mm with grass cover 151.10	SS	1	16	16	0	151	16	16		
	CLAYEY SILT TO SILTY CLAY TILL: with some shale fragments, trace gravels, trace organic rootlets at top, brown to mottled brown, damp to dry, hard	SS	2	41	38	1	150		17		
		SS	3	33	80/28	2	149	80 28	11		
		SS	4	70	41	3	148		12		
		SS	5	100	57	4	147		13		
	damp to moist below 4.57 m	SS	6	67	59	5	146		15		
	144.63	SS	7	1020	52/5	6	145	52 5	12		
	TILL/SHALE COMPLEX: reddish brown, damp to dry 6.6 143.52					7	144				
	SHALE BEDROCK: highly weathered, reddish brown to pale grey, moist 7.7	SS	8	8	50	8	143				
	ROCK CORE BEGINS at 8.99 m	RC	1	91	10	9	142				
	Very Poor Quality very soft clay zones zones from 9.14 to 9.39 m	RC	2	100	68	10	141				
	Fair Quality					11	140				
	Fair Quality	RC	3	100	84	12	139				
	Excellent Quality	RC	4	100	93	13	138				
	Excellent Quality	RC	5	100	92	14	137				
	Excellent Quality	RC	6	100	100	15	136				
	Excellent Quality	RC	7	100	100	16	135				
	Poor Quality 131.37	RC	8	99	44	17	134				
	End of Borehole 19.81 m 19.8					18	133				
						19	132				

Notes:
1. Borehole open completion of drilling.
2.Groundwater level reading not measured upon completion of drilling due to introduced drilling water.
3.Groundwater level reading 5.19m on September 30, 2021.

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▽ Groundwater depth on completion of drilling: Drilling Water m.

▼ Groundwater depth observed on 30/09/2021 at a depth of: 5.19 m.

Cave in depth recorded on completion of drilling: Open m.

RECORD OF BOREHOLE No. BH/MW203

Project Number:	BIGC-GEO-185E	Drilling Location:	See Borehole Location Plan	Logged by:	MV
Project Client:	Delmanor West Oak Inc.	Drilling Method:	150 mm Solid Stem Augering	Compiled by:	MV
Project Name:	Geotechnical and Hydrogeological Assessment Update	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1280 Dundas Street, Oakville	Date Started:	17 Sep 21 Date Completed: 17 Sep 21	Revision No.:	0, 21/10/21

Geodetic Ground Surface Elevation: 150.81 m

Description	Elevation (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Lab Testing (Moisture %)
TOPSOIL: 80mm with grass cover	150.73 / 0.1					
FILL: silty clay to clayey silt, possibly reworked, mottled brown, damp	149.29	SS	1	33	6	16
		SS	2	95	14	13
CLAYEY SILT TO SILTY CLAY TILL: trace gravel, some sandy fissures, greyish brown, dry to damp, hard	1.5	SS	3	95	30	13
	147.46	SS	4	95	39	13
TILL/SHALE COMPLEX: highly weathered, reddish brown, dry	3.4 / 146.54	SS	5	67	70	11
SHALE BEDROCK: highly weathered, reddish brown, dry	4.3 / 144.66	~~SS~~	~~6~~	~~100~~	~~50/5~~	
End of Borehole 6.15m	6.2	~~SS~~	~~7~~	~~100~~	~~50~~ /5	

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level reading at 3.66 m bgl upon completion of drilling
3. Groundwater level reading 3.97 m bgl on September 30, 2021.

Legend: 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.

Groundwater depth on completion of drilling: Dry m.

Groundwater depth observed on 30/09/2021 at a depth of: 3.97 m.

Cave in depth recorded on completion of drilling: Open m.

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Scale: 1 : 121

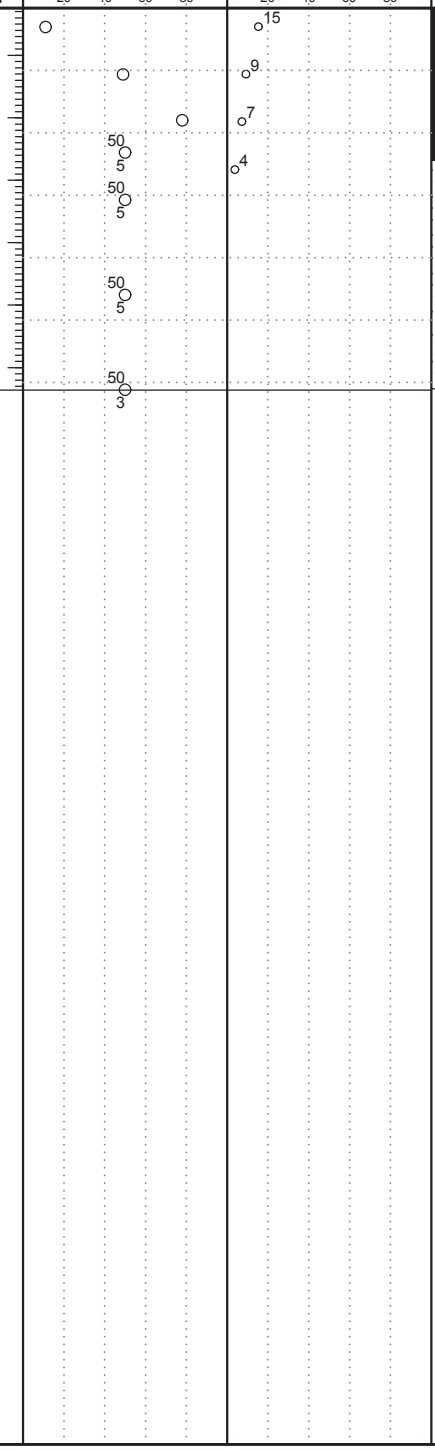
RECORD OF BOREHOLE No. BH/MW204

Project Number:	BIGC-GEO-185E	Drilling Location:	See Borehole Location Plan	Logged by:	MV
Project Client:	Delmanor West Oak Inc.	Drilling Method:	150 mm Solid Stem Augering	Compiled by:	MV
Project Name:	Geotechnical and Hydrogeological Assessment Update	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1280 Dundas Street, Oakville	Date Started:	20 Sep 21	Date Completed: 20 Sep 21	Revision No.: 0, 21/10/21

Geodetic Ground Surface Elevation: 150.76 m

Depth (m)	Description	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%
0.0	**TOPSOIL:** 120 mm with grass cover	150.64	SS	1	59	11
0.1	**FILL:** silty clay to clayey silt, possibly reworked, mottled brown, damp	150.00				
0.8	**CLAYEY SILT TO SILTY CLAY TILL:** trace gravel, reddish brown, hard	149.24	SS	2	100	49
1.5	**TILL/SHALE COMPLEX:** highly weathered, reddish brown, dry	148.47	SS	3	73	78
2.3	**SHALE BEDROCK:** highly weathered, reddish brown, damp		SS	4	100	50/5
			SS	5	60	50/5
	First water strike	144.61	SS	6	60	50/5
6.2	moist to wet below 6.1m **End of Borehole 6.12m**		SS	7	100	50/3

Notes:
1. Borehole open upon completion of drilling.
2. Groundwater level reading at 3.66 m bgl upon completion of drilling
3.Groundwater level reading 2.14 bgl on September 30, 2021.



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Groundwater depth on completion of drilling: 3.66 m.

Cave in depth recorded on completion of drilling: Open m.

Groundwater depth observed on 30/09/2021 at a depth of: 2.14 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 : 121

RECORD OF BOREHOLE No. BH/MW205

Project Number: **BIGC-GEO-185E**	Drilling Location: **See Borehole Location Plan**		Logged by: **MV**
Project Client: **Delmanor West Oak Inc.**	Drilling Method: **150 mm Solid Stem Augers**		Compiled by: **MV**
Project Name: **Geotechnical and Hydrogeological Assessment Update**	Drilling Machine: **Track Mounted Drill**		Reviewed by: **SS**
Project Location: **1280 Dundas Street, Oakville**	Date Started: **20 Sep 21**	Date Completed: **20 Sep 21**	Revision No.: **0, 21/10/21**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **INSTRUMENTATION INSTALLATION** | **COMMENTS**

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

Geodetic Ground Surface Elevation: 150.79 m

Description	Elev. (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Depth (m)	Elevation (m)	Field Testing (SPT)	Lab Testing (W %)
TOPSOIL: 100 mm with grass cover	150.69 / 0.1	SS	1	75	12			○	20
FILL: silty clay to clayey silt, trace gravel, trace organic rootlets, possibly reworked, brown, damp	150.03 / 0.8						150		
CLAYEY SILT TO SILTY CLAY TILL: trace sand and gravel, mottled brown, damp	149.42 / 1.4	SS	2	100	43	1		○	11
TILL/SHALE COMPLEX: highly weathered, reddish brown, dry	149.27 / 1.5	SS	3	16	50/10	2	149	50/10	7
SHALE BEDROCK: highly weathered, reddish brown, dry to damp		SS	4	8	50/8		148	50/8	
		SS	5	8	50/5	3		50/5	
						4	147		
---------- First water strike ----------		SS	6	5	50/5	5	146	50/5	
moist to wet below 4.57m	144.64	SS	7	60	50/5	6	145	50/5	
End of Borehole 6.15m	6.2								

Notes:
1. Borehole open to 5.94 m upon completion of drilling.
2. Groundwater level reading at 5.57 m bgl upon completion of drilling
3. Groundwater level reading 1.96 m bgl on September 30, 2021.

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▽ Groundwater depth on completion of drilling: 4.57 m.

▼ Groundwater depth observed on 30/09/2021 at a depth of: 1.96 m.

Cave in depth recorded on completion of drilling: 5.94 m.

Scale: 1 : 121

RECORD OF BOREHOLE No. BH/MW206

Project Number:	BIGC-GEO-185E	Drilling Location:	See Borehole Location Plan	Logged by:	MV
Project Client:	Delmanor West Oak Inc.	Drilling Method:	100 mm Solid Stem Augering	Compiled by:	MV
Project Name:	Geotechnical and Hydrogeological Assessment Update	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1280 Dundas Street, Oakville	Date Started:	17 Sep 21	Date Completed: 17 Sep 21	Revision No.: 0, 21/10/21

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | INSTRUMENTATION INSTALLATION | **COMMENTS**

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

Geodetic Ground Surface Elevation: 150.85 m

Description	Elevation (m) / Depth (m)
TOPSOIL: 150 mm with grass cover	150.70 / 0.2
FILL: silty clay to clayey silt, possibly reworked, brown, damp	149.63
CLAYEY SILT TO SILTY CLAY TILL: trace gravel, some sandy and oxideised fissures, pale brown, damp, hard	1.2 / 149.15 / 1.7
TILL/SHALE COMPLEX: highly weathered, reddish brown, dry	
SHALE BEDROCK: highly weathered, reddish brown, dry	
---------- First water strike ---------- moist to wet below 6.1m	144.70 / 6.2
End of Borehole 6.15m	

Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	SPT (field)	Soil Vapour (ppm)
SS	1	25	9	○	27
SS	2	100	11	○	13
SS	3	89	50/13	50/13	12
SS	4	100	50/5	50/5	6
SS	5	100	50/5	50/5	
SS	6	100	50/5	50/5	
SS	7	100	50/5	50/5	

Depth (m): 1, 2, 3, 4, 5, 6 — Elevation (m): 150, 149, 148, 147, 146, 145

Notes:
1. Borehole open to 5.94 m upon completion of drilling.
2. Groundwater level reading at 5.64 m bgl upon completion of drilling
3.Groundwater level reading 2.30 m bgl on September 30, 2021.

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▽ Groundwater depth on completion of drilling: 5.64 m.

▼ Groundwater depth observed on 30/09/2021 at a depth of: 2.3 m.

▣ Cave in depth recorded on completion of drilling: 5.94 m.

Scale: 1 : 121

RECORD OF BOREHOLE No. BH/MW207

Project Number:	BIGC-GEO-185E	Drilling Location:	See Borehole Location Plan	Logged by:	MV
Project Client:	Delmanor West Oak Inc.	Drilling Method:	150 mm Solid Stem Augering	Compiled by:	MV
Project Name:	Geotechnical and Hydrogeological Assessment Update	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1280 Dundas Street, Oakville	Date Started:	17 Sep 21	Date Completed: 17 Sep 21	Revision No.: 0, 21/10/21

Geodetic Ground Surface Elevation: 151.27 m

DESCRIPTION	Depth (m)	Elevation (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%
TOPSOIL: 100 mm with grass cover	0.1	151.17	SS	1	70	9
FILL: silty clay to clayey silt, possibly reworked, brown, damp	0.8	150.51				
CLAYEY SILT TO SILTY CLAY TILL: trace gravel, some sandy and oxideised fissures, pale brown, dry to damp, hard			SS	2	59	45
			SS	3	100	37
	2.28	148.98	SS	4	50	50/10
TILL/SHALE COMPLEX: highly weathered, reddish brown, dry	2.6	148.68	SS	5	100	50/5
SHALE BEDROCK: highly weathered, reddish brown, dry			SS	6	100	50/5
First water strike		145.12	SS	7	100	50/5
moist to wet below 5.49m	6.2					
End of Borehole 6.15m						

Notes:
1. Borehole open to 5.94 m upon completion of drilling.
2. Groundwater level reading at 5.33 m bgl upon completion of drilling
3.Groundwater level reading 2.40 m bgl on September 30, 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

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Groundwater depth on completion of drilling: 5.33 m.

Groundwater depth observed on 30/09/2021 at a depth of: 2.4 m.

Cave in depth recorded on completion of drilling: 5.94 m.

RECORD OF BOREHOLE No. BH/MW208

Project Number:	**BIGC-GEO-185E**	Drilling Location:	**See Borehole Location Plan**	Logged by:	**MV**
Project Client:	**Delmanor West Oak Inc.**	Drilling Method:	**100 mm Solid Stem Augering**	Compiled by:	**MV**
Project Name:	**Geotechnical and Hydrogeological Assessment Update**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SS**
Project Location:	**1280 Dundas Street, Oakville**	Date Started: **17 Sep 21**	Date Completed: **17 Sep 21**	Revision No.:	**0, 21/10/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 151.77 m

DESCRIPTION	Elevation (m) / Depth (m)
TOPSOIL: 180 mm with grass cover	151.59 / 0.2
FILL: silty clay to clayey silt, possibly reworked, pale brown, damp	151.01 / 0.8
CLAYEY SILT TO SILTY CLAY TILL: trace gravel, some shale fragments, reddish brown, dry to damp, hard ---------- Pale grey below 1.52 m	149.48 /
TILL/SHALE COMPLEX: highly weathered, reddish brown, dry	149.33 / 2.4
SHALE BEDROCK: highly weathered, reddish brown, dry ---------- First water strike ---------- moist to wet below 6.1m	145.62 / 6.2
End of Borehole 6.12m	

Notes:
1. Borehole open to 5.94 m upon completion of drilling.
2. Dry upon completion of drilling
3. Groundwater level reading 5.54 m bgl on September 30, 2021.

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Lab Testing (W)
SS	1	67	8	16
SS	2	95	30	12
SS	3	70	67	11
SS	4	100	50/8	11
SS	5	100	50/5	7
SS	6	100	50/5	
SS	7	100	50/3	

DEPTH (m): 1, 2, 3, 4, 5, 6
ELEVATION (m): 151, 150, 149, 148, 147, 146

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

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Groundwater depth on completion of drilling: Dry m.

Groundwater depth observed on 30/09/2021 at a depth of: 5.54 m.

Cave in depth recorded on completion of drilling: 5.94 m.

Scale: 1 : 121

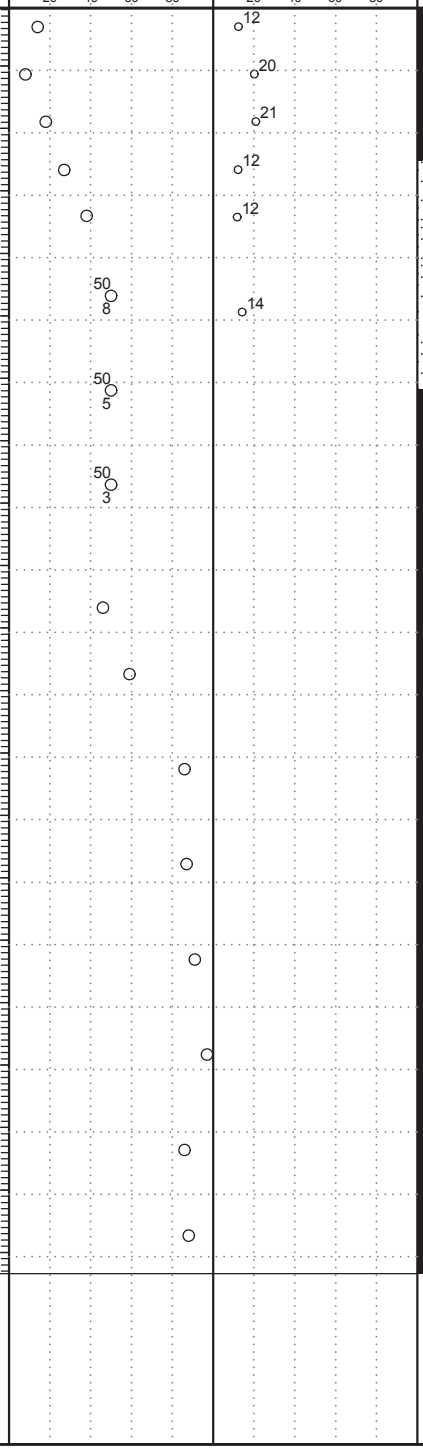
RECORD OF BOREHOLE No. BH/MW209

Project Number:	BIGC-GEO-185E	Drilling Location:	See Borehole Location Plan	Logged by:	MV
Project Client:	Delmanor West Oak Inc.	Drilling Method:	96 mm Mud Rotary/ HQ Core	Compiled by:	MV
Project Name:	Geotechnical and Hydrogeological Assessment Update	Drilling Machine:	Track Mounted Drill	Reviewed by:	SS
Project Location:	1280 Dundas Street, Oakville	Date Started:	22 Sep 21	Date Completed: 23 Sep 21	Revision No.: 0, 21/10/21

Geodetic Ground Surface Elevation: 150.93 m

Depth (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value/RQD%	Elevation (m)
0.0	**TOPSOIL:** 85 mm with grass cover	SS	1	79	14	150.93
0.8	**POSSIBLE FILL:** trace gravel, trace rootlets, mottled brown, damp	SS	2	75	8	150.17
	CLAYEY SILT TO SILTY CLAY TILL: with some shale fragments, trace gravels, trace organic rootlets at top, brown to mottled brown, damp to dry, hard	SS	3	84	18	
		SS	4	100	27	
3.5		SS	5	95	38	147.42
	TILL/SHALE COMPLEX: reddish brown, damp to dry	SS	6	63	50/8	
		SS	7	60	50/5	
7.6		SS	8	100	50/3	143.31
	SHALE BEDROCK: highly weathered, reddish brown to pale grey, moist					
	ROCK CORE BEGINS at 9.30 m	RC	1	98	46	
	Poor Quality very soft clay zones zones from 9.53 - 9.75 m	RC	2	91	59	
	Fair Quality very soft clay zones zones from 9.91 - 10.21 m					
	Excellent Quality	RC	3	107	86	
	Excellent Quality	RC	4	97	87	
	Excellent Quality	RC	5	101	91	
	Excellent Quality	RC	6	101	97	
	Good Quality	RC	7	86	86	
	Good Quality	RC	8	100	88	
20.3	**End of Borehole 20.27 m**					130.66

Notes:
1. Borehole open completion of drilling.
2. Groundwater level reading not measured upon completion of drilling due to introduced drilling water.
3. Groundwater level reading 3.50 m bgl on September 30, 2021.



COMMENTS

B.I.G. Consulting Inc.
12-5500 Tomken Rd.
Mississauga, ON L4W 2Z4
Canada
T: 416-214-4880
F: 416-551-2633

Groundwater depth on completion of drilling: Drilling Water m.

Cave in depth recorded on completion of drilling: Open m.

Groundwater depth observed on 30/09/2021 at a depth of: 3.50 m.

APPENDIX B: MECP WATER WELL SUMMARY AND CONSTRUCTION DEWATERING SUMMARY TABLES

Table B-1: MECP WWR Summary Table

Count	Well ID	Date Constructed	Total Depth (m bgs)	Reported Water Depth (m bgs)	Status of Well
1.	2802147	08/12/1955	20.4	19.8	Water supply
2.	2802148	05/22/1951	16.8	16.7	Water supply
3.	2802149	11/17/1959	33.5	21.3	Water supply
4.	2803144	07/21/1969	16.5	4.9	Water supply
5.	2803413	02/25/1970	15.2	5.2	Observation well
6.	2803657	07/10/1971	7	7	Water Supply
7.	2803683	11/17/1971	18.3	15.24	Water Supply
8.	2803730	08/30/1971	15.5	N/A	Observation well
9.	2805007	08/27/1976	45.7	42.7	Water supply
10.	2806856	11/13/1987	24.4	17.1	Water supply
11.	2806857	11/19/1987	24.1	18.3	Abandoned-supply
12.	2806858	12/10/1987	21.3	17.7	Water supply
13.	2806859	10/28/1987	32	18.9	Water supply
14.	2810195	03/23/2005	N/A	N/A	Abandoned-other
15.	2810265	05/11/2005	8.3	2	Test hole
16.	2810615	08/06/2006	9.4	4	Observation well
17.	7114225	10/24/2008	N/A	3.4	Abandoned-other
18.	7114226	10/24/2008	N/A	N/A	Abandoned-other
19.	7208298	09/10/2013	77.1	N/A	Observation well
20.	7266230	04/12/2016	3	1	Monitoring and test hole

Table B-2: MECP Permit to Take Water Registrations

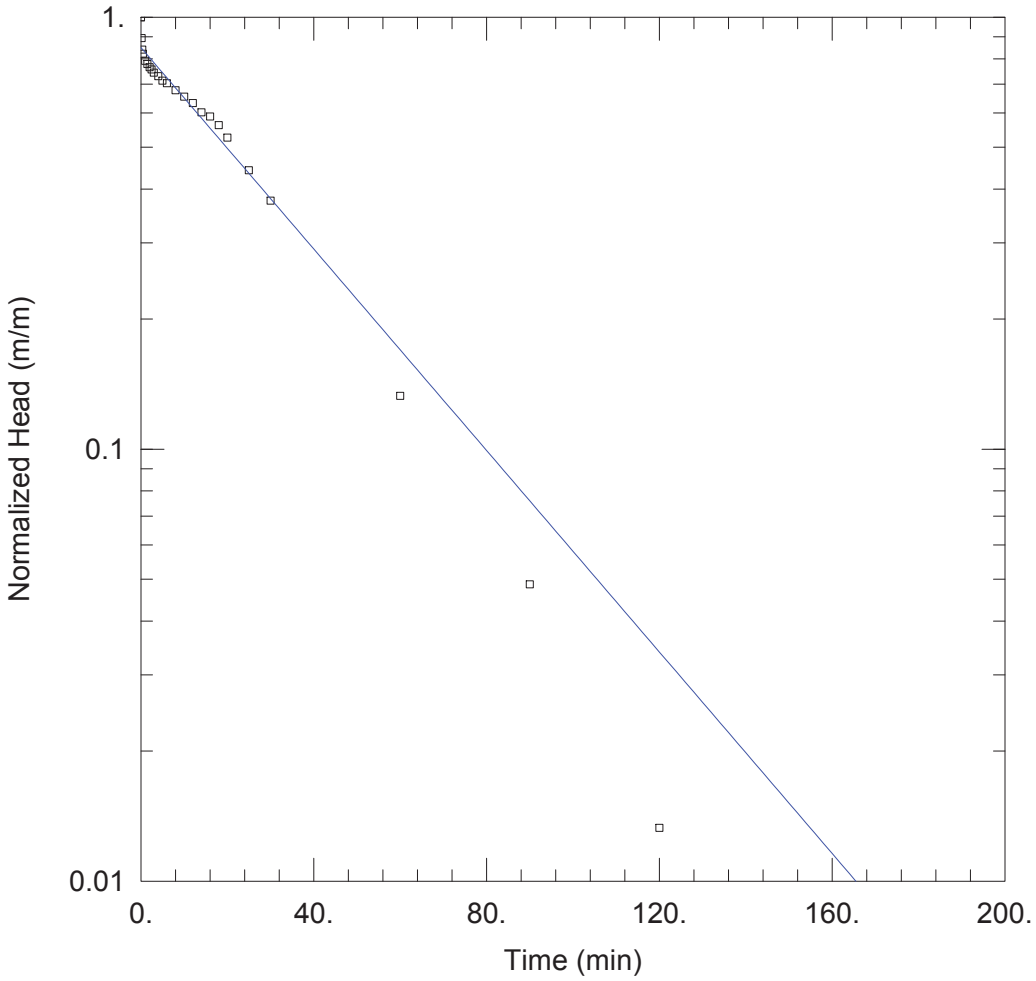
Permit Number	Purpose	Address	Municipality	Water Source	Maximum L/Day	Active
02-P-3014	Construction Dewatering	N/A	York	Ground water	545,100	No
3161-8BPSR5	Construction Dewatering	Lot 20, 21, 22, 23, 24, Concession 1 NDS	Oakville	Surface and ground water	1,762,500	No
8723-8FHTPS	Construction Dewatering	Lot 20, 21, 22, 23, 24, Concession 1 NDS	Oakville	Surface and ground water	1,635,840	No
1707-7QURRP	Construction Dewatering	Lot 20, 21, 22, 23, 24, Concession 1 NDS	Oakville	Surface and ground water	4,172,000	No
0340-8ECNNQ	Construction Dewatering	Lot 20, 21, 22, 23, 24, Concession 1 NDS	Oakville	Ground water	1,762,500	No
2431-6YKS28	Construction Dewatering	Piers 1, 3 and East Abutment	Oakville	Ground water	400,000	No

Permit Number	Purpose	Address	Municipality	Water Source	Maximum L/Day	Active
8687-6YGNKG	Construction Dewatering	Piers 2, 4 and West Abutment	Oakville	Ground water	400,000	No
0450-6Z2RH2	Construction Dewatering	Piers 2, 4 and West Abutment	Oakville	Ground water	400,000	No
1761-9LVMPL	Construction Dewatering	Dundas Street West	Oakville	Surface and ground water	3,570,585	No
5311-8TET8S	Dewatering	Dundas Street Road Stations 15+090 to 15+320	Oakville	Surface and ground water	1,762,500	No
4601-7X7SE9	Construction Dewatering	Lot 29, Concession 1 South of Dundas Street	Oakville	Ground water	120,000	No

APPENDIX C: SWRT PROCUDURES AND RESULTS

SWRT PROCEDURES

At the start of each falling test, a slug of known volume was inserted in the well; and, at the start of each rising test, the slug was removed from the well. Groundwater level monitoring began immediately after water removal and continued until the water level had recovered by at least 90%. Water levels were initially recorded at approximately 10 to 30 second intervals during the first minute of the test and measured at increasing intervals after one minute. Water levels were recorded using an electronic water level tape.



WELL TEST ANALYSIS

Data Set: C:\Users\user\BIG Consulting\Eileen's Files - Documents\1280 Dundas\HG\Aqtesolv\MW106.aqt
Date: 12/12/19 Time: 16:53:34

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor
Project: BIGC-ENV-185C
Location: 1280 Dundas Street W, Oakville
Test Date: November 19, 2019

AQUIFER DATA

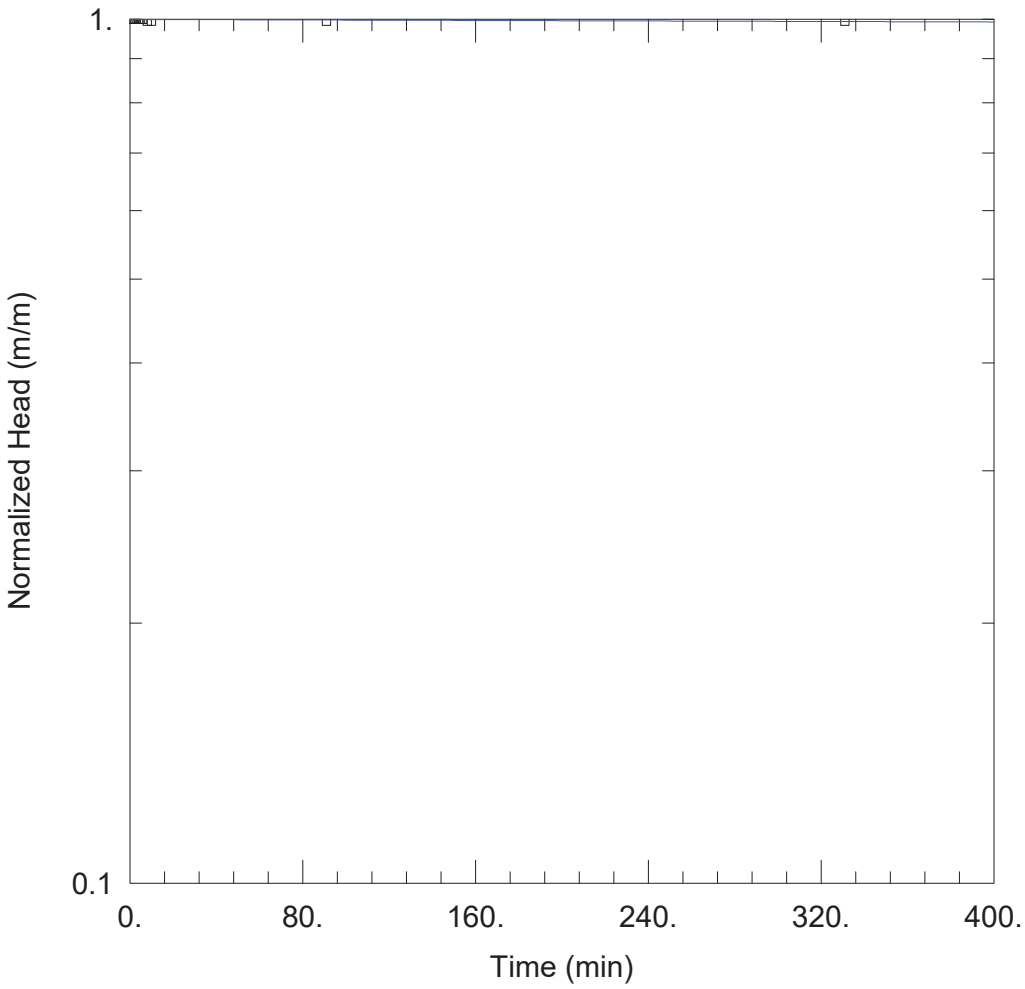
Saturated Thickness: 2.1 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW106)

Initial Displacement: 1.13 m
Total Well Penetration Depth: 2.1 m
Casing Radius: 0.025 m
Static Water Column Height: 2.1 m
Screen Length: 2.1 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.528E-7 m/sec
y0 = 0.9606 m



WELL TEST ANALYSIS

Data Set: C:\...\MW201.aqt
Date: 10/13/21 Time: 22:41:21

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor West Oak Inc.
Project: BIGC-GEO-185E
Location: 1280 Dundas St W, Oakville, ON
Test Well: MW201
Test Date: September 30, 2021

AQUIFER DATA

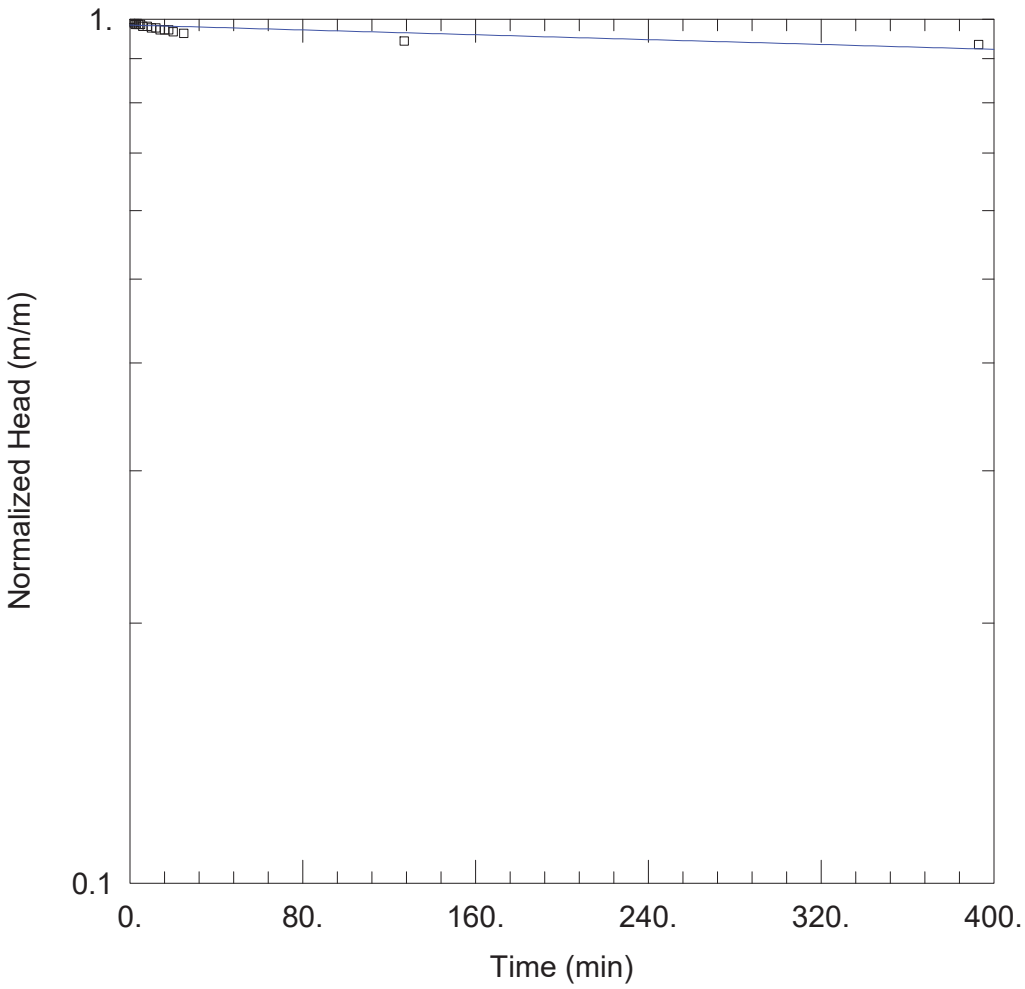
Saturated Thickness: 0.91 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW201)

Initial Displacement: 0.91 m
Total Well Penetration Depth: 3.865 m
Casing Radius: 0.025 m
Static Water Column Height: 3.865 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 5.179E-10 m/sec
y0 = 0.9092 m



WELL TEST ANALYSIS

Data Set: C:\...\MW202.aqt
Date: 10/13/21 Time: 22:43:16

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor West Oak Inc.
Project: BIGC-GEO-185E
Location: 1280 Dundas St W, Oakville, ON
Test Well: MW202
Test Date: September 30, 2021

AQUIFER DATA

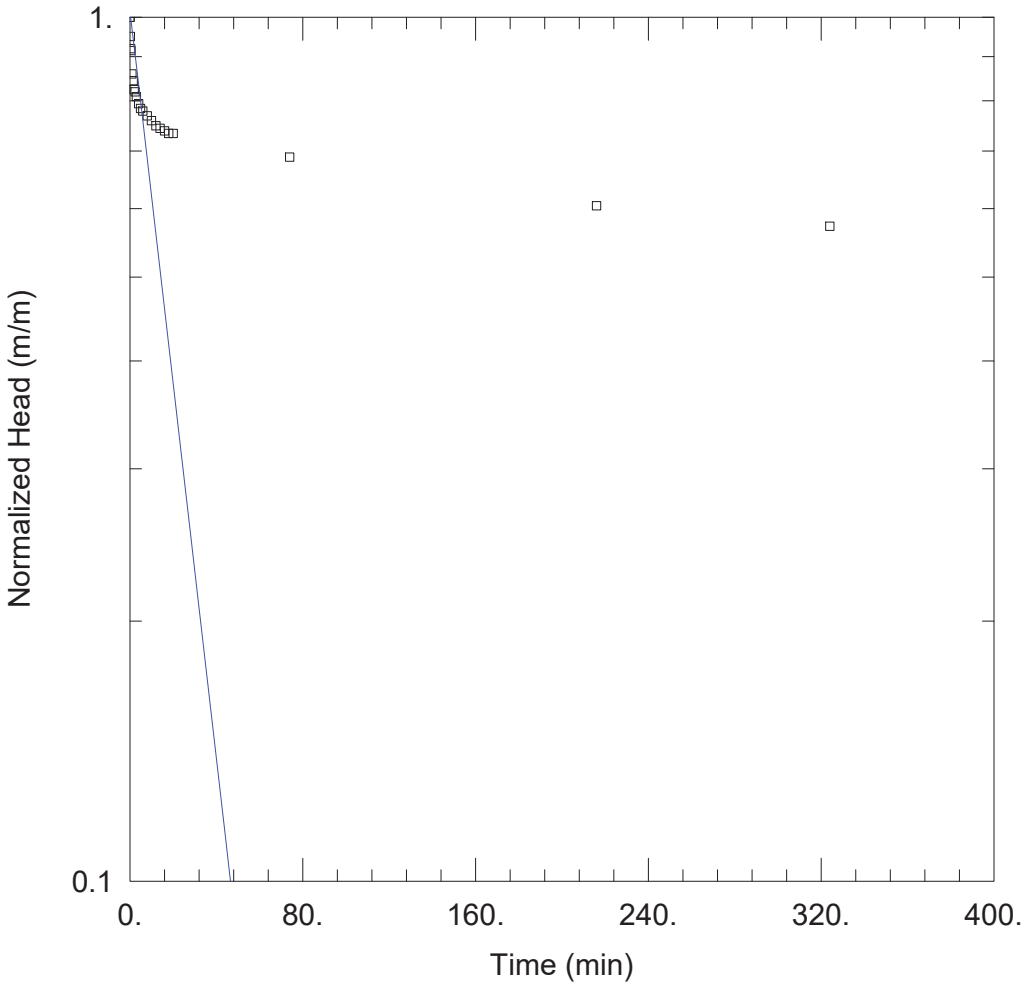
Saturated Thickness: 14.58 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW202)

Initial Displacement: 1.063 m
Total Well Penetration Depth: 14.58 m
Casing Radius: 0.025 m
Static Water Column Height: 14.58 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.536E-9 m/sec
y0 = 1.046 m



WELL TEST ANALYSIS

Data Set: C:\...\MW203.aqt
Date: 10/13/21 Time: 22:48:38

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor West Oak Inc.
Project: BIGC-GEO-185E
Location: 1280 Dundas St W, Oakville, ON
Test Well: MW203
Test Date: September 30, 2021

AQUIFER DATA

Saturated Thickness: 1.95 m Anisotropy Ratio (Kz/Kr): 1.

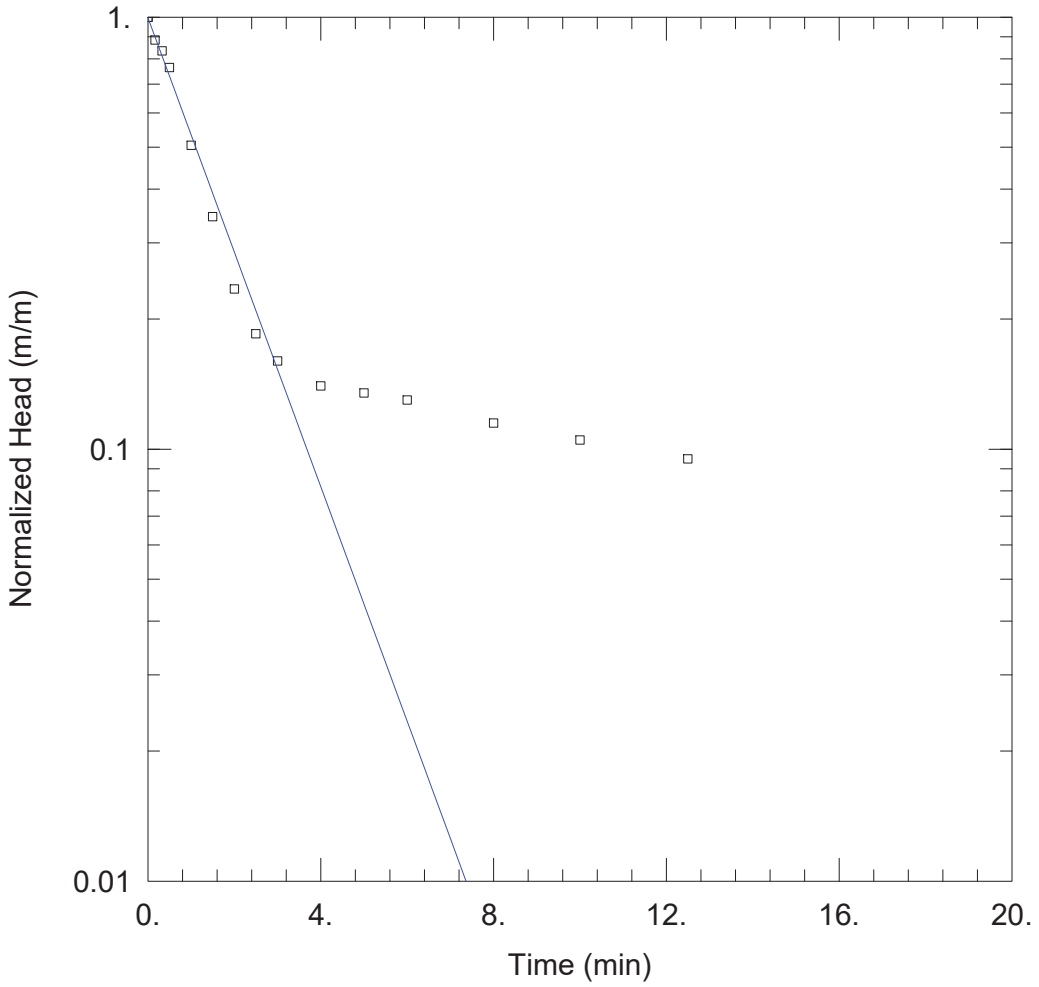
WELL DATA (MW203)

Initial Displacement: 0.995 m
Total Well Penetration Depth: 1.95 m
Casing Radius: 0.025 m
Static Water Column Height: 1.95 m
Screen Length: 1.95 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 7.061E-7 m/sec y0 = 1.016 m



WELL TEST ANALYSIS

Data Set: C:\...\MW204.aqt
Date: 10/13/21 Time: 22:47:40

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor West Oak Inc.
Project: BIGC-GEO-185E
Location: 1280 Dundas St W, Oakville, ON
Test Well: MW204
Test Date: September 30, 2021

AQUIFER DATA

Saturated Thickness: 3.825 m Anisotropy Ratio (Kz/Kr): 1.

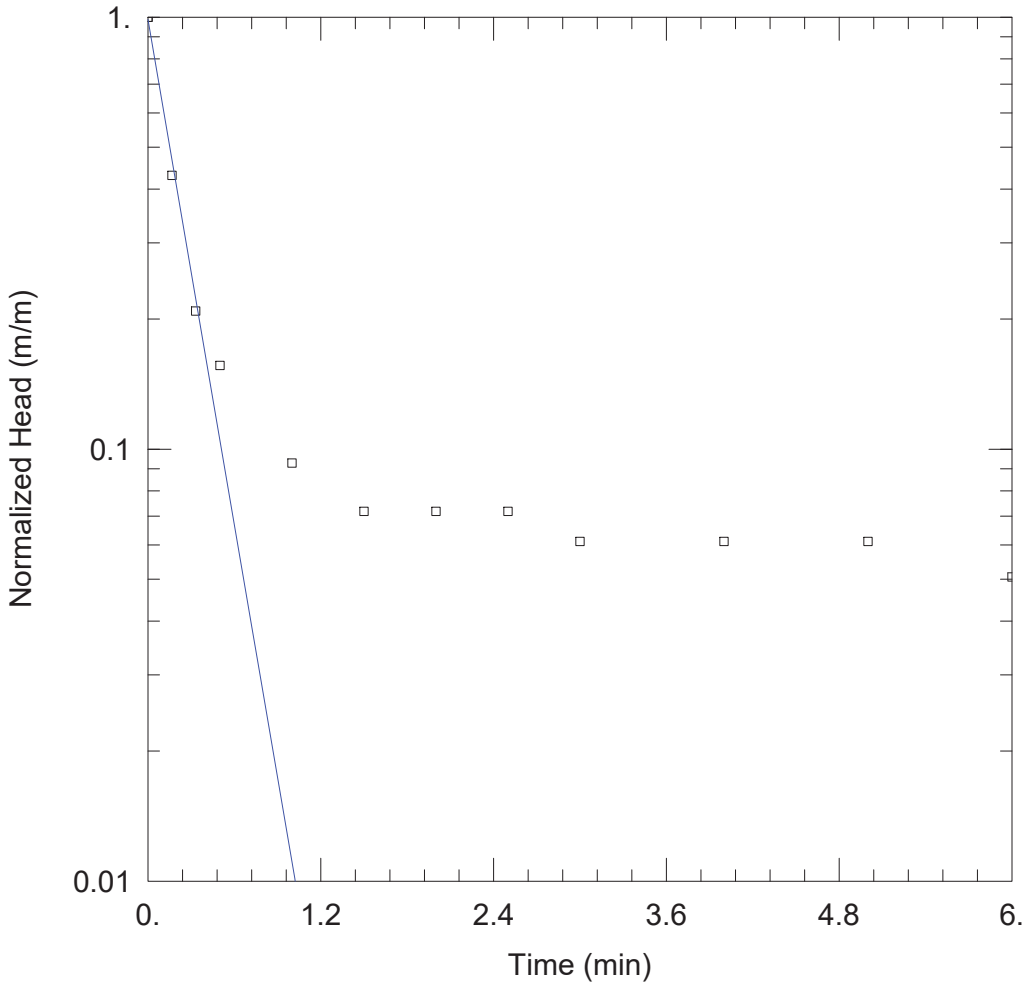
WELL DATA (MW204)

Initial Displacement: 1. m
Total Well Penetration Depth: 3.825 m
Casing Radius: 0.025 m
Static Water Column Height: 3.825 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.946E-6 m/sec y0 = 0.9965 m



WELL TEST ANALYSIS

Data Set: C:\...\MW205.aqt
Date: 10/13/21 Time: 22:50:35

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor West Oak Inc.
Project: BIGC-GEO-185E
Location: 1280 Dundas St W, Oakville, ON
Test Well: MW205
Test Date: September 30, 2021

AQUIFER DATA

Saturated Thickness: 4.139 m Anisotropy Ratio (Kz/Kr): 1.

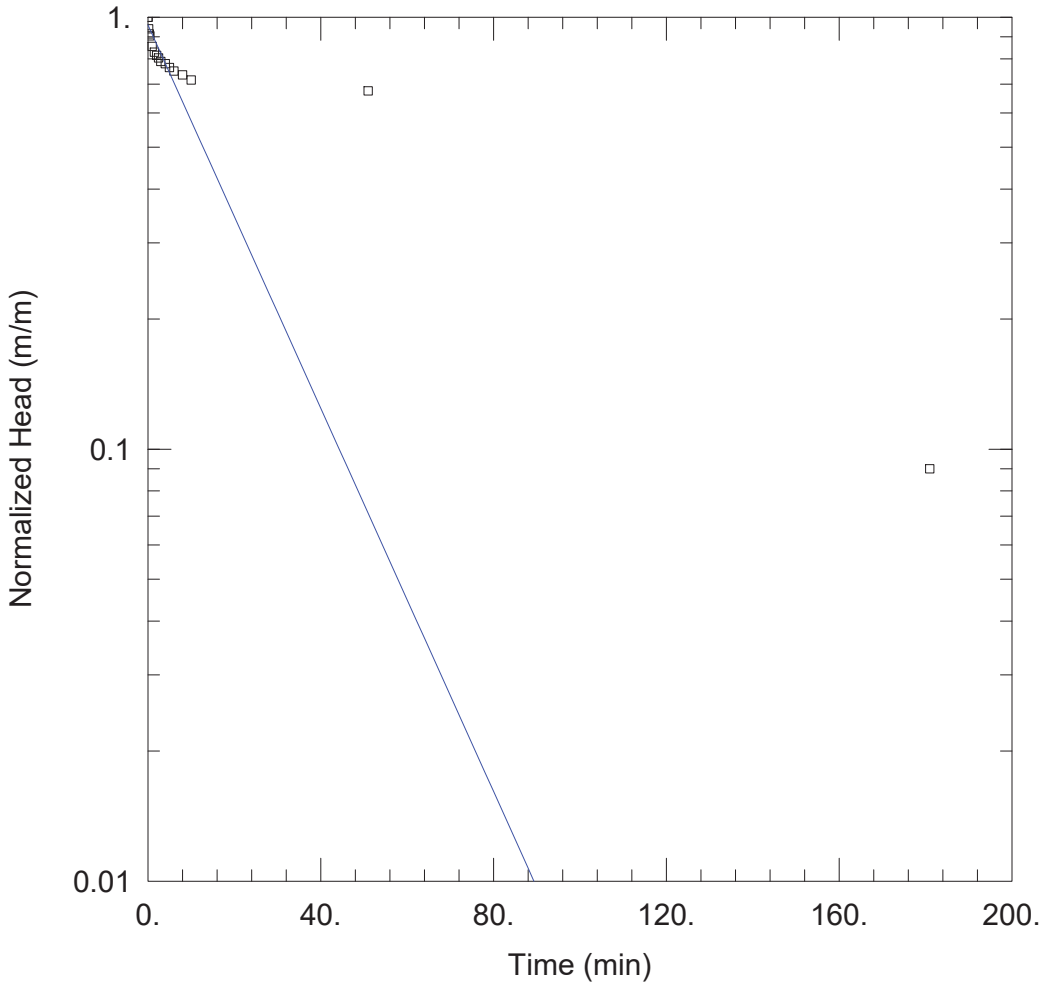
WELL DATA (MW205)

Initial Displacement: 0.474 m
Total Well Penetration Depth: 4.139 m
Casing Radius: 0.025 m
Static Water Column Height: 4.139 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 4.272E-5 m/sec y0 = 0.4676 m



WELL TEST ANALYSIS

Data Set: C:\...\MW206.aqt
Date: 10/13/21 Time: 22:53:52

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor West Oak Inc.
Project: BIGC-GEO-185E
Location: 1280 Dundas St W, Oakville, ON
Test Well: MW206
Test Date: September 30, 2021

AQUIFER DATA

Saturated Thickness: 3.605 m Anisotropy Ratio (Kz/Kr): 1.

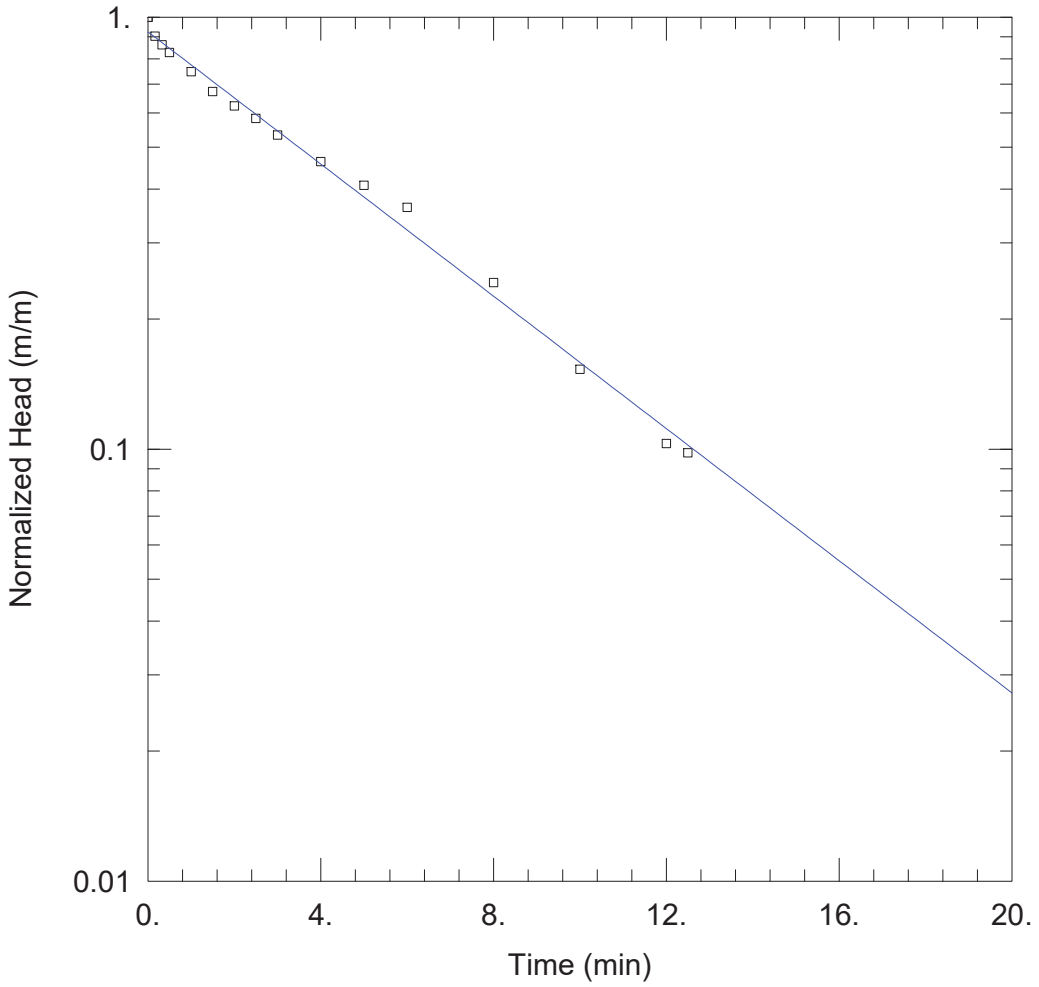
WELL DATA (MW206)

Initial Displacement: 1. m
Total Well Penetration Depth: 3.605 m
Casing Radius: 0.025 m
Static Water Column Height: 3.605 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 4.859E-7 m/sec y0 = 0.9587 m



WELL TEST ANALYSIS

Data Set: C:\...\MW207.aqt
Date: 10/13/21 Time: 22:55:30

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor West Oak Inc.
Project: BIGC-GEO-185E
Location: 1280 Dundas St W, Oakville, ON
Test Well: MW207
Test Date: September 30, 2021

AQUIFER DATA

Saturated Thickness: 3.348 m Anisotropy Ratio (Kz/Kr): 1.

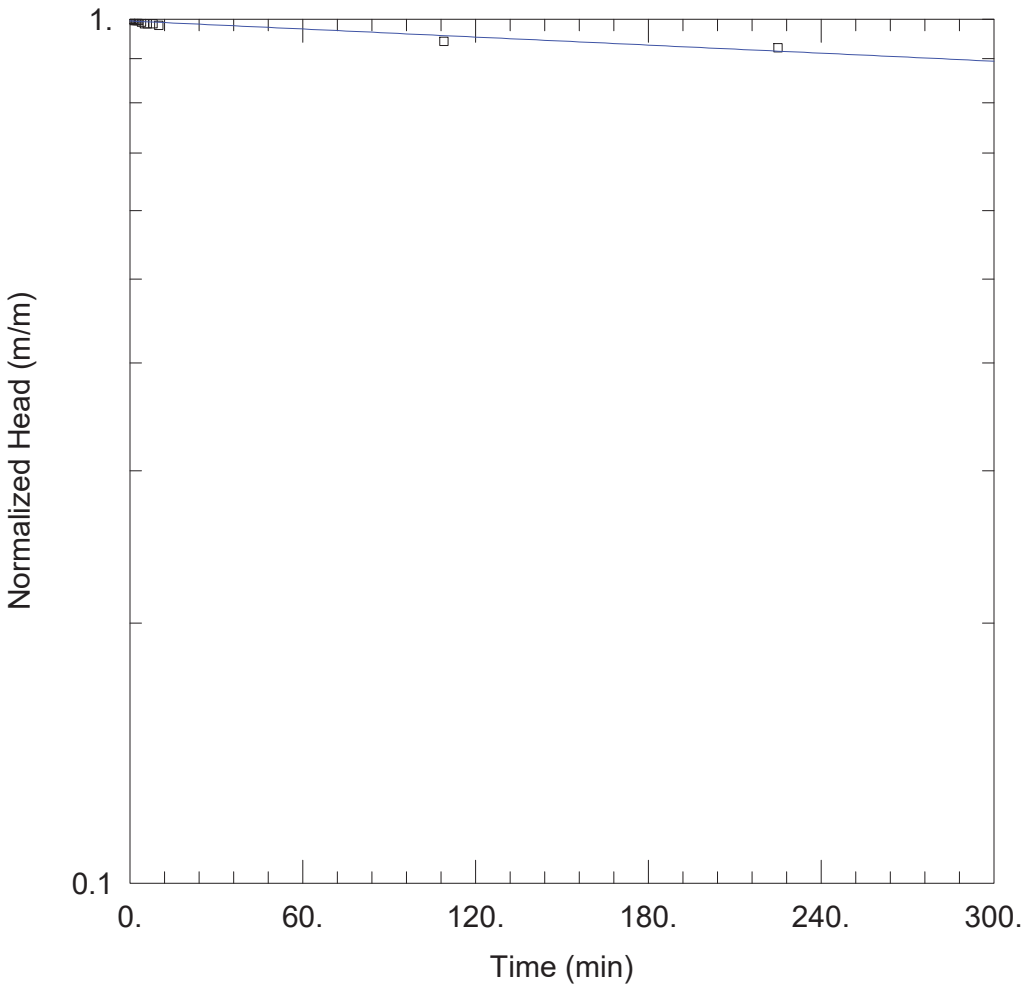
WELL DATA (MW207)

Initial Displacement: 1. m
Total Well Penetration Depth: 3.348 m
Casing Radius: 0.025 m
Static Water Column Height: 3.348 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.676E-6 m/sec y0 = 0.9244 m



WELL TEST ANALYSIS

Data Set: C:\...\MW209.aqt
Date: 10/13/21 Time: 22:57:32

PROJECT INFORMATION

Company: B.I.G. Consulting Inc.
Client: Delmanor West Oak Inc.
Project: BIGC-GEO-185E
Location: 1280 Dundas St W, Oakville, ON
Test Well: MW209
Test Date: September 30, 2021

AQUIFER DATA

Saturated Thickness: 1.31 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW209)

Initial Displacement: 1.22 m
Total Well Penetration Depth: 1.31 m
Casing Radius: 0.025 m
Static Water Column Height: 1.31 m
Screen Length: 1.31 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 7.532E-9 m/sec
y0 = 1.214 m

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

Your Project #: BIGC-ENV-185C
Site Location: 1260 DUNDAS ST.N,
Your C.O.C. #: 746428-01-01

Attention: Fernando Contento

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

Report Date: 2021/10/27
Report #: R6874586
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: B9W6178
Received: 2019/11/19, 18:15

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonaceous BOD	1	2019/11/21	2019/11/26	CAM SOP-00427	SM 23 5210B m
Total Cyanide	1	2019/11/20	2019/11/20	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2019/11/20	2019/11/20	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2019/11/20	2019/11/20	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by Axial ICP	1	2019/11/21	2019/11/21	CAM SOP-00408	EPA 6010D m
E.coli, (CFU/100mL)	1	N/A	2019/11/19	CAM SOP-00552	MOE LSB E3371
Animal and Vegetable Oil and Grease	1	N/A	2019/11/26	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2019/11/26	2019/11/26	CAM SOP-00326	EPA1664B m,SM5520A m
PAH Compounds in Water by GC/MS (SIM)	1	2019/11/21	2019/11/22	CAM SOP-00318	EPA 8270D m
pH	1	2019/11/20	2019/11/20	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2019/11/21	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2019/11/21	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2019/11/21	2019/11/21	CAM SOP-00938	OMOE E3516 m
Mineral/Synthetic O & G (TPH Heavy Oil) (1)	1	2019/11/26	2019/11/26	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2019/11/20	2019/11/22	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2019/11/22	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 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.

Your Project #: BIGC-ENV-185C
Site Location: 1260 DUNDAS ST.N,
Your C.O.C. #: 746428-01-01

Attention: Fernando Contento

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

Report Date: 2021/10/27
Report #: R6874586
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: B9W6178
Received: 2019/11/19, 18:15

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) 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.

Bureau Veritas Job #: B9W6178
Report Date: 2021/10/27

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-185C
Site Location: 1260 DUNDAS ST.N,
Sampler Initials: SL

HALTON SANITARY & COMBINED SEWER (2-03)

Bureau Veritas ID				LIT593		
Sampling Date				2019/11/19 16:00		
COC Number				746428-01-01		
	UNITS	Criteria	Criteria-2	MW106	RDL	QC Batch
Calculated Parameters						
Total Animal/Vegetable Oil and Grease	mg/L	-	150	2.6	0.50	6449670
Inorganics						
Total Carbonaceous BOD	mg/L	-	300	ND	2	6454955
Fluoride (F-)	mg/L	-	10	0.21	0.10	6452868
Total Kjeldahl Nitrogen (TKN)	mg/L	-	100	0.25	0.10	6454964
pH	pH	6.5:8.5	6.0:10.0	7.81		6452880
Phenols-4AAP	mg/L	0.008	1	ND	0.0010	6454696
Total Suspended Solids	mg/L	15	350	**63**	10	6452488
Dissolved Sulphate (SO4)	mg/L	-	1500	24	1.0	6453774
Total Cyanide (CN)	mg/L	0.02	2	ND	0.0050	6452881
Petroleum Hydrocarbons						
Total Oil & Grease	mg/L	-	-	2.6	0.50	6462794
Total Oil & Grease Mineral/Synthetic	mg/L	-	-	ND	0.50	6462799
Metals						
Total Aluminum (Al)	mg/L	-	50	0.9	0.1	6454825
Total Antimony (Sb)	mg/L	-	5	ND	0.02	6454825
Total Arsenic (As)	mg/L	0.02	1	ND	0.01	6454825
Total Beryllium (Be)	mg/L	-	5	ND	0.0005	6454825
Total Cadmium (Cd)	mg/L	0.008	1	ND	0.002	6454825
Total Chromium (Cr)	mg/L	0.08	3	ND	0.01	6454825
Total Cobalt (Co)	mg/L	-	5	ND	0.002	6454825
Total Copper (Cu)	mg/L	0.04	3	ND	0.01	6454825
Total Iron (Fe)	mg/L	-	50	1.2	0.02	6454825
Total Lead (Pb)	mg/L	0.12	3	ND	0.01	6454825
Total Manganese (Mn)	mg/L	0.05	5	**0.18**	0.001	6454825
Mercury (Hg)	mg/L	0.0004	0.05	ND	0.00010	6452542
Total Molybdenum (Mo)	mg/L	-	5	ND	0.005	6454825

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
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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HALTON SANITARY & COMBINED SEWER (2-03)

Bureau Veritas ID				LIT593		
Sampling Date				2019/11/19 16:00		
COC Number				746428-01-01		
	UNITS	Criteria	Criteria-2	MW106	RDL	QC Batch
Total Nickel (Ni)	mg/L	0.08	3	0.018	0.005	6454825
Total Phosphorus (P)	mg/L	0.4	10	0.07	0.05	6454825
Total Selenium (Se)	mg/L	0.02	5	ND	0.02	6454825
Total Silver (Ag)	mg/L	0.12	5	ND	0.01	6454825
Total Tin (Sn)	mg/L	-	5	ND	0.02	6454825
Total Titanium (Ti)	mg/L	-	5	0.012	0.005	6454825
Total Zinc (Zn)	mg/L	0.04	3	ND	0.005	6454825
Polyaromatic Hydrocarbons						
Biphenyl	ug/L	-	-	ND	0.050	6455924
Benzo(b/j)fluoranthene	ug/L	-	-	ND	0.050	6455924
Naphthalene	ug/L	-	140	ND	0.050	6455924
Volatile Organics						
Benzene	ug/L	2	10	ND	0.40	6452672
Chloroform	ug/L	2	40	ND	0.40	6452672
1,4-Dichlorobenzene	ug/L	6.8	80	ND	1.0	6452672
Ethylbenzene	ug/L	2	160	ND	0.40	6452672
Methylene Chloride(Dichloromethane)	ug/L	5.2	2000	ND	4.0	6452672
Tetrachloroethylene	ug/L	4.4	1000	ND	0.40	6452672
Toluene	ug/L	2	16	ND	0.40	6452672
Trichloroethylene	ug/L	7.6	400	ND	0.40	6452672
Surrogate Recovery (%)						
D10-Anthracene	%	-	-	103		6455924
D14-Terphenyl (FS)	%	-	-	97		6455924
D8-Acenaphthylene	%	-	-	103		6455924
4-Bromofluorobenzene	%	-	-	97		6452672
D4-1,2-Dichloroethane	%	-	-	105		6452672
D8-Toluene	%	-	-	91		6452672

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
Criteria-2: Halton Sanitary & Combined Sewer Bylaw (2-03)
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

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Bureau Veritas Job #: B9W6178
Report Date: 2021/10/27

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-185C
Site Location: 1260 DUNDAS ST.N,
Sampler Initials: SL

MICROBIOLOGY (WATER)

Bureau Veritas ID			LIT593		
Sampling Date			2019/11/19 16:00		
COC Number			746428-01-01		
	UNITS	Criteria	MW106	RDL	QC Batch
Microbiological					
Escherichia coli	CFU/100mL	200	<10	10	6451712

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

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GENERAL COMMENTS

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

Package 1	4.0°C

Revised report : Criteria revised as per client request.

Sample LIT593 [MW106] : 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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Bureau Veritas Job #: B9W6178
Report Date: 2021/10/27

QUALITY ASSURANCE REPORT

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-185C
Site Location: 1260 DUNDAS ST.N,
Sampler Initials: SL

			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
6452672	4-Bromofluorobenzene	2019/11/22	101	70 - 130	100	70 - 130	97	%				
6452672	D4-1,2-Dichloroethane	2019/11/22	102	70 - 130	99	70 - 130	100	%				
6452672	D8-Toluene	2019/11/22	98	70 - 130	101	70 - 130	95	%				
6455924	D10-Anthracene	2019/11/21	101	50 - 130	103	50 - 130	101	%				
6455924	D14-Terphenyl (FS)	2019/11/21	99	50 - 130	101	50 - 130	95	%				
6455924	D8-Acenaphthylene	2019/11/21	104	50 - 130	104	50 - 130	104	%				
6452488	Total Suspended Solids	2019/11/22					ND, RDL=10	mg/L	0	25	101	85 - 115
6452542	Mercury (Hg)	2019/11/20	96	75 - 125	97	80 - 120	ND, RDL=0.00010	mg/L	NC	20		
6452672	1,4-Dichlorobenzene	2019/11/22	94	70 - 130	96	70 - 130	ND, RDL=0.50	ug/L	NC	30		
6452672	Benzene	2019/11/22	96	70 - 130	91	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6452672	Chloroform	2019/11/22	98	70 - 130	92	70 - 130	ND, RDL=0.20	ug/L	2.7	30		
6452672	Ethylbenzene	2019/11/22	92	70 - 130	92	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6452672	Methylene Chloride(Dichloromethane)	2019/11/22	92	70 - 130	86	70 - 130	ND, RDL=2.0	ug/L	NC	30		
6452672	Tetrachloroethylene	2019/11/22	91	70 - 130	92	70 - 130	ND, RDL=0.20	ug/L	0.32	30		
6452672	Toluene	2019/11/22	89	70 - 130	88	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6452672	Trichloroethylene	2019/11/22	NC	70 - 130	93	70 - 130	ND, RDL=0.20	ug/L	1.1	30		
6452868	Fluoride (F-)	2019/11/20	87	80 - 120	99	80 - 120	ND, RDL=0.10	mg/L	1.4	20		
6452880	pH	2019/11/20			102	98 - 103			0.17	N/A		
6452881	Total Cyanide (CN)	2019/11/20	101	80 - 120	102	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
6453774	Dissolved Sulphate (SO4)	2019/11/21	NC	75 - 125	103	80 - 120	ND, RDL=1.0	mg/L	0.44	20		
6454696	Phenols-4AAP	2019/11/21	99	80 - 120	99	80 - 120	ND, RDL=0.0010	mg/L	NC	20		
6454825	Total Aluminum (Al)	2019/11/21	101	80 - 120	95	80 - 120	ND, RDL=0.1	mg/L	NC	20		
6454825	Total Antimony (Sb)	2019/11/21	101	80 - 120	99	80 - 120	ND, RDL=0.02	mg/L	NC	20		
6454825	Total Arsenic (As)	2019/11/21	104	80 - 120	94	80 - 120	ND, RDL=0.01	mg/L	NC	20		
6454825	Total Beryllium (Be)	2019/11/21	97	80 - 120	96	80 - 120	ND, RDL=0.0005	mg/L	NC	20		
6454825	Total Cadmium (Cd)	2019/11/21	103	80 - 120	96	80 - 120	ND, RDL=0.002	mg/L	NC	20		
6454825	Total Chromium (Cr)	2019/11/21	93	80 - 120	94	80 - 120	ND, RDL=0.01	mg/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
6454825	Total Cobalt (Co)	2019/11/21	91	80 - 120	94	80 - 120	ND, RDL=0.002	mg/L	NC	20		
6454825	Total Copper (Cu)	2019/11/21	95	80 - 120	95	80 - 120	ND, RDL=0.01	mg/L	NC	20		
6454825	Total Iron (Fe)	2019/11/21	NC	80 - 120	91	80 - 120	ND, RDL=0.02	mg/L	2.8	20		
6454825	Total Lead (Pb)	2019/11/21	85	80 - 120	97	80 - 120	ND, RDL=0.01	mg/L	0.16	20		
6454825	Total Manganese (Mn)	2019/11/21	86	80 - 120	95	80 - 120	ND, RDL=0.001	mg/L	2.6	20		
6454825	Total Molybdenum (Mo)	2019/11/21	94	80 - 120	95	80 - 120	ND, RDL=0.005	mg/L	NC	20		
6454825	Total Nickel (Ni)	2019/11/21	90	80 - 120	94	80 - 120	ND, RDL=0.005	mg/L	NC	20		
6454825	Total Phosphorus (P)	2019/11/21	118	80 - 120	107	80 - 120	ND, RDL=0.05	mg/L	NC	20		
6454825	Total Selenium (Se)	2019/11/21	106	80 - 120	99	80 - 120	ND, RDL=0.02	mg/L	NC	20		
6454825	Total Silver (Ag)	2019/11/21	97	80 - 120	97	80 - 120	ND, RDL=0.01	mg/L	NC	20		
6454825	Total Tin (Sn)	2019/11/21	93	80 - 120	97	80 - 120	ND, RDL=0.02	mg/L	NC	20		
6454825	Total Titanium (Ti)	2019/11/21	100	80 - 120	101	80 - 120	ND, RDL=0.005	mg/L	NC	20		
6454825	Total Zinc (Zn)	2019/11/21	99	80 - 120	98	80 - 120	ND, RDL=0.005	mg/L	6.3	20		
6454955	Total Carbonaceous BOD	2019/11/26					ND,RDL=2	mg/L	NC	30	89	85 - 115
6454964	Total Kjeldahl Nitrogen (TKN)	2019/11/21	106	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	9.1	20	99	80 - 120
6455924	Benzo(b/j)fluoranthene	2019/11/21	88	50 - 130	93	50 - 130	ND, RDL=0.050	ug/L				
6455924	Biphenyl	2019/11/21	84	50 - 130	88	50 - 130	ND, RDL=0.050	ug/L				
6455924	Naphthalene	2019/11/21	90	50 - 130	82	50 - 130	ND, RDL=0.050	ug/L	NC	30		
6462794	Total Oil & Grease	2019/11/26			97	85 - 115	ND, RDL=0.50	mg/L	1.8	25		

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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
6462799	Total Oil & Grease Mineral/Synthetic	2019/11/26			93	85 - 115	ND, RDL=0.50	mg/L	2.7	25		

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).

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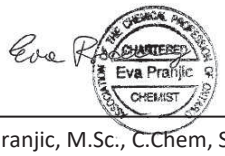
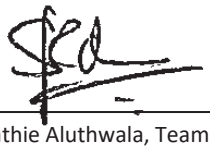
VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



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



Sirimathie Aluthwala, Team Lead

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.

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Bureau Veritas Job #: B9W6178
Report Date: 2021/10/27

B.I.G Consulting Inc.
Client Project #: BIGC-ENV-185C
Site Location: 1260 DUNDAS ST.N,
Sampler Initials: SL

Exceedance Summary Table – Oakville Storm Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
MW106	LIT593-08	Total Manganese (Mn)	0.05	0.18	0.001	mg/L
MW106	LIT593-02	Total Suspended Solids	15	63	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.

Exceedance Summary Table – Halton Sanitary Sewer

Result Exceedances

Sample ID	Bureau Veritas 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.

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CHAIN OF CUSTODY RECORD

Page of

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#31796 B.I.G Consulting Inc.	Company Name:	B.I.G Consulting Inc	Quotation #:	B64476	BV Labs Job #:	Bottle Order #:
Attention:	Accounts Payable	Attention:	Fernando Contento	P.O. #:			746428
Address:	12-5500 Tomken Road Mississauga ON L4W 2Z4	Address:	Same	Project:	BIGC-ENV-185C	COC #:	Project Manager:
Tel:	(416) 214-4880 Fax:	Tel:	(416) 214-4880 Ext: 206 Fax:	Project Name:	1260 Dundas St N	C#746428-01-01	Christine Gripton
Email:	ldougherty@brownfieldigi.com; admin@brownfieldigi.co	Email:	fcontento@brownfieldigi.com; dstrajin@brownfieldigi.co	Site #:			
				Sampled By:	SL		

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 ☐ PWQO ☐ 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	Halton Storm Sewer Bylaw (2-03)	Halton Sanitary & Combined Sewer (2-03)	# of Bottles	Comments
1		MW106	Nov/19	1600	GW	NO	✓	✓	15	
2										
3										
4										
5										
6										
7										
8										
9										
10										

19-Nov-19 18:15
Christine Gripton
B9W6178
DSG ENV-1219

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Shirley Li	19/11/19	18:11		19/11/19	12:15	

Laboratory Use Only					
Time Sensitive	Temperature (°C) on Recei	2 | 5 | 5	Custody Seal Present	Yes	No
			Intact		

* 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 FLOW RATE ESTIMATE CALCULATIONS

Construction Dewatering Rate Estimate

1260 & 1280 Dundas Street West, Oakville, Ontario
Unconfined Aquifer, Groundwater seepage to rectangular excavation (line source)

Table E-1: Precipitation Estimate

Location	Assumed Precipitation Event (mm)	Length of Excavation (m)	Width of Excavation (m)	Rainwater Collection (L)
Aerial Extent of the Excavation	10	70	30	21,000

Table E-2: Construction Dewatering Rate Estimates

Description	Symbol	Values	Unit	Explanation
Input Data				
Lowest Ground Elevation		152.15	m asl	Based on A401, Building Elevations, prepared by Icke Brochu, dated September 10, 2021
Highest Groundwater Elevation		149.46	m asl	Highest groundwater elevation measured on Site within the basement area (September 30, 2021)
Footing Elevation		146.75	m asl	Based on A401, Building Elevations, prepared by Icke Brochu, dated September 10, 2021, basement FFE is at 148.75 m asl. Footing elevation is assumed 2 m below FFE
Aquifer Bottom		143.75	m asl	Assume 3 m below footing
Hydraulic Conductivity	K	7.06E-07	m/s	Highest K value in the vicinity of the basement
Length of Excavation	x	70.0	m	Based on A201, Basement Floor Plan, prepared by Icke Brochu, dated September 10, 2021
Width of Excavation	a	30.0	m	Based on A201, Basement Floor Plan, prepared by Icke Brochu, dated September 10, 2021
Output				
Top of Aquifer		149.46	m asl	Water table for unconfined aquifer
Target Water Level		145.75	m asl	Assumed 1 m below footing elevation
Water Level above aquifer bottom before dewatering	H	5.7	m	
Target water level above aquifer bottom	h	2.0	m	
Radius of Influence	L (R_0)	5.5	m	Sichardt Equation (C=1750 for line source)
Construction Dewatering Flow Rate	Q	32.0	m^3/day	Construction dewatering flow - Dupuit Equation

Description	Symbol	Values	Unit	Explanation
Maximum Construction Dewatering Flow Rate (safety factor of 3)	3Q	96.0	m^3/day	During the initial period and after rains
Estimated Construction Dewatering Flow Rate	Q	32,000	L/day	
Estimated Maximum Construction Dewatering Flow Rate	3Q	96,000	L/day	
Total Construction Dewatering Flow Rate Including Rainfall		**117,000**	**L/day**	

APPENDIX F: LONG TERM DRAINAGE FLOW RATE ESTIMATE CALCULATIONS

Long Term Drainage Flow Rate Estimate

1260 & 1280 Dundas Street West, Oakville, Ontario
Unconfined Aquifer, Groundwater seepage to rectangular excavation (line source)

Table F-1: Precipitation Estimate

Location	Assumed Precipitation Event (mm)	Radius within Basement Footprint (m)	Rainwater Collection (L)
Aerial Extent of the Basement	10	10	11,000

Table F-2: Construction Dewatering Rate Estimates

Description	Symbol	Values	Unit	Explanation
Input Data				
Lowest Ground Elevation		152.15	m asl	Based on A401, Building Elevations, prepared by Icke Brochu, dated September 10, 2021
Highest Groundwater Elevation		149.46	m asl	Highest groundwater elevation measured on Site within the basement area (September 30, 2021)
Basement FFE		148.75	m asl	Based on A401, Building Elevations, prepared by Icke Brochu, dated September 10, 2021, basement FFE is at 148.75 m asl
Aquifer Bottom		145.75	m asl	Assume 3 m below basement slab
Hydraulic Conductivity	K	7.06E-07	m/s	Highest K value in the vicinity of the basement
Length of Excavation	x	70.0	m	Based on A201, Basement Floor Plan, prepared by Icke Brochu, dated September 10, 2021
Width of Excavation	a	30.0	m	Based on A201, Basement Floor Plan, prepared by Icke Brochu, dated September 10, 2021
Output				
Top of Aquifer		149.46	m asl	Water table for unconfined aquifer
Target Water Level		148.25	m asl	Assumed 0.5 m below basement floor level
Water Level above aquifer bottom before dewatering	H	3.7	m	
target water level above aquifer bottom	h	2.5	m	
Radius of Influence	L (R_0)	16.5	m	Cooper and Jacob's Equation - R_0 after 90 days
Long-Term Flow Rate - Steady State	Q	2.78	m^3/day	Long term flow rate - Dupuit Equation

Description	Symbol	Values	Unit	Explanation
Maximum Foundation Drain Flow Rate (safety factor of 3)	3Q	8.34	m^3/day	During the initial period and after rains
Estimated Long-term Foundation Drain Flow Rate	Q	3,000	L/day	
Estimated Maximum Foundation Drain Flow Rate	3Q	9,000	L/day	
Total Foundation Drain Flow Rate Including Rainfall		**20,000**	**L/day**	