Hydrogeological Assessment Report - 582 Essa Road, Barrie, Ontario.

January 16, 2023

Prepared for:
2858098 Ontario Inc.

Cambium Reference: 16304-002

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1.0 Introduction

Cambium Inc. (Cambium) was retained by 2858098 Ontario Inc. (the client) to complete a hydrogeological assessment of the property located at 582 Essa Road, City of Barrie, Ontario (herein referred to as Site). A hydrogeological assessment is required as part of the application process for Official Plan Amendment (OPA), Zoning By-law Amendment (ZBA), and Plan of Subdivision and Condominium for the proposed residential development at the Site; the total area of the property is approximately 0.38 hectares (0.93 acres).

The property is currently a vacant land. It is understood the proposed development includes a six-storey mixed use residential apartment building consisting of 69-units, parking spaces, vehicular access roads, and landscape areas.

1.1 Scope of Work

This hydrogeological investigation was carried out with the following tasks:

- **Review of available background information**: a review of available geological and hydrogeological information for the site and surrounding areas and the previous investigation reports completed for the Site, was conducted to provide background information to allow for characterization of the Site's soil and groundwater conditions.
- **Detailed site inspection**: an inspection of the Site was completed to review existing site conditions including identification of any hydrogeological features such as significant areas of potential groundwater recharge or areas of groundwater discharge.
- **Measurement of groundwater levels:** groundwater levels were measured in the existing monitoring wells to establish and/or confirm the general groundwater flow condition and elevations.
- **In-situ hydraulic conductivity tests: s**ingle well response tests (SWHT) i.e., in-situ hydraulic conductivity tests in all monitoring wells conducted to estimate the hydraulic conductivity of the underlying soils and/or bedrock, which will be used for assessing the potential dewatering requirements, if any.

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- **Water quality assessment:** an unfiltered groundwater sample will be collected from the existing on-site monitoring well for analysis per City of Barrie Sewer Use Bylaw in order to determine the dewatered groundwater discharge options.
- **Dewatering assessment:** based on the proposed development, a dewatering assessment for the proposed one level underground parking was completed to estimate short-term construction dewatering at the Site.
- **Water balance (preliminary):** a preliminary water balance study was completed for the proposed development using the Thornthwaite-Mather approach and utilizing the climatic data obtained from Environment Canada.
- **Source water impact assessment:** as the Site is situated with a Wellhead Protection Area Q2 (WHPA-Q2) with a low stress level, a Source Water Protection assessment in terms of groundwater recharge management was discussed.
- **Report preparation:** a hydrogeological report was prepared presenting the results, findings, and recommendations of this investigation.

It should be noted that a preliminary geotechnical investigation is being completed at the Site by Cambium (Cambium, 2022). The data or information obtained in the current and former investigations has been incorporated into this hydrogeological investigation report.

1.2 Site Description and Site Development

The total area of the property is approximately 0.38 ha (0.93 acres) in size and the Site has a triangular footprint situated on the east side of Essa Road. The parcel is bordered to the west by Essa Road, to the north by developed properties, and to the south by vacant land. The property is currently vacant with a mixture of vegetation, treed areas, and chair lift poles along the east side of the site. The existing ground elevation at the property is relatively flat throughout the site.

As per the drawings provided by the client, the proposed development will initially consist of a mixed-use residential apartment complex with six above-ground storeys and two above ground

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parking floors. However, based on correspondence received by the Client on November 3, 2022, the proposed development changed to an 8-storey building with 1-storey of above ground parking and one level of underground parking.

Water and wastewater services are being provided by the City of Barrie.

The regional location of the Site is outlined on Figure 1, the property and surrounding areas outlined on Figure 2 and the proposed development plans are included in Appendix A.

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2.0 Environmental Features

To assess environmental features, databases maintained by the Ministry of Natural Resources and Forestry (MNRF), the Ministry of Environment, Conservation and Parks (MECP), and Nottawasaga Valley Conservation Authority (NVCA) were reviewed.

Based on the data reviewed, the Site is situated within the Middle Nottawasaga River subwatershed under the jurisdiction of the NVCA Source Protection Area. The local drainage continues west and northwestward through a series of tributaries to ultimately discharge into Nottawasaga River. The Site area is drained into an unnamed ephemeral tributary creek in the northwest portion of the Property.

No significant wetlands or woodlands are situated on the Site; however, majority of the Site is covered with treed areas. The Site is not situated in NVCA regulated area and therefore, development restrictions do not apply to the proposed development Site, in its entirety.

As per MNRF Natural Heritage System database the Site does not have any Areas of Environmental Significance or Areas of Natural and Scientific Interests (ANSI) (Appendix A).

As shown on the Ministry of Environment, Conservation and Parks (MECP) Source Water Protection Atlas map and NVCA Protection Plan, the Site is in Wellhead Protection Area -Q2 (WHPA-Q2) with a low stress level in terms of groundwater recharge management (Appendix A).

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3.0 Physical Setting

3.1 Topography and Drainage

The Site is located within the Middle Nottawasaga River subwatershed of the Nottawasaga Valley watershed area. Based on the regional topographic map of the area, the general slope of the terrain is northwestwards with an elevation of about 322 meters above sea level (masl) in the southeast to about 312 masl in the northwest (Appendix A).

Based on the site-specific topographic survey completed by Total Tech Surveying Inc., dated October 2, 2021 (Appendix A), elevations ranged from 314.55 masl to 313.91 masl, with an average grade elevation of about 314.15 masl.

3.2 Physiography

The Site is located in the physiographic region known as Peterborough Drumlin Field, comprising of typically oval shaped hills with smooth convex contours. This physiographic region is typically characterized by numerous drumlins that are on average oriented 60˚ west of south or 240° azimuth and rise up from the surrounding Newmarket Till plain (Chapman, L.J. and D.F. Putnam, 1984).

3.3 Overburden Geology

In general, the study area is characterized by glaciolacustrine deposits, interpreted to have been deposited by the Laurentide Ice Sheet during the Wisconsin glaciations. The overburden is primarily consisting of a Newmarket Till (Simcoe lobe: sandy silt to silt matrix, moderate to high in matrix carbonate content, clast content moderate to high) which is a stone-poor, carbonate-derived silty to sandy till (Barnett, P.J.,Cowan, W.R. and Henry, A.P., 1991).

3.4 Bedrock Geology

According to Miscellaneous Release – Data 219 from the Ontario Geological Survey (OGS, 2007), the bedrock in the area of the Site consists of Middle Ordovician rocks from the Simcoe Group. The Simcoe Group consists of four formations that dip gently towards the southwest:

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Gull River Formation, Bobcaygeon Formation, Verulam Formation, and the Lindsay Formation from oldest to youngest. Simcoe Group primarily composed of limestone, dolostone, shale, arkose, and sandstone formations.

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4.0 MECP Well Records Assessment

Cambium accessed the Ministry of the Environment Conservation and Parks (MECP) Water Well Information System (WWIS) to review water well records within 500 m of the Site.

There were about 32 water well records found within approximately 500 m of the Site (Figure 3). All wells were installed in overburden and the deepest well (Record#5740875) was installed to a maximum depth of 73.8 metres below ground surface (mbgs), which was installed for water supply. The boreholes were installed between the years 1952 and 2019. A total of seven wells were either abandoned/decommissioned and have no information. A summary of the depths, static water levels, and pumping rate are shown in Table 1 and the well records have been included as Appendix B.

Table 1 Summary of Surrounding Water Well Record Information

Well Type		Depth (mbgs)	Static Water Level (mbgs)	Recommended Pumping Rate (L/min)
Abandoned/Decommissioned Count = 7		N/A	N/A	N/A
Overburden Count = 24	Maximum	73.80	37.0	72
	Minimum	4.6	1.50	23
	Average	12.5	3.8	42

A summary of the information outlined in the well records is provided below:

- Of the records analyzed, all the wells were clear and fresh water was encountered and typically used for livestock and domestic/commercial water supply.
- A thick overburden was reported in the study area, consisting predominantly of fine to medium sand and gravel with silt and clay interlayers.
- Based on well yields, it is indicated the presence of high yielding and productive wells in the area.

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5.0 Borehole Drilling and Monitoring Well Installation

5.1 Past Investigations

A Phase II Environmental Site Assessment report entitled “Phase II Environmental Site Assessment - 582 Essa Road, Barrie”, dated October 14, 2021, was completed by Fortis Environmental (Fortis Environmental, 2021). The Phase II ESA site investigation consisted of advancing four exterior boreholes as well as the additional installation of three monitoring wells, named FBH101, FBH102 and FBH103, at the Site. The drilling of the boreholes was completed on September 4, 2021. The borehole logs were presented in Appendix C and monitoring well locations are shown in Figure 4.

Groundwater samples from each existing well were collected and submitted for laboratory analyses of one or more of the following: Volatile Organic Compounds (VOCs) Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), Petroleum Hydrocarbons (PHCs). None of the measured concentrations in soil samples exceeded the applicable Ministry of Environment, Conservation and Parks (MECP) Table 3 Standards.

The groundwater depth was measured in each monitoring well on September 8, 2021, prior to purging and sampling. Depth to groundwater level ranged between 1.64 mbgs and 2.10 mbgs. The groundwater elevations were based on arbitrary benchmark survey and therefore were not reliable.

5.2 Borehole Investigation (Cambium)

Cambium completed a geotechnical investigation at the Site on November 1, 2022, and their boreholes were advanced at predetermined locations confirmed with the Client. The boreholes were designated as BH101-22 to BH103-22 and were terminated at depths ranging from 8.2 mbgs to 9.8 mbgs. No monitoring wells were installed during the investigation, as three monitoring wells installed in the previous investigation were utilized for water level monitoring.

The elevations and coordinates for all boreholes were obtained during a subsequent Site survey conducted by a Cambium technician on November 9, 2022. The benchmark utilized for

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the survey (top of sanitary manhole located on Essa Road at the northwest corner of the Site) was selected based on the provided proposed Site plan and has an absolute elevation of 314.27 masl.

Borehole locations are appended as Figure 4. Borehole logs are included in Appendix C.

A summary of general lithological details is presented below.

Topsoil

A surficial layer of black sandy topsoil was observed at the surface of each of the boreholes advanced throughout the Site. The thickness of the topsoil ranged from 0.01 m and 0.125 m. The topsoil layer was noted as moist at the time of the investigation.

Fill Materials

Given that the site was previously developed, it is generally expected that imported fill materials or reworked native materials exist throughout the Site and extended to a depth of approximately 1.5 mbgs in each of the boreholes advanced throughout the Site.

Till

Below a depth of 1.5 mbgs in all boreholes, soil materials inferred to be glacial till were encountered. Glacial till is characterized by a heterogeneous mixture of all grain sizes.

The glacial till was predominantly brown in colour and was a silty sand-dominant material with interbedded clayey silt seems and trace to some amounts of gravel throughout a significant portion of the explored depths. The inferred till material transitioned to a grey colour at 6.0 mbgs in BH101-22, 3.0 mbgs in BH102-22, and 2.3 mbgs in BH103-22.

Bedrock

Bedrock was not encountered during the geotechnical investigation. Drilling was terminated at depths ranging from 8.2 mbgs to 9.8 mbgs, in native soils.

No monitoring wells were installed during Cambium's geotechnical investigation. However, monitoring well construction details including screen elevations are obtained from the previous environmental investigation (Fortis Environmental, 2021) and are presented in the Table 2.

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Table 2 Monitoring Well Construction Details

Monitoring Well	Termination Depth (mbgs)	Ground Elevation (masl)	Screen Details	
			Screen Top (masl)	Screen Bottom (masl)
FBH101	4.50	314.14	312.64	309.64
FBH102	4.50	314.39	312.89	309.89
FBH103	4.50	314.33	312.83	309.83

5.3 Groundwater Level Monitoring

Water level monitoring was completed at the Site on December 12 and 19, 2022, in order to assess the water levels and elevations and to define the groundwater flow direction at the Site.

This hydrogeological assessment report includes stabilized water level monitoring data for the winter months. Groundwater levels were measured on two occasions and the recorded groundwater levels are presented in Table 3 below.

Table 3 Measured Groundwater Levels

Monitoring Well	Measured Well Depth (mbgs)	Ground Elevation (masl)	12-Dec-22		19-Dec-22	
			Depth to Groundwater (mbgs)	Water table Elevation (masl)	Depth to Groundwater (mbgs)	Water table Elevation (masl)
EBH101	4.20	314.14	Not available as wells were buried under snow.		1.24	312.90
EBH102	4.62	314.39	1.48	312.91	1.66	312.73
EBH103	4.98	314.33	Not available as wells were buried under snow.		1.42	312.91

As presented above, the measured groundwater levels in the monitoring wells on December 19, 2022, monitoring event ranged in depth from 1.24 mbgs to 1.66 mbgs, and the elevations ranged from 312.73 masl to 312.91 masl, indicating a generally flat water table condition at the Site. Accordingly, the highest winter water level and elevation would be 1.24 mbgs and 312.91 masl, respectively.

Cambium proposes to complete a spring water level monitoring from March to June as part of the requirement of the Conservation Authority. A separate letter report will be submitted after

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the conclusion of long-term monitoring depicting the seasonal high water table conditions at the Site.

5.4 Groundwater Flow Direction

Based on the groundwater elevation data obtained from the monitoring event (December 19, 2022), a site-specific groundwater elevation contour map was prepared to present the groundwater flow direction across the Site. As shown in Figure 5, the groundwater flow direction was found to be northwest following the local surficial drainage.

5.5 Physical Laboratory Testing

Physical laboratory testing, including four sieve and hydrometer analyses (LS-702, 705) was completed on selected soil samples (BH101-22, BH102-22 and, BH103-22) to confirm textural classification and to estimate percolation rates of the native soils. Results are presented in Appendix D and details of the grin-size analysis are presented in Table 4 below.

Based on sieve analysis data, the sample from BH102-22 is almost devoid of gravel and rest of the samples are a typical till deposits.

Table 4 Particle Size Distribution

BH	Depth (mbgs)	Description	% Gravel	% Sand	% Silt	% Clay	Percolation Times (min/cm)
BH101-22 SS3	1.5 – 2.1	Silty Sand, some Gravel, trace Clay	10	56	25	9	25
BH101-22 SS7	6.1 – 6.7	Silty Sand some Gravel trace Clay	14	25	25	13	30
BH102-22 SS4	2.3 – 2.9	Clayey Silt some Sand trace Gravel	1	14	57	28	45
BH103-22 SS5	3.0 – 3.7	Silty Sand trace Gravel trace Clay	9	57	25	9	25

The soil percolation rates ranged between 25 min/cm and 45 min/cm, indicating a low to moderate drainage capacity of the native soils. The geometric mean of the percolation rate was estimated at about 30 min/cm.

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5.6 In-Situ Hydraulic Conductivity Tests

The hydraulic conductivity (k-value) of the soils were estimated based on the results obtained from the single well response tests (slug tests). Aquifer response test (slug tests/single well response tests) was conducted on December 19, 2022. Either falling head test or rising head tests were performed in the existing monitoring wells FBH101, FBH102, and FBH103. Results of hydraulic conductivity tests are presented below in Table 5 and analytical data is included in Appendix E.

Table 5 Results of Estimated Hydraulic Conductivity as per Slug Test

Monitoring well	Estimated Hydraulic Conductivity (m/sec)	Tested Soil Type
FBH101	2.95×10^{-6}	Silty Sand Till, some Gravel, trace Clay
FBH102	1.30×10^{-7}	Silty Sand Till, some Gravel, trace Clay
FBH103	4.93×10^{-7}	Silty Sand Till, some Gravel, trace Clay

The hydraulic conductivity was estimated utilizing Aquifer Test Pro slug test software using the Hvorslev interpretation method. The estimated hydraulic conductivities ranged between 1.30×10^{-7} m/sec and 2.95×10^{-6} m/sec and were consistent with published values for the native soils encountered at the respective boreholes. The geometric mean of hydraulic conductivity was calculated at 5.74×10^{-7} m/sec.

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6.0 Construction Dewatering

Construction dewatering is intended to lower the groundwater levels in the excavation area in order to ensure a dry and safe working condition.

The requirements for construction dewatering generally depend on the Site's soil and groundwater conditions including soil type, soil permeability or hydraulic conductivity, local groundwater levels, and the design of the proposed development, such as the foundation and/or basement elevation, as well as the size of proposed structure.

6.1 Proposed Development, Anticipated Excavation and Dewatering

It is proposed that the property will be developed into an 8-storey mixed use residential building with one above ground and one underground parking which will require construction excavation (Appendix A). Dewatering estimates were calculated for a single construction excavation to accommodate the underground parking. As per the design drawings from the client, the proposed basement excavation area is slightly irregular in shape with a total area of about 2059 m^2 (Appendix A).

Based on the design information and the topographic survey plan (Appendix A), the anticipated grade elevation or finished floor elevation (FFE) would be 314.15 masl and the depth to the proposed one level underground parking would be 3.66 m and excavation elevation would be 309.99 masl, including an allowance of 0.50 m for granular base and sub-slab thickness.

Based on the groundwater monitoring data, the measured and recorded groundwater depth and elevation were from 1.24 mbgs and 312.91 masl, which are higher than the excavation elevations.

The open-cut excavation will be anticipated to cut through fill materials into native sandy silt to silty sand till soils to the explored depth of 8.2 mbgs. Therefore, groundwater control (construction dewatering) shall be considered during the construction, during which time the groundwater level should be lowered to 1 m below the excavation for a safe and dry working environment. In addition, long-term sub-drain drainage discharge will be required as well, if water-tight foundation construction methods are not employed.

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6.2 Construction Dewatering Rate Estimation (Short-term)

To estimate the dewatering rate needed to drain the excavation area for the building foundation, the equation for a partially penetrating well, with an equivalent area to the excavation, in an unconfined aquifer under steady-state condition was used. To calculate inflow into the excavation, the methods outlined in the Construction Dewatering and Groundwater Control (J.P.Powers, 2007) were utilized.

The following assumptions and assumed parameters were applied in estimating the construction dewatering rate.

- Depth to groundwater 1.24 mbgs, at an elevation of 312.91 masl.
- The target dewatering excavation depth is estimated at 5.16 mbgs for one level underground parking (1 m below the bottom excavation) at an elevation of 308.99 masl.
- Water table drawdown would be 3.92 m for the one level underground parking.
- The total excavation area is about 2,059 m2.
- Aquifer thickness is assumed at 10 m; no aquitard unit was encountered at the base of the boreholes and therefore the aquifer may be thickest could not be confirmed.
- The mean hydraulic conductivity = 5.74 x 10-7 m/s.

Although the foundation construction details were not available at the time of this report, the following can be inferred:

- Maximum expected depth of excavation would be 5.16 mbgs
- Maximum expected depth of foundation would be 4.16 mbgs
- Percentage of Site to be developed is approximately 58%

Based on the above assumptions, the dewatering rate for the excavation area and construction of the footing foundation for one level of underground parking was calculated for different hydraulic conductivities as shown in Table 6 below (Appendix F).

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Table 6 Estimated Dewatering Rates

Hydraulic Conductivities (m/sec)		Estimated Flow (L/day)	With a Safety Factor of 1.5
Low	1.30×10^{-7}	13,742	20,163
High	2.95×10^{-6}	80,543	120,800
Mean	5.74×10^{-7}	30,190	45,290

Assuming a safety factor of 1.5, to accommodate the uncertain factors such as aquifer thickness, the contribution from the upper sandy layer, hydraulic conductivity of water bearing layers and the extent of horizontal excavation area, the total dewatering volume was estimated at about 120,800 L/day. It is known that the equation used in dewatering rate estimation is applied for a steady state condition. In general, at the beginning of the pumping, the pumping rate may be greater than that at the steady state condition as the soils surrounding the excavation drain and approach their equilibrium level.

To account for the runoff on a rainy day during the construction at the Site, a 20 mm daily rainfall has been considered referring to the City of Toronto Wet Weather Flow Management Guidelines (Nov. 2006). The total runoff volume is given by the following formula:

Total Runoff Volume (V) per day = Site Area x Rainfall Intensity.

$$= 2{,}059\ m^2 \times 0.02\ m$$

$$= 41\ m^3/day\ (or\ 41{,}000\ L/day)$$

Accordingly, the total peak short-term dewatering rate during construction was estimated at about 161,800 L/day (121,800,000 L/day + 41,000 L/day).

6.3 Sub-drain Dewatering (Long-term)

Given the proposed one level of underground parking, the weeping tiles and/or foundation drainage system would be installed for the proposed building to avoid hydrostatic pressure from groundwater on the footing walls as well as to achieve a dry condition for the underground basement levels.

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The finished floor elevations for the underground P1 parking level would be at 310.49 masl (Appendix A) and the water table elevation is at 312.91 masl. It is assumed that weeping tile or sub-drain drainage system will be installed at the same elevation as basement elevation. Therefore, the sub-drain discharge elevation will be below the water table and a drawdown of 2.42 m was estimated for P1 parking. The approximate excavation area for the basement parking is 2,059 m^2.

The groundwater flux from the perimeter and/or under-slab drainage system could be calculated using the Darcy equation:

Q = k * *i* *A, where,

Where: Q is the volume of water (m^3/s)

K is hydraulic conductivity (2.95×10^{-6} m/s)

i is hydraulic gradient (m/m), and

A is the total lateral seepage area (m^2)

The hydraulic gradient would be estimated according to the drawdown and the radius of influence, while the radius of influence is calculated using the Sichardt formula ($Ro = 3000 * Sw * k^{1/2}$).

Based on the assumptions discussed above, the long-term sub-drain discharge was estimated to be approximately 49,400 L/day, without a safety factor.

However, it should be noted that City of Barrie does not allow a permanent dewatering either by sump & pump method or to any local sewers and therefore, Cambium recommends employing water-tight foundation construction methods so as to eliminate the permanent dewatering at the Site.

6.4 Regulatory Permits or Registration

Any construction dewatering or water taking in Ontario are governed by Ontario Regulation 387/04 – Water Taking and Transfer, an Ontario regulation made under the Ontario Water Resource Act (OWRA), and/or Ontario Regulation 63/16 – Registration under Part II.2 of the

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Act – Water Taking, made under Environmental Protection Act and/or Section 34 of the Ontario Water Resources Act (OWRA).

According to Section 34 of the OWRA, any water taking over 50,000 liters per day cannot take place without a valid permit.

According to O. Reg. 63/16, a PTTW will not be required for temporary construction dewatering (for six months or less) in an amount greater than 50,000 L/day but less than 400,000 L/day. However, a registration or posting shall be processed through Environmental Activity and Sector Registry (EASR).

Based on the dewatering rate estimation, the temporary construction dewatering from groundwater will be anticipated to be a maximum of 120,800 L/day, which is above 50,000 L/day but below 400,000 L/day. Additionally, considering precipitation runoff, the total short-term construction dewatering volume would be 161,800 L/day, which necessitates to process filling an EASR registration to permit the short-term dewatering for the proposed development.

6.5 Zone of Influence

The dewatering calculations include estimates of the horizontal distance away from the walls of each excavation where the influence of water withdrawal will be negligible (i.e., the length to zero drawdown (Appendix F).

The area included within the length to zero drawdown from the excavation is the zone of influence (ZOI), also known as radius of influence. The length to zero drawdown of construction excavation to accommodate one level of underground parking was calculated to extend to about 38 m (using the mean hydraulic conductivity), from the walls of the construction excavations.

Available information indicates that there are three private supply wells located within the ZOI; however, these wells were drilled in the 1970’s and 1980’s and it is assumed that all properties are now serviced with municipal water. There are no natural features located within the ZOI of the construction excavations.

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During construction dewatering activities, the areas adjacent to the construction excavations should be monitored regularly for any land settlement and stability issues.

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7.0 Groundwater Quality

One groundwater sample was collected in an unfiltered form from monitoring well FBH101 on December 12, 2022, and analyzed for those parameters outlined in the City of Barrie Sewer Use By-Law (No. 2021-002). The groundwater samples were submitted to Bureau Veritas (BV) Laboratories for chemical analysis. BV has been accredited by Canadian Association for Laboratory Accreditation (CALA). The laboratory analytical results are presented in Appendix G.

Water quality exceedances are outlined in Table 7.

Table 7 Groundwater Quality

Parameter	Parameter Concentration (mg/L)	Sanitary Sewer By-Law Criteria (mg/L)	Storm Sewer By-Law Criteria (mg/L)
Total Suspended Solids	**1,100**	350	15
Total Copper	**0.0198**	2	0.01

Based on the results of the chemical analysis, the following comments on the groundwater quality could be made.

- Concentrations of total suspended solids were reported exceeding for both the sanitary and storm sewer use criteria.
- Total copper found exceeding the storm sewer use criteria for unfiltered water sample.
- The groundwater generated from the Site may meet the sanitary sewer standards after appropriate filtration and can be considered to be discharged to sanitary system.
- Since the City of Barrie Sewer Use By-law doesn't allow groundwater discharge to the sanitary system, we recommend groundwater from dewatering activities be discharged to the storm sewers after appropriate filtration and treatment.

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8.0 Water Balance Assessment

Based on the Thornthwaite and Mather methodology (Thornthwaite & Mather, 1957), the water balance is an accounting of water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from ground or evapotranspiration by vegetation (ET). When long-term average values of P, R, I, and ET are used, there is minimal or no net change to groundwater storage (ΔS).

The annual water budget can be expressed as:

$$P = ET + R + I + \Delta S$$

Where:

P = Precipitation (mm/year)

ET = Evapotranspiration (mm/year)

R = Run-off (mm/year)

I = Infiltration (mm/year)

ΔS = Change in groundwater storage (taken as zero) (mm/year)

It is noted that the water balance described herein does not account for catchment areas that extend off-site. The calculations compare the pre- and post-development water balance changes within the Site boundaries.

The pre-development portion of the area is mainly a vacant land and consists of some paved areas for the driveway.

It is understood that the proposed development consists of an 8-storey mixed-use commercial/residential building with a 1-storey of above ground and one level of underground parking and associated infrastructure including, but not limited to, sidewalks, snow storage and landscape areas.

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Based on the available design information, the development area at the Site can be generally categorized into three types as paved area, roof area, and landscape areas. The pre- and post-development plans of the proposed development are shown in Figure 6 and Figure 7, respectively. A summary of the surface areas of the development is listed in Table 8.

Table 8 Pre- and Post-Development Site Statistics.

Type of Land Coverage	Pre-Development Areas (m^2)	Post Development Areas (m^2)
Paved Area	500	1,002
Building Roof Area	0	1,884
Landscape/Vegetated Area	3,272	886
Total (m^2)	**3,772**	**3,772**

Supporting information referenced herein (including detailed water balance calculations) is attached in Appendix H.

8.1 Water Surplus

Water surplus is calculated by determining the difference between precipitation and evapotranspiration (changes in soil water storage was assumed to be negligible over the course of a year). The volume of water surplus is further sub-divided into portions that infiltrate the on-site soils and that are directed off-site as runoff.

The climatic data including monthly average temperature and precipitation were obtained from Environment Canada, for Barrie WPCC weather station (Climate Identifier: 6110557) located about 4 km distance from the Site. Accordingly, the average annual evapotranspiration was estimated to be about 545 mm/year using the USGS Thornthwaite Monthly Water Balance methodology (Appendix H), and the average annual precipitation was recorded to be 933 mm/year. The water surplus of the Site was calculated to be 388 mm/yr.

Evapotranspiration does not occur from structures, paved areas, or gravel surfaces. It was assumed that 10% of precipitation falling on these surfaces is lost directly to evaporation. The

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remaining depth (i.e., 90% of precipitation) was considered surplus and converted to infiltration and/or runoff.

8.2 Infiltration Rates

The volume of surplus water that infiltrates through pervious surfaces on-site was determined by applying an infiltration factor to the surplus depth. The surplus water that does not infiltrate into pervious surfaces will leave the Site as surface water runoff. The infiltration factor varies from 0 to 1 and is estimated based on topography, soils, and vegetation cover as per the *Stormwater Management Planning and Design Manual* (Ministry of the Environment, 2003).

The rate of infiltration at a site is expected to vary, based on a number of factors to be considered in any infiltration model. To partition the available water surpluses into infiltration and surface run-off, the Ministry of Environment, Conservation and Parks (MECP) infiltration factor was used. The MECP Storm Water Management Planning and Design Manual (2003) methodology for calculating total infiltration based on topography, soil type and land cover was used, and a corresponding run-off component was calculated for the soil moisture storage conditions.

The Site is relatively a flat topography, and based on the results of the borehole investigation, the subsurface conditions at the Site consist predominantly of sandy silt to silty sand till with varying proportions of gravel and clay with a flat topography and an open land. Therefore, an infiltration factor of 0.60 was considered appropriate for the Site.

The calculation of infiltration and runoff in the stages of pre-development and post-development is provided in Appendix H, and are presented in Table 9 through Table 12, below.

8.3 Pre-Development Water Balance

The water balance for the existing conditions of the Site is summarized in Table 9. The pre-development infiltration rate was calculated to be 762 m³/yr and the runoff rate was 928 m³/yr.

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Table 9 Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapo-transpiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	500	467	47	0	420
	Roof Area	-	-	-	0	-
Pervious Areas	Landscape Area	3,272	3,053	1,783	762	508
		3,772	**3,519**	**1,830**	**762**	**928**
Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.						

8.4 Post-Development Water Balance

The post-development water balance is summarized in Table 10. The post-development infiltration rate was calculated to be 206 m^3/yr and the total runoff volume was 2,561 m^3/yr.

Table 10 Post-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapo-transpiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	1,002	935	93	0	841
	Roof Area	1,884	1,758	176	0	1,582
Pervious Areas	Landscape Area	886	827	483	206	138
		3,772	**3,519**	**752**	**206**	**2,561**

8.5 Water Balance Comparison

The water balances of the pre-development and post-development scenarios are summarized below in Table 11.

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Table 11 Water Balance Comparison

	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	3,519	1,830	762	928
Post-Development	3,519	752	206	2,561
Change in Volume			-555	1,633
Change in %			-73	176

Based on the above, there is a net infiltration deficit of about 555 m^3/year compared to the pre-development infiltration. The runoff rate upon development of the Site will increase by 1,633 m^3/year.

8.6 Requirement of Infiltration from Roof Runoff

As shown below in Table 12, approximately 35% of roof runoff is required to compensate the pre-development infiltration.

Table 12 Requirement of Infiltration from Roof Run-off

Volume of Pre-Development Infiltration (m^3/year)	762
Volume of Post-Development Infiltration (m^3/year)	206
Deficit from Pre to Post Development Infiltration (m^3/year)	555
% of Roof Runoff required to match the pre-development Infiltration	35

Based on the above calculations, a summary of the water balance could be provided as follows:

1. There is a net increase in run-off at the Site of about 1,633 m^3/year, from 928 m^3/year to 2,561 m^3/year. This increase is a result of the development of the Site with more impervious areas such as roof and paved areas and decrease in pervious areas.
2. Post-development landscape area was decreased by about 2,386 m^2, when compared to the pre-development landscape, causing less infiltration across the Site.
3. Without implementing any mitigation measures, there is a net deficit of about 555 m^3/year in the post-development infiltration on a yearly basis.

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4. Based on the estimation, a diversion of about 35% of general roof water for infiltration, the proposed development would maintain an enhanced infiltration after the development. Therefore, Cambium would recommend the implementation of any Low Impact Development (LID) measures at the Site in its present design.

8.7 Discussions on LID Measures

It is known that low impact development (LID) practices have received increasing attention as these strategies attempt to capture the runoff and mimic the natural hydrologic cycle. Infiltration decrease reduces groundwater recharge and soil moisture replenishment and reduces stream baseflow needed for sustaining aquatic life. Therefore, it is important to maintain the natural hydrologic cycle as much as possible.

In general, there are two primary categories of LIDs. The first promotes the infiltration of Stormwater close to the source. These infiltration type LIDs are preferred when hydrogeological and physical conditions are optimal and allow for their emplacement. The proposed development does not include a stormwater management pond to improve water quality and to enhance the lost infiltration due to the Site development with paved and roof areas. Therefore, the second option described below could be considered.

The second option captures and slowly releases the water to the groundwater system through the process of storage and filtration by infiltration LIDs. Infiltration targets may be achieved through the incorporation of a variety of stormwater management practices including roof downspout disconnection, roof leaders discharging to ponding areas or soak away pits, infiltration trenches, and grassed swales etc.

The conceptual water balance indicates that there will be an infiltration deficit of about 555 m^3/year in the post-development infiltration upon development of the Site, compared to the pre-development. Based on the estimation, a diversion of 35% of general roof water for infiltration, the proposed development would maintain an enhanced infiltration after the development.

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For the implementation of Low Impact Development (LID) measures, there should be at least 1.0 m of separation distance between the bottom of any proposed infiltration trench and the highest water table. As the water levels at the Site ranged between 1.24 mbgs and 1.66 mbgs even during the winter months, it is not feasible to implement the LIDs at the Site; however, a roof downspout disconnection method could be employed to reduce the infiltration deficit.

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9.0 Source Water Protection and Risk Management

As per the MECP Source Water Protection Information Atlas, the Subject Site is located within the Wellhead Protection Area Q1/Q2 (Appendix A).

9.1 WHPA-Q1/Q2

WHPA Q1- refers to the area where activities that take water without returning it to the same source may be a threat; while WHPA Q2- refers to the area where activities that reduce recharge may be a threat. WHPA-Q1 (area affected by groundwater use) and WHPA-Q2 (area affected by recharge reduction) for the municipal wells in Barrie area were delineated through the application of a numerical groundwater flow model that considered all known high volume groundwater users. In other words, WHPA-Q2 delineates an area where there is potential for threats from reductions in groundwater recharge (i.e. new development).

There is, however, a net deficit in the infiltration compared to pre-development scenario and therefore, there is a negative impact to the groundwater recharge due to the proposed nature of the development in the study area. The water balance assessment for the proposed development indicated an infiltration deficit of 555 m^3/year.

Therefore, as per the Source Protection Plan Land Use Policies it is required to meet the pre-development water balance by implementing the LID measures such as downspout disconnection techniques or any suitable measures where practicable, demonstrating recharge will be maintained across the Site.

Based on the proposed Site Plan, the client is not proposing any infiltration tanks or trenches across the Site for the compensation of infiltration deficit across the Site. Cambium, if requested, can complete native soils infiltration tests using Guelph Permeameter to estimate the soil infiltration rates to help designing the infiltration measures across the Site.

The Site will be under municipal sewage service and as such is not expected to cause any groundwater contamination by nitrates.

The major land use practices at the proposed development do not include the storage & handling of large quantities of road salt and snow storage and handling, hence, the

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development of Salt Management Plans and Snow Storage Plans is not required for the proposed development.

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10.0 Assessment of Potential Impacts

Based on the proposed development, the potential impacts due to the Site development were assessed as below.

10.1 Natural Features

As discussed, no natural features such as wetland or woodlands are located on Site, and therefore no impacts on the local natural features due to the Site development were anticipated. Also, as the Site is not located within the NVCA regulated area, no development restrictions apply to the Site.

10.2 Water Supply Wells near the Site

Given that shallow water table conditions and likely having one level underground parking, there could be potential dewatering required for the completion of the proposed development. The development surrounding the Site is under municipal water supply; therefore, impacts on the local water wells (private or public), if any will not be anticipated to be associated with the dewatering activity or due to the Site development.

10.3 Considerations on Drinking Water Vulnerability

Based on the MECP Source Protection Information Atlas, the Site is situated within WHPA Q1/Q2 area related to groundwater recharge management, all possible infiltration measures should be considered to compensate the infiltration deficit caused by the proposed development.

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11.0 Conclusions and Recommendations

Cambium Inc. (Cambium) was retained by 2858098 Ontario Inc. (the Client) to complete a hydrogeological assessment of the property located at 582 Essa Road, Barrie, Ontario.

The site is not situated in the NVCA regulated area as per Ont. Reg. 172/06. and therefore, development restrictions do not apply to the proposed development Site, in its entirety.

The measured groundwater levels in the monitoring wells during the winter months ranged in depth from 1.24 mbgs to 1.66 mbgs, and the elevations ranged between 312.73 masl to 312.91 masl, indicating a generally flat water table condition at the Site. The groundwater flow direction was found to be northwest following the local surficial drainage.

The estimated hydraulic conductivities ranged between 1.30×10^{-7} m/sec and 2.95×10^{-6} m/sec and the geometric mean of hydraulic conductivity was calculated at 5.74×10^{-7} m/sec.

As the proposed development includes one-level underground parking, construction excavation dewatering will be required. Preliminary dewatering calculations for short-term construction dewatering indicated that the conservative groundwater inflow rate into the construction excavation for was estimated to be 161,800 L/day, factoring in precipitation run-off and a safety factor of 1.5.

As the combined daily dewatering rates are conservatively measured to be greater than 50,000 L/day during the construction excavation process, it is anticipated that EASR registration will be required.

It is imperative that daily dewatering rates be monitored (or the dewatering of stagnant water in the construction excavation estimated) to ensure that the short-term are less than 400,000 L/day. During construction dewatering activities the areas adjacent to the construction excavations should be monitored regularly for any land settlement and stability issues.

As the City of Barrie does not allow for permanent dewatering either by sump & pump method or to any local sewers, Cambium recommends employing water-tight foundation construction methods so as to eliminate the permanent dewatering at the Site.

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At the time this document was prepared, the final receiver of the discharge water was unknown, however, City of Barrie does not allow any discharge to the sanitary sewers. Therefore, Cambium recommends that water discharged from construction excavations is disposed to local storm sewers and based on the groundwater sample collected by Cambium, water discharge is anticipated to meet the storm sewer criteria after appropriate filtration and treatment.

The conceptual water balance indicates that there will be an infiltration deficit of about 555 m³/year in the post-development infiltration upon development of the Site, compared to the pre-development. Based on the estimation, a diversion of 35% of general roof water for infiltration, the proposed development would maintain an enhanced infiltration after the development.

For the implementation of LID measures, there should be at least 1.0 m of separation distance between the bottom of any proposed infiltration trench and the highest water table. As the water levels at the Site ranged between 1.24 mbgs and 1.66 mbgs even during the winter months, it is not feasible to implement LIDs at the Site; however, a roof downspout disconnection method could be employed to reduce the infiltration deficit.

Since the Site is situated within WHPA Q1/Q2 area related to groundwater recharge management, all possible measures should be considered to compensate the infiltration deficit caused by the proposed development.

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12.0 Closing

We trust that the information in this submission meets your current requirements. If you have any questions regarding the contents of this report, please contact the undersigned.

Respectfully submitted,

Cambium Inc.

Nicole Heikoop, M.Sc., GIT Project Coordinator	Sudhakar Kurli, M.Sc., P.Geo. Project Manager/Hydrogeologist

SK/nh

P:\16300 to 16399\16304-002 2858098 Ontario Inc - HydroG - 582 Essa Rd, Barrie\Deliverables\REPORT - HydroG\Draft\2023-01-16 Hydrogeo Assessment, 582 Essa Road, Barrie_DRAFT.docx

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13.0 References

Barnett, P.J.,Cowan, W.R. and Henry, A.P. (1991). Quaternary geology of Ontario, southern sheet; Ontario.

Cambium. (2022). *Geotechnical Investigation Report - 582 Essa Road, Barrie, Ontario.* Cambium Inc.

Chapman, L., & Putnam, D. (1984). *The Physiography of Southern Ontario.* Toronto, Ontario: Ontario Geological Survey Special.

Chapman, L.J. and D.F. Putnam. (1984). *The Physiography of Southern Ontario: Ontario Geological Survey, Special Volume 2.*

Fortis Environmental. (2021). *Phase II Environmental Site Assessment - 582 Essa Road, Barrie.*

J.P.Powers, A. C. (2007). *Construction Dewatering and Groundwater Control, New Methods and Applications.*

Ministry of the Environment. (2003). *Stormwater Management Planning and Design Manual .*

OGS. (2007). *Paleozoic Geology of Southern Ontario; Miscellaneous Release -- Data 219.* Ontario Geological Survey.

Thornthwaite, C., & Mather, J. (1957). *Instructions and tables for computing potential evapotranspiration and the water balance.* Centerton, N.J.: Laboratory of Climatology, Publications in Climatology, v. 10, no. 3, p. 185-311.

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14.0 Standard Limitations

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Site Assessments

A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

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Appended Figures

HYDROGEOLOGICAL ASSESSMENT

INNOVATIVE PLANNING SOLUTIONS
582 Essa Rd
Barrie, Ontario

LEGEND

- Highway
- Major Road
- Minor Road
- Watercourse
- Water Area
- Wooded Area
- Built Up Area

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REGIONAL SITE LOCATION MAP

Project No.: 16304-002		Date: January 2023 Rev.:	
Scale: 1:100,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: SK	Figure:	1

O:\GIS\MXDs\16300-16399\16304-002 Inspiration Group of Companies Ltd - HydroG - 582 Essa Rd, Barrie\2022-12-21 FIG 1 - Regional Site Location Map.mxd

HYDROGEOLOGICAL ASSESSMENT

INNOVATIVE PLANNING SOLUTIONS
582 Essa Rd
Barrie, Ontario

LEGEND

Site (approximate)

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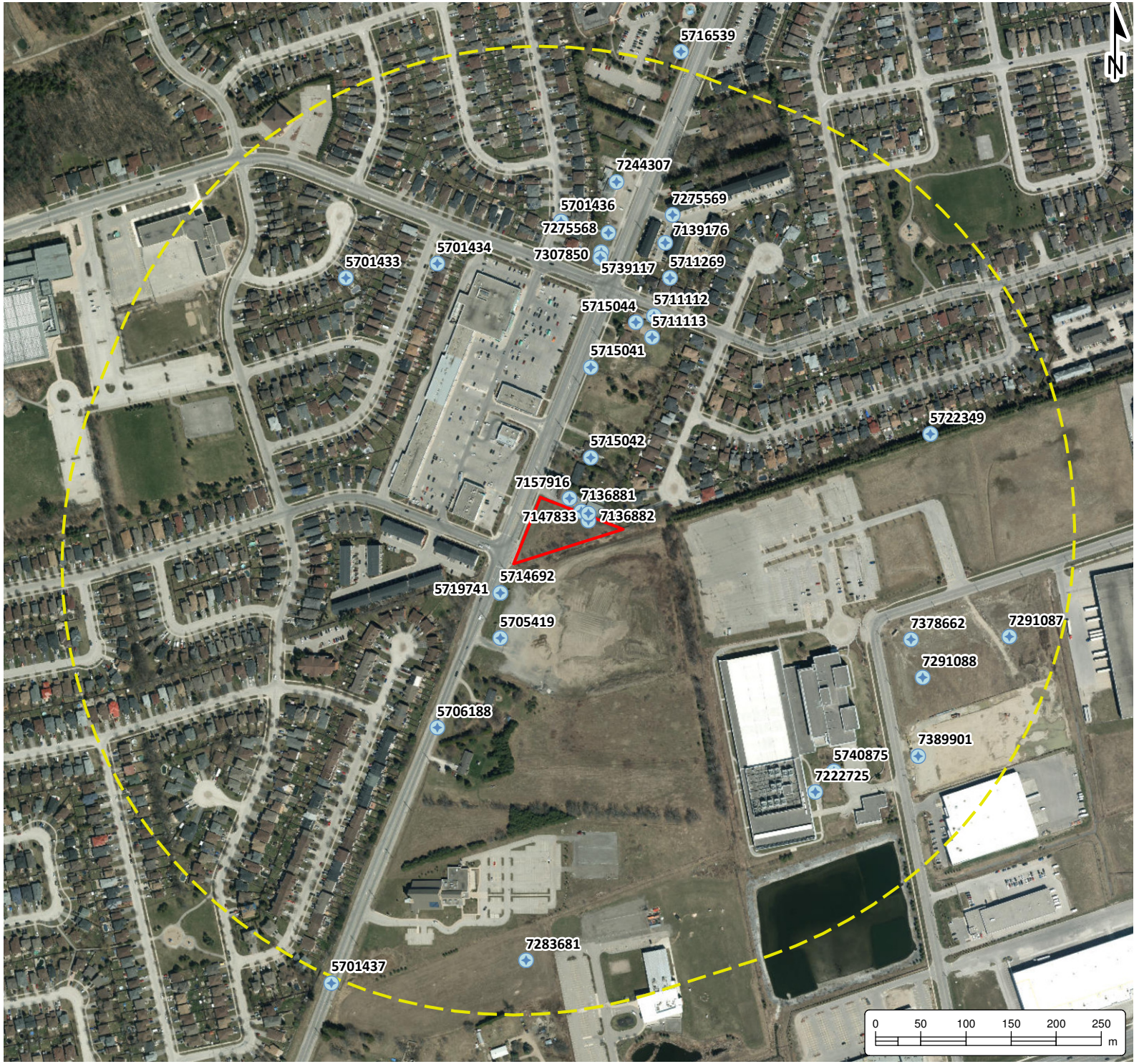
SITE PLAN

Project No.: 16304-002		Date: January 2023 Rev.:	
Scale: 1:1,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: SK	Figure:	**2**

O:\GIS\MXDs\16300-16399\16304-002 Inspiration Group of Companies Ltd - HydroG - 582 Essa Rd, Barrie\2022-12-21 FIG 2 - Site Plan.mxd



HYDROGEOLOGICAL ASSESSMENT

INNOVATIVE PLANNING SOLUTIONS
582 Essa Rd
Barrie, Ontario

LEGEND

- Water Well Records
- Study Area (500m)
- Site (approximate)

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MECP WELL RECORDS WITHIN 500m

Project No.: 16304-002		Date: December 2022	Rev.:
Scale: 1:6,000		Projection: NAD 1983 UTM Zone 17N	
Created by: PAS	Checked by: SK	Figure: 3	

O:\GIS\MXDs\16300-16399\16304-002 Inspiration Group of Companies Ltd - HydroG - 582 Essa Rd, Barrie\2022-12-20 FIG 3 MECP Well Records Map.mxd

HYDROGEOLOGICAL ASSESSMENT

INNOVATIVE PLANNING SOLUTIONS
582 Essa Rd
Barrie, Ontario

LEGEND

- Borehole
- Monitoring Well (installed by others)
- Site (approximate)

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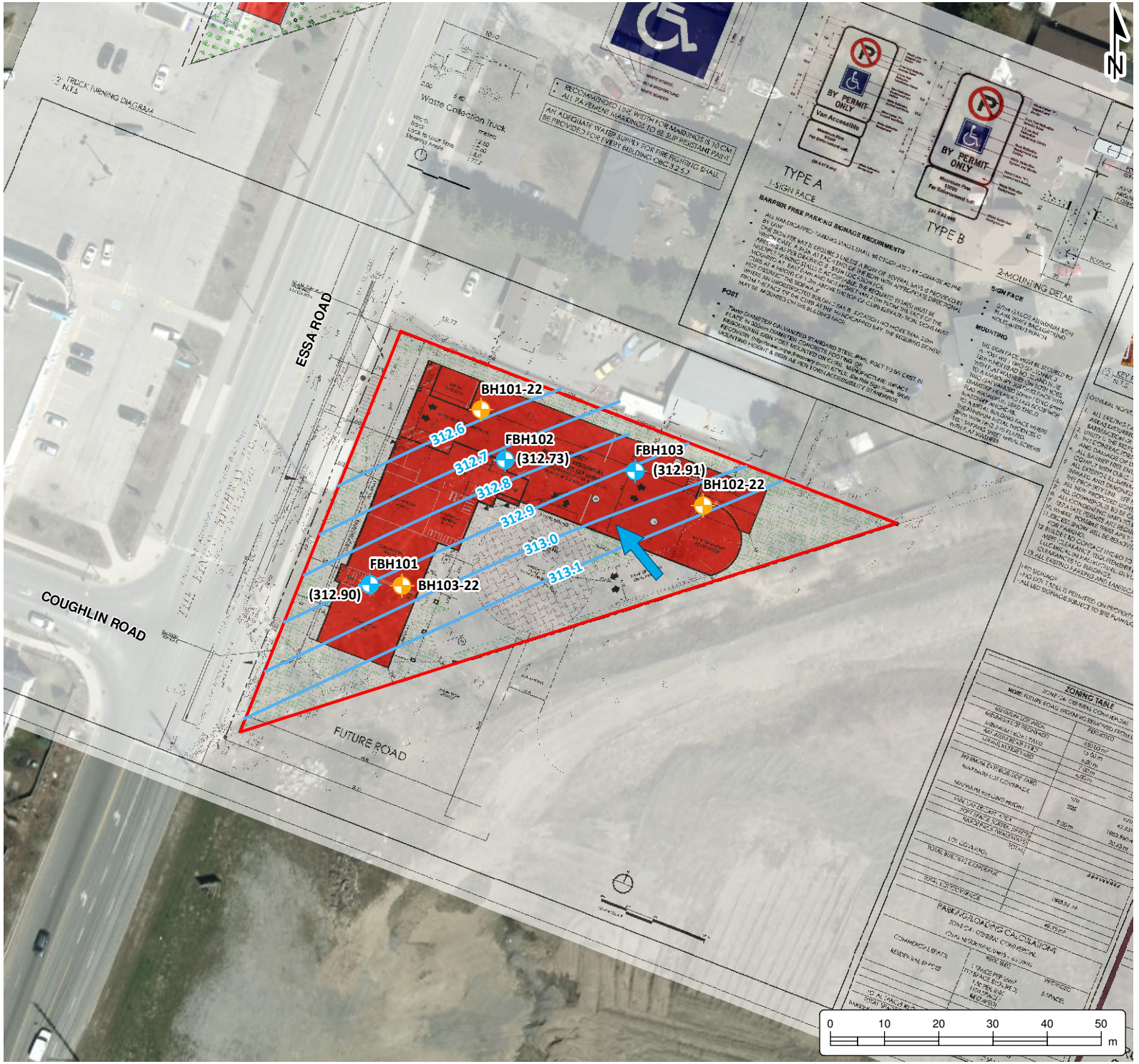
BOREHOLE LOCATION PLAN

Project No.: 16304-002		Date: January 2023 Rev.:	
Scale: 1:1,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: SK	Figure:	4

O:\GIS\MXDs\16300-16399\16304-002 Inspiration Group of Companies Ltd - HydroG - 582 Essa Rd, Barrie\2022-12-21 FIG 4 - Borehole Location Plan.mxd



HYDROGEOLOGICAL ASSESSMENT

INNOVATIVE PLANNING SOLUTIONS
582 Essa Rd
Barrie, Ontario

LEGEND

- Borehole
- Monitoring Well (installed by others)
- Groundwater Contour
- Site (approximate)
- (312.91) Groundwater Elevation (December 19, 2022)
- Groundwater Flow Direction (December 19, 2022)

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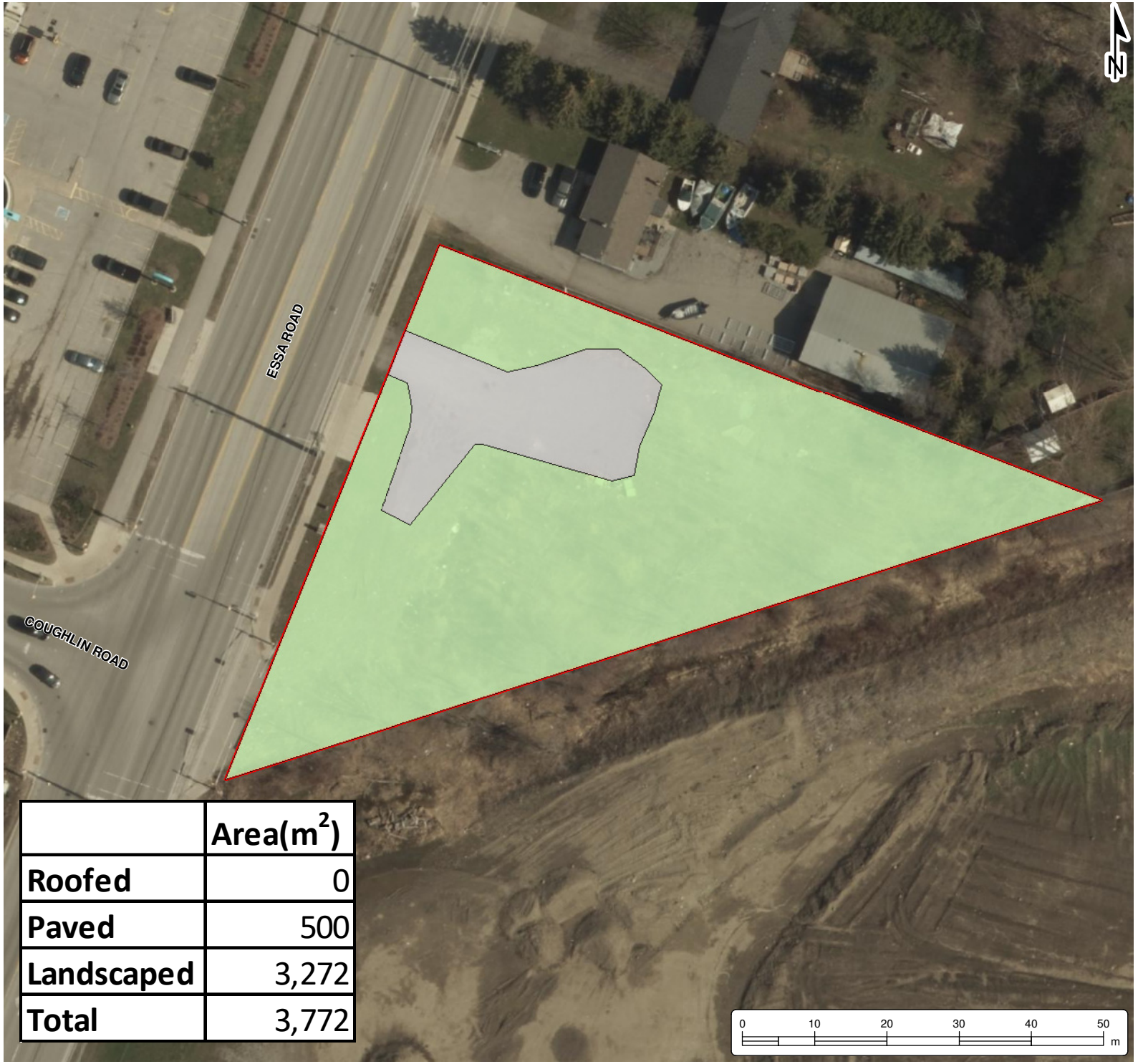
GROUNDWATER CONFIGURATION MAP

Project No.: 16304-002		Date: January 2023 Rev.:	
Scale: 1:1,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: SK	Figure:	5

O:\GIS\MXDs\16300-16399\16304-002 Inspiration Group of Companies Ltd - HydroG - 582 Essa Rd, Barrie\2022-12-21 FIG 5 - Groundwater Configuration Map.mxd

HYDROGEOLOGICAL ASSESSMENT

INNOVATIVE PLANNING SOLUTIONS
582 Essa Rd
Barrie, Ontario



	Area(m^2)
Roofed	0
Paved	500
Landscaped	3,272
Total	3,772

LEGEND

- Paved
- Landscaped
- Site (approximate)

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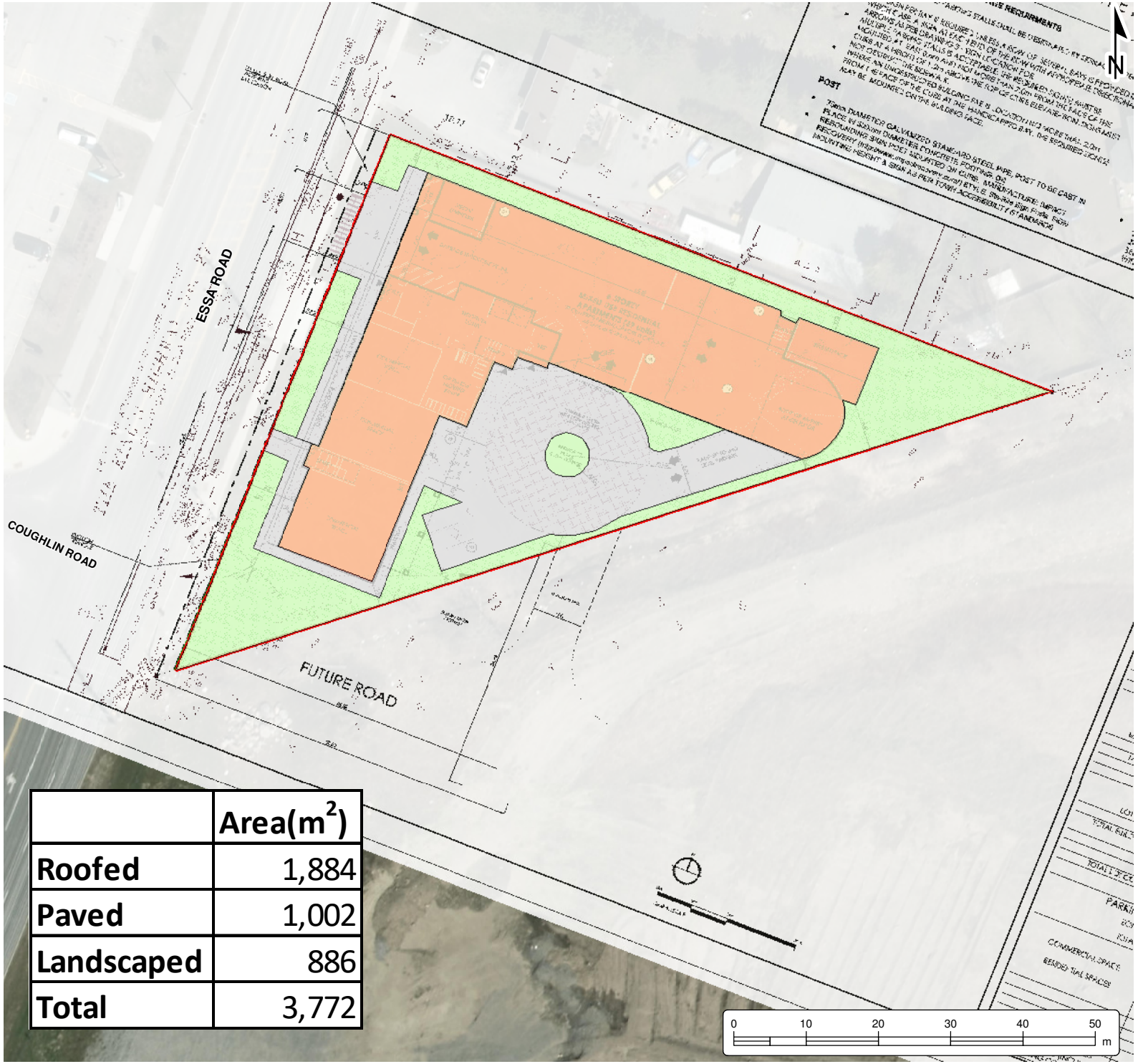
PRE-DEVELOPMENT PLAN

Project No.: 16304-002		Date: January 2023	Rev.:
Scale: 1:750		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: SK	Figure: 6	

O:\GIS\MXDs\16300-16399\16304-002 Inspiration Group of Companies Ltd - HydroG - 582 Essa Rd, Barrie\2022-12-21 FIG 6 - Pre-Development Plan.mxd

HYDROGEOLOGICAL ASSESSMENT

INNOVATIVE PLANNING SOLUTIONS
582 Essa Rd
Barrie, Ontario



	Area(m^2)
Roofed	1,884
Paved	1,002
Landscaped	886
Total	3,772

LEGEND

- Roofed
- Paved
- Landscaped
- Site (approximate)

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POST-DEVELOPMENT PLAN

Project No.: 16304-002		Date: January 2023 Rev.:	
Scale: 1:750		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: SK	Figure:	7

O:\GIS\MXDs\16300-16399\16304-002 Inspiration Group of Companies Ltd - HydroG - 582 Essa Rd, Barrie\2022-12-21 FIG 5 - Post-Development Plan.mxd

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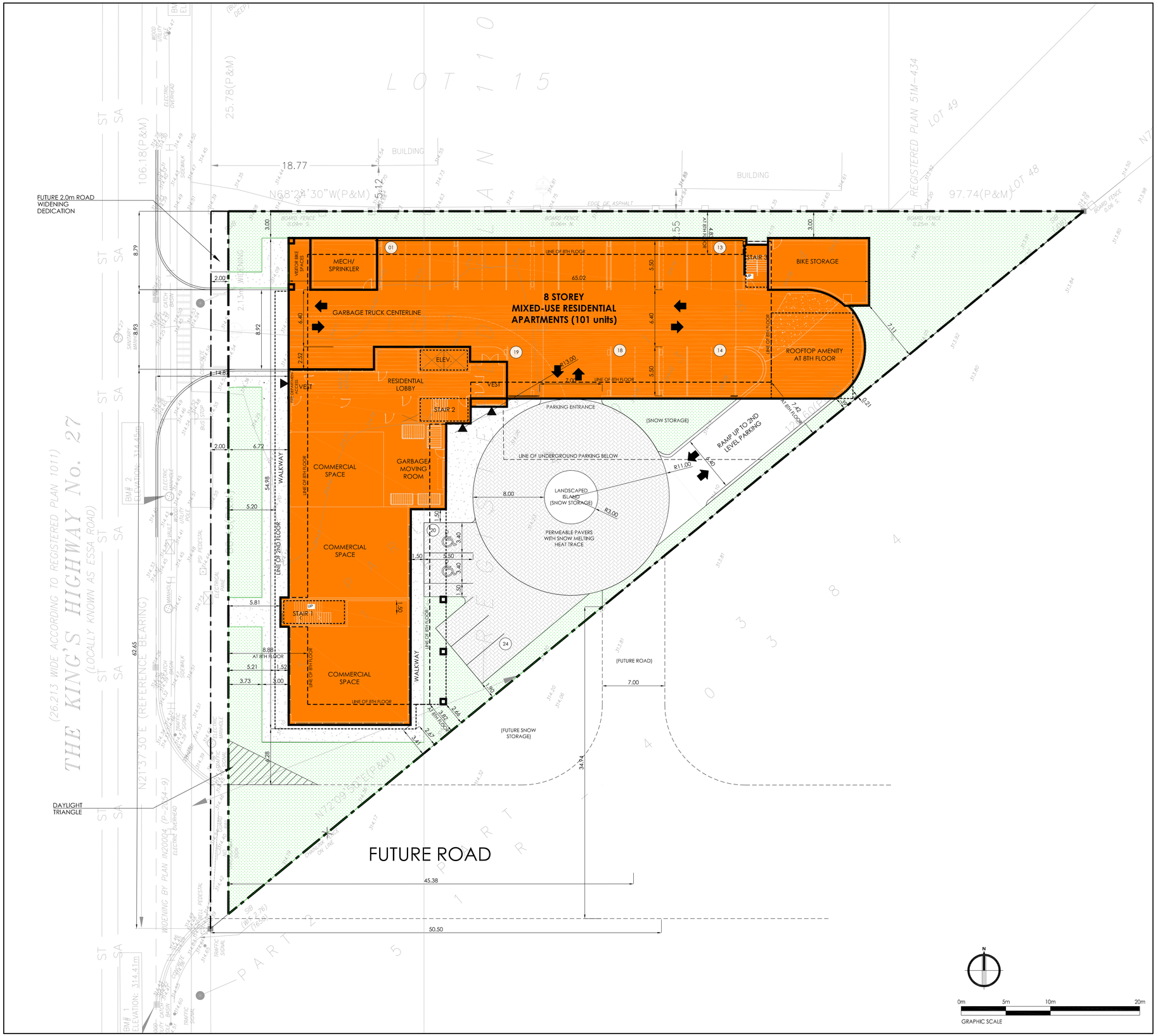
Appendix A

Land Information & Development Plans



1 SITE PLAN
1:200

SITE PLAN APPLICATIION NUMBER

D28-021-2022

CITY OF BARRIE

LOT 16 ON REGISTERED PLAN 1101
CITY OF BARRIE
COUNTY OF SIMCOE, ONTARIO

2 KEY PLAN
N.T.S

GENERAL NOTES:

1. ALL EXISTING PAVEMENT, CURBS, SIDEWALKS, DRIVEWAYS AND BOULEVARD AREAS DISTURBED BY THE CONSTRUCTION MUST BE REINSTATED TO THE SATISFACTION OF THE TOWN.
2. UTILITY IS THE RESPONSIBILITY OF THE DEVELOPER/OWNER.
3. THE CONTRACTOR/OWNER IS RESPONSIBLE FOR ALL UTILITY LOCATES AND AND DAMAGE OR DISTURBANCE DURING CONSTRUCTION.
4. ALL BARRIER FREE ENTRANCES AND BARRIER FREE PATHS OF TRAVEL MUST COMPLY WITH O.B.C. 3.8.
5. ALL EXTERIOR ILLUMINATION TO BE DIRECTED DOWNWARD AS WELL AS INWARD AND DESIGNED TO MAINTAIN ZERO CUTOFF LIGHT DISTRIBUTION AS THE PROPERTY LINE.
6. ALL DOWNSPOUTS TO BE CONNECTED TO THE STORM DRAINAGE SYSTEM.
7. THERE WILL BE NO CURBSIDE WASTE COLLECTION.
8. ALL CONDENSING UNITS TO BE SCREENED ON THE ROOF
9. SEPARATE PERMITS ARE REQUIRED FOR ANY SIGNAGE ON THE PROPERTY.
10. WHERE POSSIBLE TREES ARE TO BE PROTECTED FROM CONSTRUCTION.
11. EXCESS SNOW WILL BE REMOVED BY PRIVATE HAULER SUBJECT TO DEMAND FOR PARKING.
12. ALL FIRE ROUTES SHALL BE CONSTRUCTED OF HARD SURFACE MATERIAL SUCH AS ASPHALT OR CONCRETE AND DESIGNED TO SUPPORT A LOAD OF NOT LESS THAN 11,363kg PER AXLE AND HAVE A CHANGE IN GRADIENT OF NOTE MORE THAN 1 IN 12.5 OVER A MIN. DISTANCE OF 15M. ACCESS ROUTE SHALL BE A MIN. WIDTH OF 6.0m AND ALL TURNS IN THE ROUTE SHALL HAVE A CENTERLINE RADIUS OF 12.0m
13. FIRE ROUTES SHALL BE DESIGNATED AS PER BY-LAW AS AMENDED PRIOR TO OCCUPANCY OF THE BUILDING.
14. THE TOPS OF ANY CURBS BORDERING DRIVEWAYS WITHIN THE MUNICIPAL BOULEVARDS WILL BE FLUSH WITH THE MUNICIPAL SIDEWALK AND ROAD CURB.
15. AT THE ENTRANCES TO THE SITE, THE MUNICIPAL CURB AND SIDEWALK WILL BE CONTINUOUS THROUGH THE DRIVEWAY AND A CURB DEPRESSION WILL BE PROVIDED FOR EACH ENTRANCE.
16. CONSTRUCTION CHAINLINK HOARDING MUST BE INSTALLED WITH SEDIMENT CONTROL AS PER CITY STANDARDS AND APPROVALS.
17. ROAD OCCUPANCY PERMIT MUST BE OBTAINED 48 HOURS PRIOR TO COMMENCING ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOWANCE.
18.

ZONING TABLE

ZONE C4- GENERAL COMMERCIAL

NOTE: FUTURE ROAD WIDENING REMOVED FROM LOT AREA

	PERMITTED	PROPOSED
MINIMUM LOT AREA	450.00 m²	3771.95 m²
MINIMUM LOT FRONTAGE	15.00 m	80.40 m
MINIMUM FRONT YARD	6.00 m	5.20 m
MINIMUM REAR YARD	7.00 m	N/A
MINIMUM SIDE YARD	6.00 m	3.00 m
MINIMUM SIDE YARD	6.00 m	0.22 m
MINIMUM EXTERIOR SIDE YARD	n/a	n/a
MAXIMUM LOT COVERAGE	50%	49.947
		1883.960 m²
MAXIMUM BUILDING HEIGHT	9.00 m	27.20 m
MIN. LANDSCAPE AREA		
SOFT SPACE (GREEN SPACE)		1036.50 m²
HARDSPACE (WALKWAYS)		283.40 m²
TOTAL		1319.90 m²
LOT COVERAGE		
TOTAL BUILDING COVERAGE	1883.96 m²	
TOTAL LOT COVERAGE	49.95 m²	

PARKING/LOADING CALCULATIONS

ZONE C4 - GENERAL COMMERCIAL

TOTAL RESIDENTIAL UNITS = 65 UNITS

	REQUIRED	PROVIDED
COMMERCIAL SPACE	1 SPACE PER 25m² [17 SPACE REQUIRED]	15 SPACES
RESIDENTIAL SPACES	1.50 PER UNIT [152 SPACES REQUIRED]	101 SPACES
TOTAL SPACES REQUIRED	169 SPACES	
TOTAL SPACES PROVIDED	116 SPACES	
BARRIER FREE SPACE (INCLUDED IN PARKING COUNT)	2 SPACES	

0m 5m 10m 20m
GRAPHIC SCALE

PROJECT NAME
BARRIE APARTMENTS

PROJECT ADDRESS
582 ESSA ROAD
BARRIE, ON

CLIENT
INSPIRATION GROUP

ARCHITECT
KHALSA DESIGN INC.

BRAMPTON, ON
TELEPHONE: 647-468-2940

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REGISTRATION

Project number	23002
Date	12/05/2022
Drawn by	AB
Checked by	KDI
Scale	As indicated

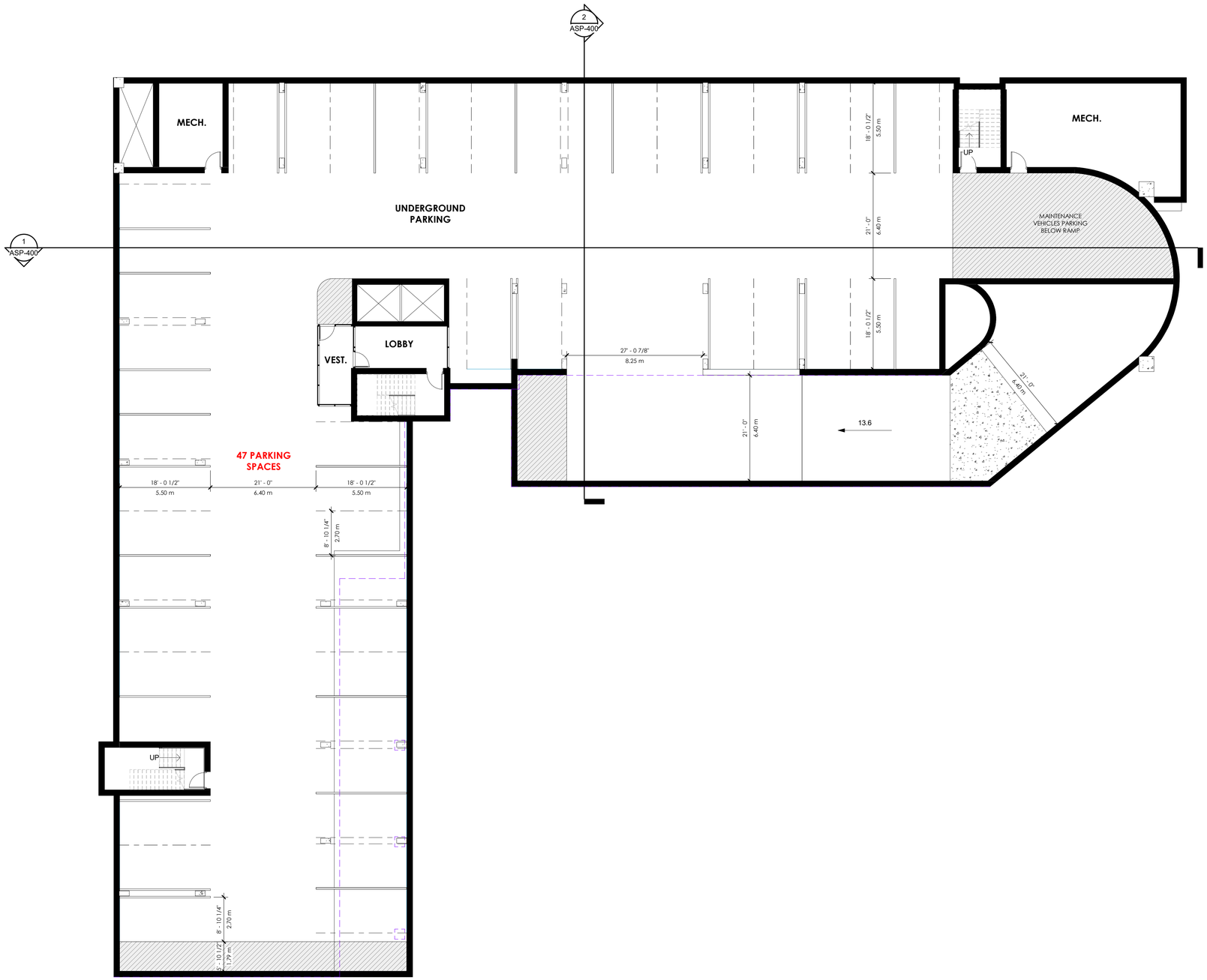
REVISIONS

No.	Description	Date
1	ISSUED FOR PRE-CONSULTATION	03/11/2022
2	ISSUED FOR SPA	12/05/2022

PROPOSED
SITE PLAN

ASP-1

BARRIE APARTMENTS



1 T/O BASEMENT
ASP-100 3/32" = 1'-0"

BUILDING AREA SUMMARY		
Name	Area	Area (Metric)
GROUND FLOOR	8696 SF	808 m²
SECOND FLOOR	2292 SF	213 m²
TYPICAL FLOOR	19397 SF	1802 m²
4TH FLOOR	19397 SF	1802 m²
5TH FLOOR	19397 SF	1802 m²
SIXTH FLOOR	19397 SF	1802 m²
7TH FLOOR	19397 SF	1802 m²
8TH FLOOR	13723 SF	1275 m²
Grand total	121694 SF	11306 m²

PARKING AREA		
Name	Area	Area (Metric)
UNDERGROUND PARKING	22158 SF	2059 m²
GROUND FLOOR PARKING	7959 SF	739 m²
PARKING LEVEL 2	17895 SF	1663 m²
Grand total	48012 SF	4460 m²

PROJECT NAME

BARRIE APARTMENTS

PROJECT ADDRESS

582 ESSA ROAD
BARRIE, ON

CLIENT

INSPIRATION GROUP

ARCHITECT
KHALSA DESIGN INC.

DESIGN
KHALSA

BRAMPTON, ON

TELEPHONE: 647-468-2940

CONSULTANTS:

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REGISTRATION

Project number	23002
Date	12/05/2022
Drawn by	ASB
Checked by	KDI
Scale	3/32" = 1'-0"

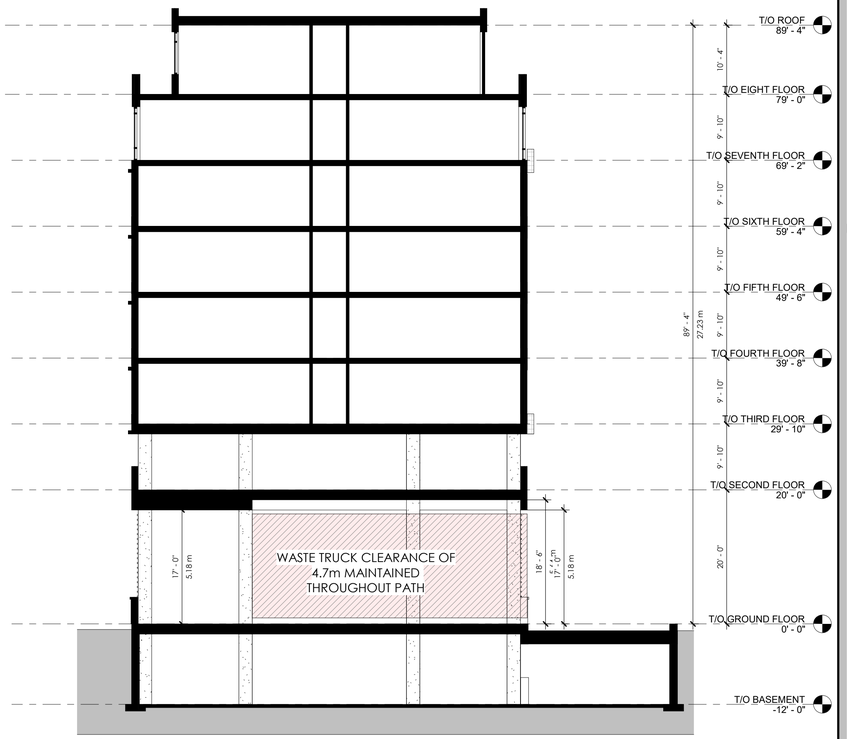
REVISIONS

No.	Description	Date

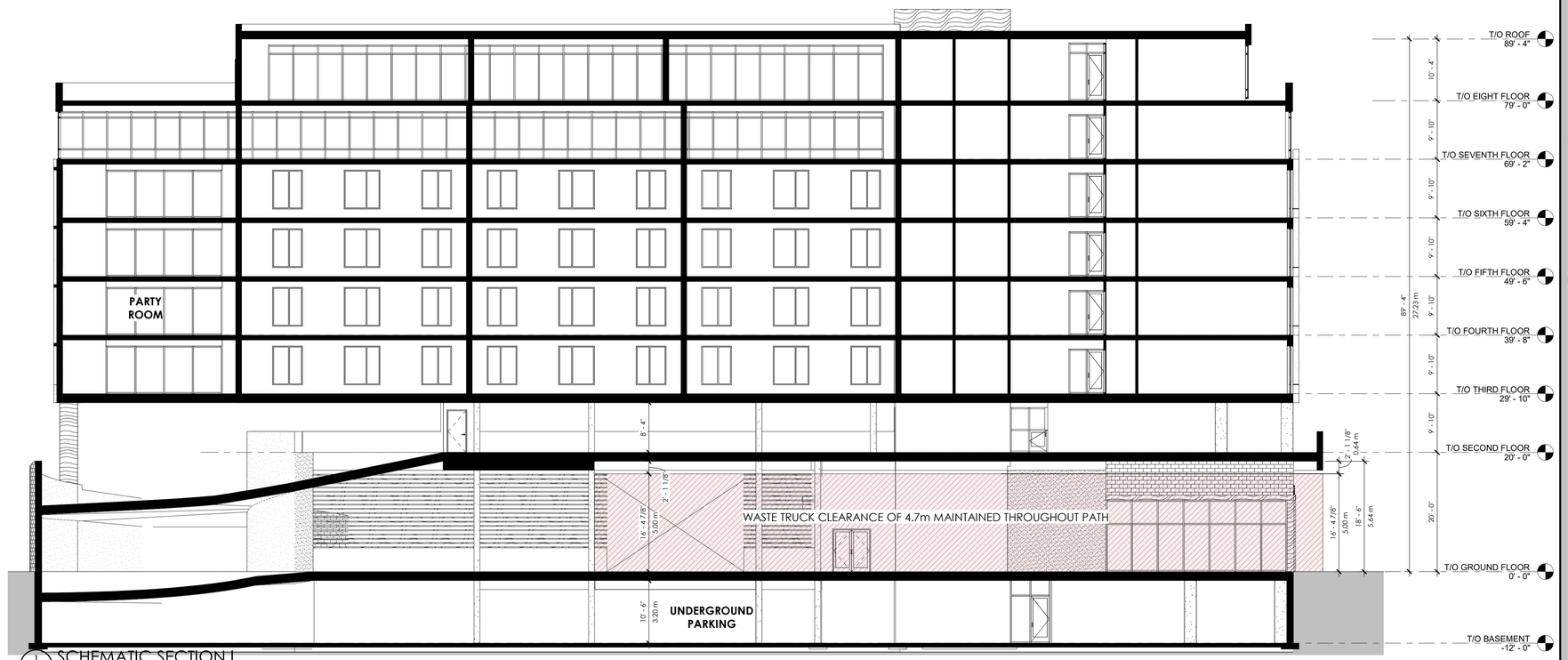
UNDERGROUND PARKING

ASP-100

BARRIE APARTMENTS



2 SCHEMATIC SECTION II
ASP-400 3/32" = 1'-0"



1 SCHEMATIC SECTION I
ASP-400 3/32" = 1'-0"

PROJECT NAME

BARRIE APARTMENTS

PROJECT ADDRESS

582 ESSA ROAD
BARRIE, ON

CLIENT

INSPIRATION GROUP

ARCHITECT
KHALSA DESIGN INC.

DESIGN
KHALSA

BRAMPTON, ON

TELEPHONE: 647-468-2940

CONSULTANTS:

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REGISTRATION

Project number	23002
Date	12/05/2022
Drawn by	ASB
Checked by	KDI
Scale	3/32" = 1'-0"

REVISIONS

No.	Description	Date

SCHEMATIC BUILDING SECTIONS

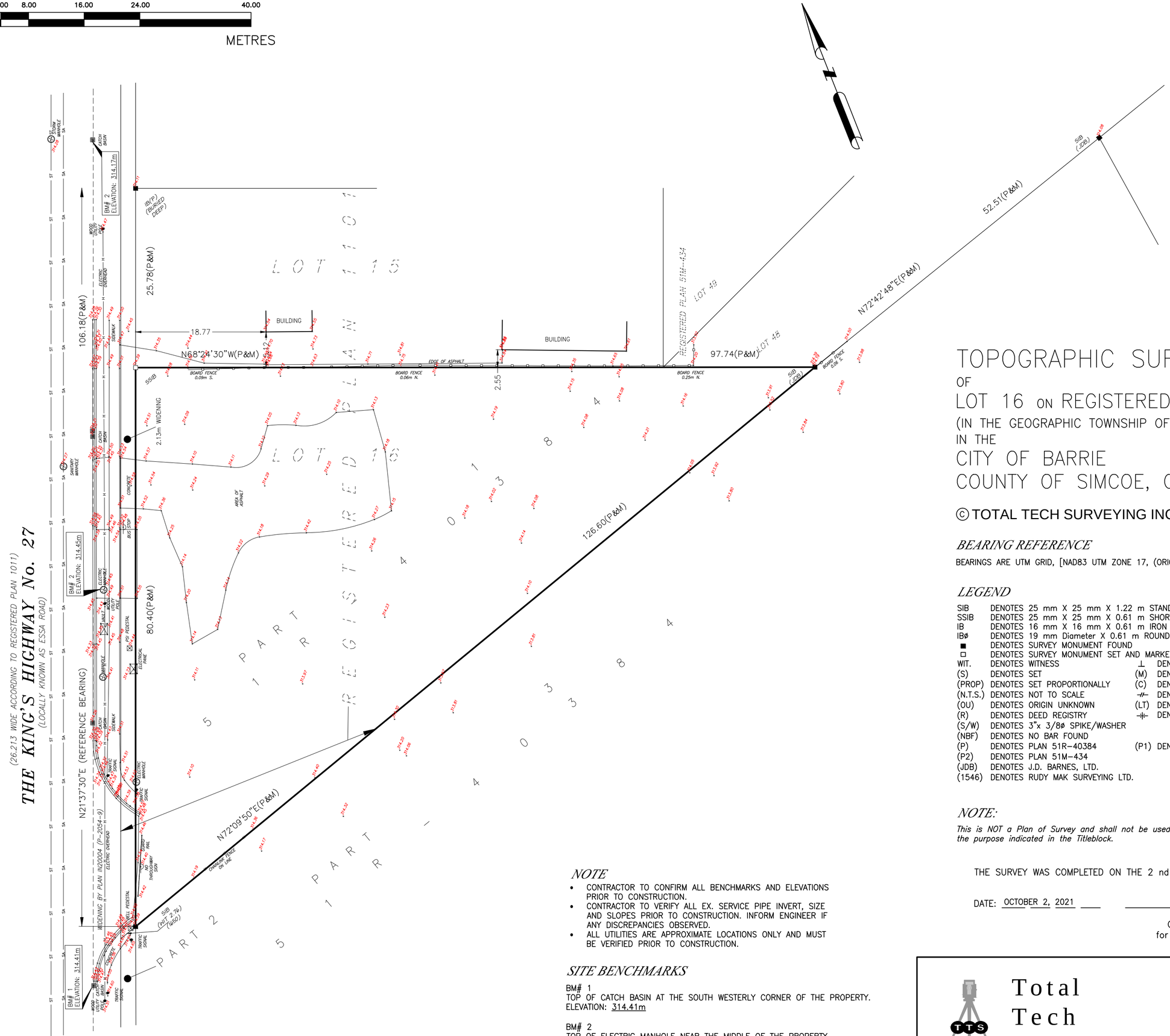
ASP-400

BARRIE APARTMENTS

SCALE = 1:400

0.00 4.00 8.00 16.00 24.00 40.00

METRES



TOPOGRAPHIC SURVEY

OF

LOT 16 ON REGISTERED PLAN 1101

(IN THE GEOGRAPHIC TOWNSHIP OF INNISFIL)

IN THE

CITY OF BARRIE

COUNTY OF SIMCOE, ONTARIO

© TOTAL TECH SURVEYING INC.

BEARING REFERENCE

BEARINGS ARE UTM GRID, [NAD83 UTM ZONE 17, (ORIGINAL).

LEGEND

SIB	DENOTES 25 mm X 25 mm X 1.22 m STANDARD IRON BAR		
SSIB	DENOTES 25 mm X 25 mm X 0.61 m SHORT STANDARD IRON BAR		
IB	DENOTES 16 mm X 16 mm X 0.61 m IRON BAR		
IBø	DENOTES 19 mm Diameter X 0.61 m ROUND IRON BAR		
■	DENOTES SURVEY MONUMENT FOUND		
□	DENOTES SURVEY MONUMENT SET AND MARKED 1858		
WIT.	DENOTES WITNESS	⊥	DENOTES PERPENDICULAR
(S)	DENOTES SET	(M)	DENOTES MEASURED
(PROP)	DENOTES SET PROPORTIONALLY	(C)	DENOTES CALCULATED
(N.T.S.)	DENOTES NOT TO SCALE	-//-	DENOTES NOT TO SCALE
(OU)	DENOTES ORIGIN UNKNOWN	(LT)	DENOTES LAND TITLES
(R)	DENOTES DEED REGISTRY	-#-	DENOTES SET BY INTERSECTION
(S/W)	DENOTES 3"x 3/8ø SPIKE/WASHER		
(NBF)	DENOTES NO BAR FOUND		
(P)	DENOTES PLAN 51R-40384	(P1)	DENOTES PLAN 51R-40560
(P2)	DENOTES PLAN 51M-434		
(JDB)	DENOTES J.D. BARNES, LTD.		
(1546)	DENOTES RUDY MAK SURVEYING LTD.		

NOTE:

This is NOT a Plan of Survey and shall not be used except for the purpose indicated in the Titleblock.

THE SURVEY WAS COMPLETED ON THE 2 nd DAY OF OCTOBER, 2021.

DATE: OCTOBER 2, 2021

BLOSS J. SUTHERLAND
ONTARIO LAND SURVEYOR
for TOTAL TECH SURVEYING INC.

NOTE

- CONTRACTOR TO CONFIRM ALL BENCHMARKS AND ELEVATIONS PRIOR TO CONSTRUCTION.
- CONTRACTOR TO VERIFY ALL EX. SERVICE PIPE INVERT, SIZE AND SLOPES PRIOR TO CONSTRUCTION. INFORM ENGINEER IF ANY DISCREPANCIES OBSERVED.
- ALL UTILITIES ARE APPROXIMATE LOCATIONS ONLY AND MUST BE VERIFIED PRIOR TO CONSTRUCTION.

SITE BENCHMARKS

BM# 1
TOP OF CATCH BASIN AT THE SOUTH WESTERLY CORNER OF THE PROPERTY.
ELEVATION: 314.41m

BM# 2
TOP OF ELECTRIC MANHOLE NEAR THE MIDDLE OF THE PROPERTY.
ELEVATION: 314.45m

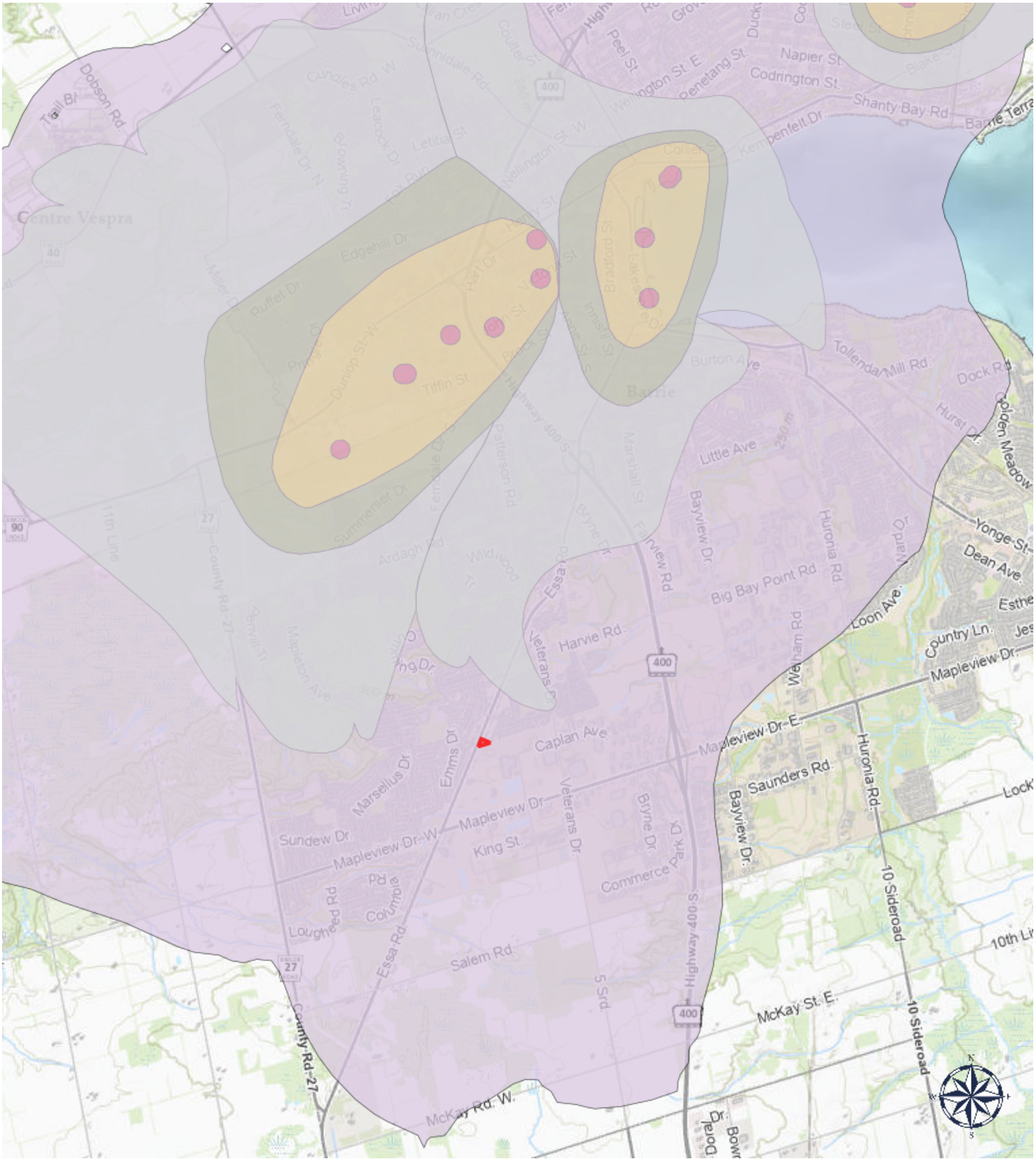
BM# 3
TOP OF CATCH BASIN AT THE NORTH WESTERLY CORNER OF LOT 15.
ELEVATION: 314.17m

"METRIC" DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Total Tech Surveying Inc.
341 Talbot St. N.
Units 2 & 3
Essex, ON N8M 2W3
(519) 776-9887

Drawn by:	Checked by:	Job No:	Plan File No:
W.R.G.	B.J.S.	2021-349	C-384

County of Simcoe - Web Map



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0 1 2 3km

1 : 72,224

Dec 13, 2022

Nottawasaga Valley Conservation Authority

Property Screening Report

10-Jan-2023

Information Resources for Regulated Properties

Do I need a permit?

Submit a Property Inquiry

Google Driving Directions

Info Regarding Covid-19

Email the Regulations Department
permits@nvca.on.ca

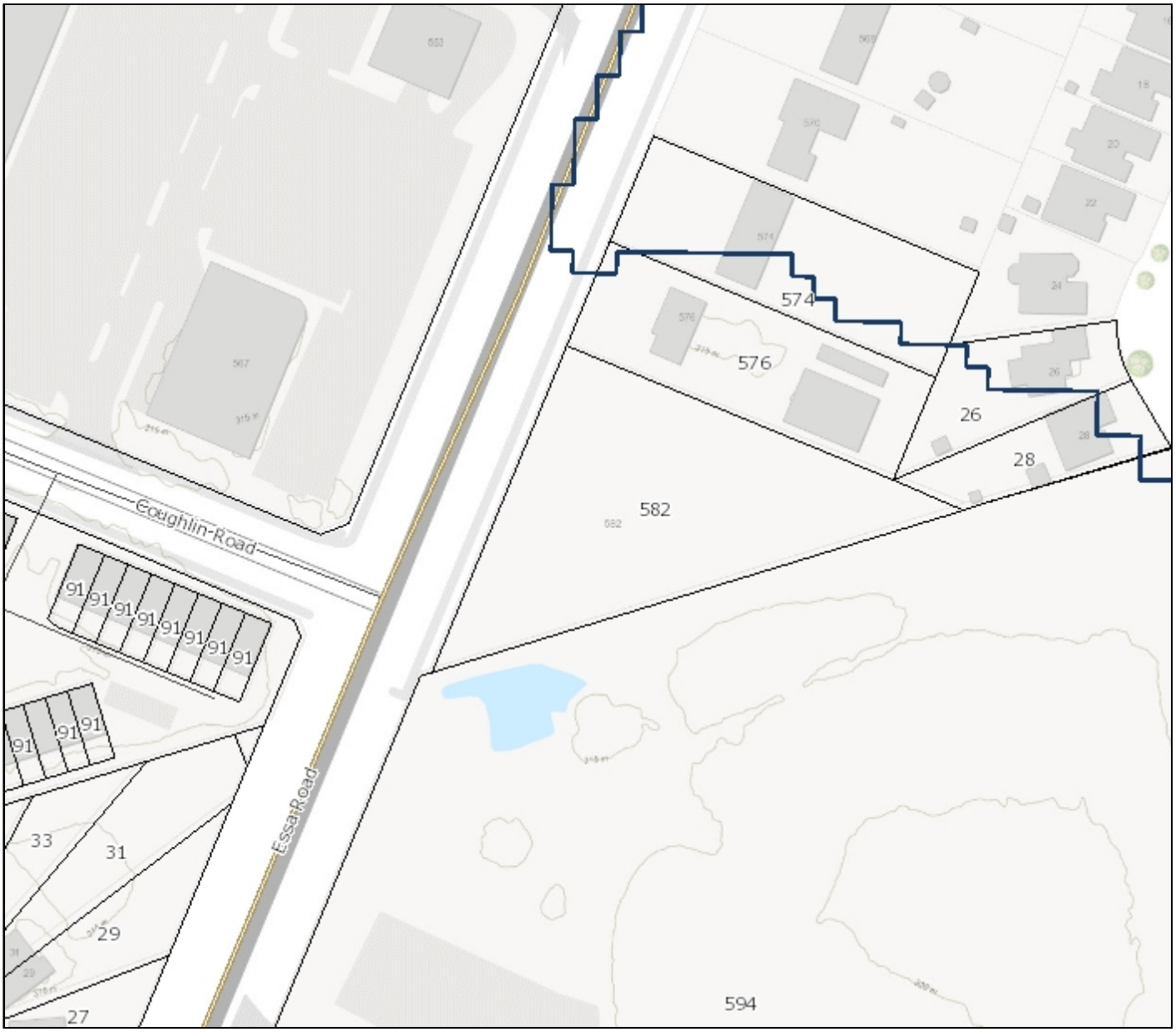
NVCA Contact Information

(705) 424-1479

8195 8th Line,
Utopia, ON L0M 1T0

www.nvca.on.ca

Monday to Friday
8:30 a.m. to 4:30 p.m.
except between 12:00 p.m. - 1:00 p.m.



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DRAFT

Appendix B

MECP Well Records Summary

Water Well Records Summary Report

Produced by Cambium Inc. using MOECP Water Well Information System (WWIS)

All units in meters unless otherwise specified

Well ID: 5701433 **Easting:** 602643 **UTM Zone** 17
Construction Date: 1952-03-03 **Northing:** 4910372 **Positional Accuracy:** unknown UTM

Well Depth:	18.9	**Water Kind**	FRESH	**Pump Rate (LPM):**	18
Well Diameter (cm):	10.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	
Water First Found:	15.9	**Primary Water Use:**	Livestock	**Pumping Duration (h:m):**	1 : 0
Static Level:	13				

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	6.71
3	MEDIUM SAND	6.71	18.9

Well ID: 5701434 **Easting:** 602744 **UTM Zone** 17
Construction Date: 1961-05-11 **Northing:** 4910388 **Positional Accuracy:** margin of error : 100 m - 300 m

Well Depth:	19.8	**Water Kind**	FRESH	**Pump Rate (LPM):**	59
Well Diameter (cm):	76.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	
Water First Found:	13.7	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	8 : 0
Static Level:	14				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	1.52
2	GRAVEL	1.52	3.35
3	CLAY	3.35	9.14
4	MEDIUM SAND	9.14	19.8

Well ID: 5701436 **Easting:** 602881 **UTM Zone** 17
Construction Date: 1965-05-25 **Northing:** 4910435 **Positional Accuracy:** margin of error : 100 m - 300 m

Well Depth:	58.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	36
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	36
Water First Found:	47.2	**Primary Water Use:**	Commerical	**Pumping Duration (h:m):**	2 : 0
Static Level:	47				

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	4.57
3	CLAY	4.57	6.40
4	SILT	6.40	7.32
5	CLAY	7.32	14.6
6	SILT	14.6	20.1
7	FINE SAND	20.1	22
8	SILT	22	28.0
9	MEDIUM SAND	28.0	47.2
10	MEDIUM SAND	47.2	58.2

Well ID: 5701437
Construction Date: 1966-07-04

Easting: 602627
Northing: 4909590

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 42.1
Well Diameter (cm): 10.2
Water First Found: 38.7
Static Level: 38

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Livestock

Pump Rate (LPM): 23
Recommended Pump Rate: 23
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREVIOUSLY DUG	0	7.62
2	CLAY	7.62	9.14
3	MEDIUM SAND	9.14	14.6
4	CLAY	14.6	20.7
5	CLAY	20.7	21.3
6	CLAY	21.3	22.6
7	MEDIUM SAND	22.6	42.1

Well ID: 5705419
Construction Date: 1968-12-11

Easting: 602814
Northing: 4909973

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 13.7
Well Diameter (cm): 76.2
Water First Found: 9.14
Static Level: 10

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM):
Recommended Pump Rate: 9
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57
2	MEDIUM SAND	4.57	13.7

Well ID: 5706188
Construction Date: 1969-04-11

Easting: 602744
Northing: 4909873

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 58.5
Well Diameter (cm): 15.2
Water First Found: 56.4
Static Level: 43

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 59
Recommended Pump Rate: 59
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	8.23
3	MEDIUM SAND	8.23	21.0
4	FINE SAND	21.0	29.6
5	MEDIUM SAND	29.6	42.7
6	FINE SAND	42.7	56.4
7	MEDIUM SAND	56.4	58.5

Well ID: 5711112
Construction Date: 1974-07-19

Easting: 602984
Northing: 4910330

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 5.49
Well Diameter (cm): 76.2
Water First Found: 2.44
Static Level: 2

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM):
Recommended Pump Rate: 14
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	0.61

2	CLAY	0.61	3.66
3	CLAY	3.66	5.49

Well ID: 5711113
Construction Date: 1974-07-19

Easting: 602982
Northing: 4910306

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 7.62
Well Diameter (cm): 76.2
Water First Found: 3.05
Static Level: 3

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM):
Recommended Pump Rate: 14
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.22
2	CLAY	1.22	2.13
3	CLAY	2.13	7.62

Well ID: 5711269
Construction Date: 1974-08-06

Easting: 603002
Northing: 4910372

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 4.57
Well Diameter (cm):
Water First Found: 2.44
Static Level: 2

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM):
Recommended Pump Rate: 14
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	GRAVEL	0	0.61
2	CLAY	0.61	3.66
3	GRAVEL	3.66	4.57

Well ID: 5714692
Construction Date: 1977-11-16

Easting: 602814
Northing: 4910023

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 61.3
Well Diameter (cm):
Water First Found:
Static Level: 37

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 27
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	39.6
3	SAND	39.6	42.7
4	GRAVEL	42.7	51.8
5	SAND	51.8	54.9
6	SAND	54.9	61.3

Well ID: 5715041
Construction Date: 1978-05-10

Easting: 602914
Northing: 4910273

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 13.1
Well Diameter (cm): 76.2
Water First Found: 13.1
Static Level: 3

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM):
Recommended Pump Rate: 14
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	3.05
3	CLAY	3.05	13.1

Well ID: 5715042
Construction Date: 1978-05-10

Easting: 602914
Northing: 4910173

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 13.4
Well Diameter (cm): 76.2
Water First Found: 13.4
Static Level: 5

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	3.05
3	CLAY	3.05	13.4

Well ID: 5715044
Construction Date: 1977-04-15

Easting: 602964
Northing: 4910323

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 11
Well Diameter (cm): 76.2
Water First Found: 3.05
Static Level: 2

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 18
Recommended Pump Rate: 14
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	1.52
3	GRAVEL	1.52	3.05
4	CLAY	3.05	11

Well ID: 5716539
Construction Date: 1980-01-23

Easting: 603014
Northing: 4910623

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 23.2
Well Diameter (cm): 12.7
Water First Found: 5.79
Static Level: 13

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 27
Recommended Pump Rate: 27
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREVIOUSLY DUG	0	14.9
2	SAND	14.9	23.2
3	CLAY	23.2	23.2

Well ID: 5719741
Construction Date: 1985-04-01

Easting: 602814
Northing: 4910023

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 24.4
Well Diameter (cm): 15.2
Water First Found: 22.9
Static Level: 11

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 64
Recommended Pump Rate: 45
Pumping Duration (h:m): 1 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	22.9
3	FINE SAND	22.9	24.4

Well ID: 5722349
Construction Date: 1987-10-21

Easting: 603290
Northing: 4910199

UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 18.9
Well Diameter (cm): 76.2
Water First Found: 12.2
Static Level: 12

Water Kind Not stated
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM):
Recommended Pump Rate: 14
Pumping Duration (h:m): : 1

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	SAND	0.30	18.9

Well ID: 5739117
Construction Date: 2004-09-10

Easting: 602926
Northing: 4910401

UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 5.1
Well Diameter (cm): 5
Water First Found: 1.5
Static Level:

Water Kind FRESH
Final Status Observation W
Primary Water Use: Not Used

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	FILL	0	0.9
2	SAND	0.9	1.5
3	SAND	1.5	2.40
4	CLAY	2.40	5.1

Well ID: 5740875
Construction Date: 2006-07-05

Easting: 603184
Northing: 4909825

UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 73.8
Well Diameter (cm): 20
Water First Found:
Static Level: 37

Water Kind
Final Status Water Supply
Primary Water Use: Cooling And A

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m): 72 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	GRAVEL	0	3.70
2	CLAY	3.70	7.30
3	FINE SAND	7.30	17.7
4	CLAY	17.7	23.2
5	FINE GRAVEL	23.2	43.3
6	CLAY	43.3	51.8
7	FINE GRAVEL	51.8	54.6
8	GRAVEL	54.6	56.1
9	FINE SAND	56.1	73.8

Well ID: 7136881
Construction Date: 2009-12-29

Easting: 602904
Northing: 4910113

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 4.57
Well Diameter (cm):
Water First Found:
Static Level:

Water Kind
Final Status Test Hole
Primary Water Use: Test Hole

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	FILL	0	0.61
2	SILT	0.61	4.57

Well ID: 7136882
Construction Date: 2009-12-29

Easting: 602912
Northing: 4910103

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 4.57
Well Diameter (cm):
Water First Found:
Static Level:

Water Kind
Final Status Test Hole
Primary Water Use: Test Hole

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	FILL	0	0.61
2	SAND	0.61	3.66
3	CLAY	3.66	4.57

Well ID: 7139176
Construction Date: 2010-02-04

Easting: 602997
Northing: 4910411

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 4.57
Well Diameter (cm): 91.4
Water First Found:
Static Level:

Water Kind
Final Status Abandoned-Q
Primary Water Use: Not Used

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1		0	4.57

Well ID: 7147833
Construction Date: 2010-07-05

Easting: 602912
Northing: 4910111

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 11.5
Well Diameter (cm): 2
Water First Found: 9
Static Level:

Water Kind Untested
Final Status Observation W
Primary Water Use: Monitoring

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	11.5

Well ID: 7157916
Construction Date: 2011-01-17

Easting: 602891
Northing: 4910127

UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth:
Well Diameter (cm):
Water First Found:
Static Level:

Water Kind
Final Status Abandoned-Ot
Primary Water Use:

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 7222725
Construction Date: 2014-06-27

Easting: 603163
Northing: 4909802

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 4.88
Well Diameter (cm): 5.08
Water First Found:
Static Level:

Water Kind
Final Status
Primary Water Use: Monitoring an

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.22
2	SAND	1.22	4.88

Well ID: 7244307
Construction Date: 2015-07-08

Easting: 602943
Northing: 4910479

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 4.57
Well Diameter (cm): 5.08
Water First Found: 2.29
Static Level:

Water Kind
Final Status
Primary Water Use:

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	GRAVEL	0	0.76
2	CLAY	0.76	1.52
3	CLAY	1.52	3.05
4	CLAY	3.05	4.57

Well ID: 7275568
Construction Date: 2016-11-24

Easting: 602934
Northing: 4910422

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:
Well Diameter (cm):
Water First Found:
Static Level:

Water Kind
Final Status
Primary Water Use:

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 7275569
Construction Date: 2016-11-24

Easting: 603005
Northing: 4910442

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:
Well Diameter (cm): 91.4
Water First Found:
Static Level:

Water Kind
Final Status Abandoned-Ot
Primary Water Use: Not Used

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 7275580
Construction Date: 2016-11-24

Easting: 603272
Northing: 4909511

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:
Well Diameter (cm): 5.08
Water First Found:
Static Level:

Water Kind
Final Status Observation W
Primary Water Use: Monitoring

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	
2	CLAY		

Well ID: 7283681
Construction Date: 2017-03-27

Easting: 602843
Northing: 4909615

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:
Well Diameter (cm):
Water First Found:
Static Level:

Water Kind
Final Status
Primary Water Use:

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 7291087
Construction Date: 2017-07-27

Easting: 603378
Northing: 4909974

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 6.1
Well Diameter (cm): 5.08
Water First Found: 5.49
Static Level:

Water Kind Untested
Final Status Observation W
Primary Water Use: Monitoring

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57
2	SAND	4.57	6.1

Well ID: 7291088
Construction Date: 2017-07-27

Easting: 603282
Northing: 4909929

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 7.62
Well Diameter (cm): 5.08
Water First Found: 7.01
Static Level:

Water Kind Untested
Final Status Observation W
Primary Water Use: Monitoring

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57
2	SAND	4.57	6.1
3	CLAY	6.1	7.62

Well ID: 7307850
Construction Date: 2018-03-15

Easting: 602925
Northing: 4910394

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:
Well Diameter (cm):
Water First Found:
Static Level:

Water Kind
Final Status
Primary Water Use:

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

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Appendix C

Borehole Logs (Cambium & Fortis)

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Kingston
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Log of Borehole: BH101-22

Client: Inspiration Group of Companies Ltd.
Project Name: GEO - 582 Essa Road, Barrie
Project No.: 16304-001
Contractor: Landshark Drilling
Method: Hollow Stem Augers
Date Completed: November 1, 2022
Location: 582 Essa Road, Barrie, ON
UTM: 17T 4910112 m N, 602873 m E
Elevation: 314.15 mASL

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
314 / 0	TOPSOIL: (~ 100 mm thick)	~~1A~~							
	FILL: (SM) SILTY SAND; trace clay, trace gravel; brown, non-cohesive, moist, compact	1B	SS	70	18				
313 / 1		2	SS	80	18				
	SILTY SAND: (SM) TILL; some gravel, trace clay, brown, non-cohesive, moist, compact	3	SS	80	24				GSA SS3: 10% Gravel 56% Sand 25% Silt 9% Clay
312 / 2	- dense	4	SS	80	45				
311 / 3	-very dense	5	SS	20	78				
310 / 4									
309 / 5	- dense	6	SS	20	46				
308 / 6	- becomes grey at 6.0 mbgs; very dense	7	SS	60	87				GSA SS7: 14% Gravel 48% Sand 25% Silt 13% Clay
307 / 7									
306 / 8		8	SS	70	54				
305 / 9	Borehole terminated at 8.2 mbgs due to target depth achieved								Borehole caved to a depth of 7.0 mbgs and was dry upon completion of drilling
304 / 10									

Logged By: Waleed El-Taweel
Input By: Waleed El-Taweel

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Oshawa
Kingston
T: 866-217-7900
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Log of Borehole: BH102-22

Client: Inspiration Group of Companies Ltd. **Project Name:** GEO - 582 Essa Road, Barrie **Project No.:** 16304-001

Contractor: Landshark Drilling **Method:** Hollow Stem Augers **Date Completed:** November 1, 2022

Location: 582 Essa Road, Barrie, ON **UTM:** 17T 4910098 m N, 602912 m E **Elevation:** 314.12 mASL

Elevation (m) / Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
314 / 0	TOPSOIL: (~ 100 mm thick)	~~1A~~							
	FILL: (SP) SAND; trace silt; brown; non-cohesive, moist, compact	1B	SS	20	15				
313 / 1	FILL: (ML) sandy SILT, some clay; brown; non-cohesive, moist, compact	2	SS	70	14				
312 / 2	SILTY SAND: (SM) TILL; some gravel, trace clay; brown, non-cohesive, moist, dense	3	SS	80	30				
	- interbedded clayey silt seam at 2.3 mbgs	4	SS	80	37				GSA SS4: 1% Gravel 14% Sand 57% Silt 28% Clay
311 / 3	- becomes grey at 3.0 mbgs	5	SS	90	32				
310 / 4									
309 / 5		6	SS	80	39				
308 / 6	- very dense	7	SS	80	71				
307 / 7									
306 / 8		8	SS	80	95				
305 / 9	Borehole terminated at 8.2 mbgs due to target depth achieved								Borehole caved to a depth of 7.0 mbgs and was dry upon completion of drilling
304 / 10									

Logged By: Waleed El-Taweel **Input By:** Waleed El-Taweel

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Log of Borehole: BH103-22

Client: Inspiration Group of Companies Ltd.
Project Name: GEO - 582 Essa Road, Barrie
Project No.: 16304-001
Contractor: Landshark Drilling
Method: Hollow Stem Augers
Date Completed: November 1, 2022
Location: 582 Essa Road, Barrie, ON
UTM: 17T 4910087 m N, 602862 m E
Elevation: 314.19 mASL

Elevation (m)	Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
314	0		TOPSOIL: (~ 125 mm thick)	1A							
			FILL: (SM) SILTY SAND; trace gravel, trace organic matter, brown; non-cohesive, moist, compact	1B	SS	70	13				
313	1			2	SS	60	17				
	2		SILTY SAND: (SM) TILL; trace gravel, trace clay; brown; non-cohesive, moist, dense	3	SS	10	47				
312			- becomes grey at 2.3 mbgs; very dense	4	SS	25	63				
	3		- dense	5	SS	80	40				GSA SS5: 9% Gravel 57% Sand 25% Silt 9% Clay
311											
	4										
310			- very dense	6	SS	80	55				
	5										
309											
	6		-dense	7	SS	80	49				
308											
	7										
307			- very dense	8	SS	80	119				
	8										
306											
	9		- wet	9	SS	80	65				Borehole caved to a depth of 6.1 mbgs and groundwater level measured in borehole at a depth of 5.5 mbgs upon completion of drilling
305											
	10		Borehole terminated at 9.8 mbgs due to target depth achieved								
304											

Logged By: Waleed El-Taweel
Input By: Waleed El-Taweel

FBH101 (MW)

PROJECT NUMBER: F199209001
PROJECT NAME: Essa Road Redev
CLIENT: 2858098 Ontario Inc.
ADDRESS: 582 Essa Road, Barrie
DRILLING DATE: September 4, 2021

UTM COORD. (m) 17 T 602853 4910082
HOLE SIZE/SAMPLING METHOD: 50 mm / SS
RIG MODEL: Geoprobe 7892DT
DRILLING METHOD: 5' (1.50m) dual tube
SAMPLING LENGTH: 1.50 m

TOTAL WELL DEPTH: 4.50
SURFACE ELEVATION: 310 - arbitrary
WELL SCREEN: 3.00

COMMENTS : masl: meter above sea level - SS: Soil sample

LOGGED BY ATOPP

Elevation (masl)	Depth (m)	Soil Sample ID	Soil Lab Analyses	Material Description	Graphic Log	% Recovery	HSVC as Isobutylene (ppm)	Well Diagram
309.5	0.5	1, 2	(SS2) PHC BTEX Metals	Grass and Topsoil Brown, Sand and Gravel Fill - Coarse textured - Moisture: Low - Odour: No - Staining: No			0 ppm	0
309	1			Brown / Grey Native Sand Till - Extremely compact - coarse textured - Moisture: low medium - Odour: No - Staining: No - high clast content of varrying sizes			0 ppm	
308.5	1.5	3, 4						
308	2						0 ppm	
307.5	2.5							
307	3	5, 6	(SS5) VOCs BTEX PHC				5 ppm	
306.5	3.5							
306	4						15 ppm	
305.5	4.5	7, 8						
305	5						10 ppm	
304.5	5.5							
304	6						5 ppm	
303.5	6.5						0 ppm	Groundwater measured at 2.10 mbgl on September 8, 2021

FBH102 (MW)

PROJECT NUMBER: F199209001
PROJECT NAME: Essa Road Redev
CLIENT: 2858098 Ontario Inc.
ADDRESS: 582 Essa Road, Barrie
DRILLING DATE: September 4, 2021

UTM COORD. (m) 17 T 602878 4910105
HOLE SIZE/SAMPLING METHOD: 50 mm / SS
RIG MODEL: Geoprobe 7892DT
DRILLING METHOD: 5' (1.50m) dual tube
SAMPLING LENGTH: 1.50 m

TOTAL WELL DEPTH: 4.50
SURFACE ELEVATION: 309.855
WELL SCREEN: 3.00

COMMENTS : masl: meter above sea level - SS: Soil sample

LOGGED BY ATOPP

Elevation (masl)	Depth (m)	Soil Sample ID	Soil Lab Analyses	Material Description	Graphic Log	% Recovery	HSVC as Isobutylene (ppm)	Well Diagram
309.5	0.5	1, 2	(SS1) PHC BTEX Metals	Asphalt, Gravel and Topsoil Brown, Sand and Gravel Fill - Coarse textured - Moisture: Low - Odour: No - Staining: No			0 ppm	0
309	1			Brown / Grey Native Sand Till - Extremely compact - coarse textured - Moisture: low medium - Odour: No - Staining: No - high clast content of varrying sizes			0 ppm	
308.5	1.5	3, 4					5 ppm	
308	2							
307.5	2.5						5 ppm	
307	3	5, 6						
306.5	3.5						10 ppm	
306	4							
305.5	4.5	7, 8	(SS7) VOCs BTEX PHC				25 ppm	
305	5							
304.5	5.5						35 ppm	
304	6						10 ppm	
303.5	6.5							Groundwater measured at 1.78 mbgl on September 8, 2021
303								

FBH103 (MW)

PROJECT NUMBER: F199209001
PROJECT NAME: Essa Road Redev
CLIENT: 2858098 Ontario Inc.
ADDRESS: 582 Essa Road, Barrie
DRILLING DATE: September 4, 2021

UTM COORD. (m) 17 T 602902 4910103
HOLE SIZE/SAMPLING METHOD: 50 mm / SS
RIG MODEL: Geoprobe 7892DT
DRILLING METHOD: 5' (1.50m) dual tube
SAMPLING LENGTH: 1.50 m

TOTAL WELL DEPTH: 4.50
SURFACE ELEVATION: 308.170
WELL SCREEN: 3.00

COMMENTS : masl: meter above sea level - SS: Soil sample

LOGGED BY ATOPP

Elevation (masl)	Depth (m)	Soil Sample ID	Soil Lab Analyses	Material Description	Graphic Log	% Recovery	HSVC as Isobutylene (ppm)	Well Diagram
309.5	0.5	1, 2	(SS2) PHC BTEX Metals	Gravel and Topsoil Brown, Sand and Gravel Fill - Coarse textured - Moisture: Low - Odour: No - Staining: No			0 ppm	0
309	1			Grey Native Sand Till - Loose - coarse textured - Moisture: high moistrue at 2.00 mbgl - Odour: No - Staining: No - high clast content of varrying sizes			0 ppm	
308.5	1.5	3, 4						
308	2						0 ppm	
307.5	2.5						5 ppm	
307	3	5, 6	(SS5) VOCs BTEX PHC					
306.5	3.5						10ppm	
306	4						5 ppm	
305.5	4.5	7, 8						
305	5						5 ppm	
304.5	5.5							
304	6						0 ppm	
303.5	6.5							Groundwater measured at 1.64 mbgl on September 8, 2021
303								

FBH104

PROJECT NUMBER: F199209001
PROJECT NAME: Essa Road Redev
CLIENT: 2858098 Ontario Inc.
ADDRESS: 582 Essa Road, Barrie
DRILLING DATE: September 4, 2021

UTM COORD. (m) 17 T 602867 4910099
HOLE SIZE/SAMPLING METHOD: 50 mm / SS
RIG MODEL: Geoprobe 7892DT
DRILLING METHOD: 5' (1.50m) dual tube
SAMPLING LENGTH: 1.50 m

TOTAL WELL DEPTH: N/A
SURFACE ELEVATION: 310 - Arbitrary
WELL SCREEN: N/A

COMMENTS : masl: meter above sea level - SS: Soil sample

LOGGED BY ATOPP

Elevation (masl)	Depth (m)	Soil Sample ID	Soil Lab Analyses	Material Description	Graphic Log	% Recovery (0–100)	HSVC as Isobutylene (ppm)	Well Diagram
309.5	0	1, 2		Asphalt, Gravel and Topsoil Brown, Sand and Gravel Fill - Coarse textured - Moisture: Low - Odour: No - Staining: No			0 ppm	
309	0.5							
308.5	1			Grey Native Sand Till - Loose - coarse textured - Moisture: high moistrue at 2.00 mbgl - Odour: No - Staining: No - high clast content of varrying sizes			0 ppm	
308	1.5	3, 4	(SS3) VOCs PHC BTEX				0 ppm	
307.5	2							
307	2.5						0 ppm	
306.5	3							No well installed
306	3.5							
305.5	4							
305	4.5							
304.5	5							
304	5.5							
303.5	6							
303	6.5							

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Appendix D

Grain Size Analysis Results

Grain Size Distribution Chart

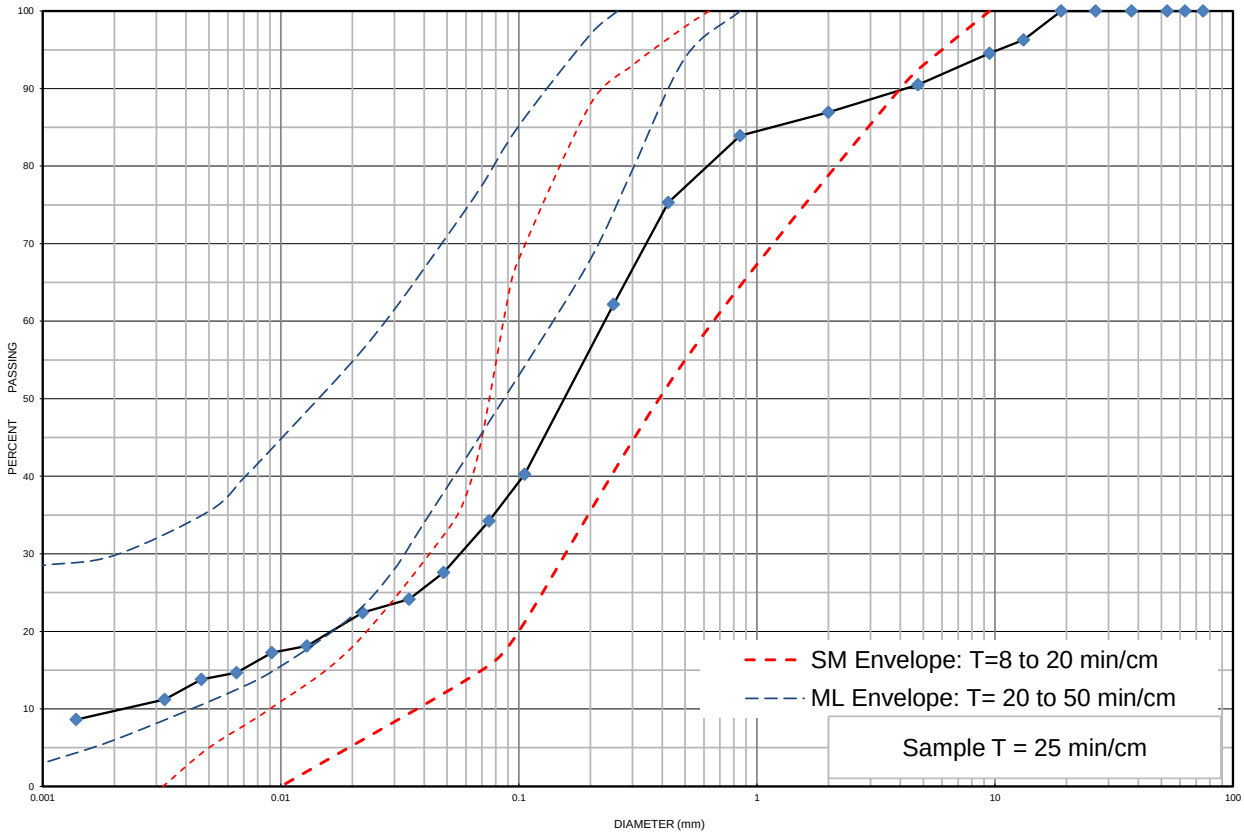
Project Number: *16304-001* **Client:** *Inspiration Group of Companies Ltd.*

Project Name: *Geotechnical Investigation - 582 Essa Road, Barrie*

Sample Date: *November 1, 2022* **Sampled By:** *Waleed El-Taweel - Cambium Inc.*

Location: *BH 101-22 SS 3* **Depth:** *1.5 m to 2.1 m* **Lab Sample No:** *S-22-1649*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 101-22	SS 3	1.5 m to 2.1 m	10	56	25	9	8.8

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand some Gravel trace Clay	SM	0.2350	0.0560	0.0022	106.82	6.07

Additional information availabe upon request

Issued By: _____ *Date Issued:* *December 19, 2022*

(Senior Project Manager)

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Grain Size Distribution Chart

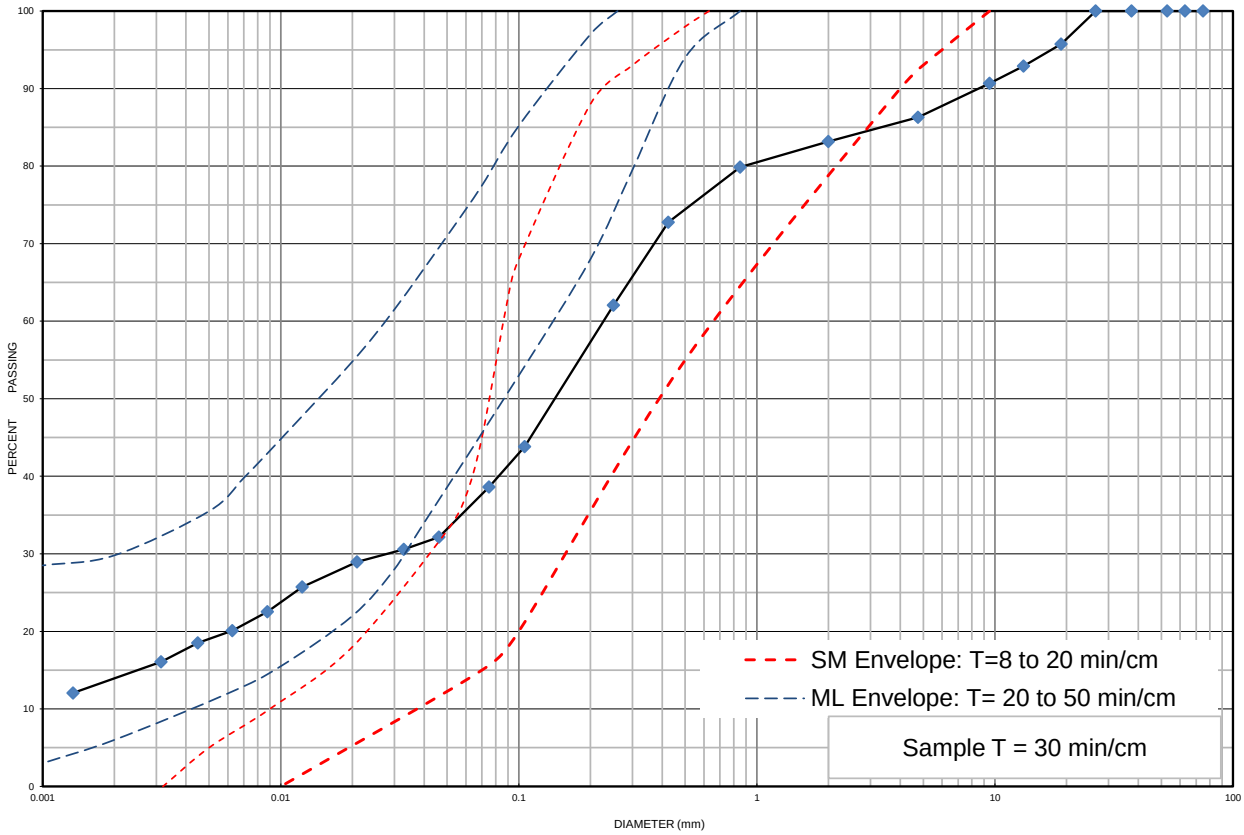
Project Number: *16304-001* **Client:** *Inspiration Group of Companies Ltd.*

Project Name: *Geotechnical Investigation - 582 Essa Road, Barrie*

Sample Date: *November 1, 2022* **Sampled By:** *Waleed El-Taweel - Cambium Inc.*

Location: *BH 101-22 SS 7* **Depth:** *6.1 m to 6.7 m* **Lab Sample No:** *S-22-1650*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 101-22	SS 7	6.1 m to 6.7 m	14	48	25	13	7.0

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand some Gravel some Clay	SM	0.230	0.026	-	-	-

Additional information availabe upon request

Issued By: _____ *Date Issued:* *December 19, 2022*

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Grain Size Distribution Chart

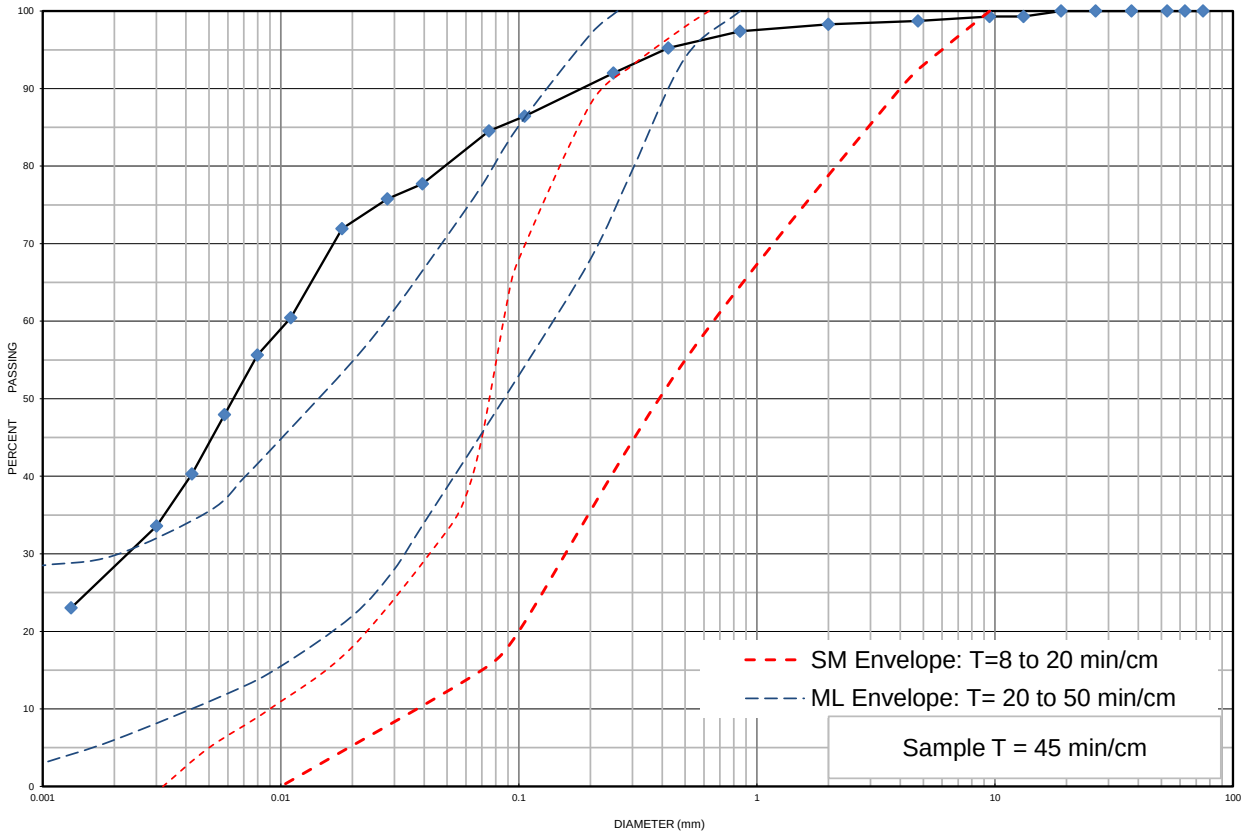
Project Number: *16304-001* **Client:** *Inspiration Group of Companies Ltd.*

Project Name: *Geotechnical Investigation - 582 Essa Road, Barrie*

Sample Date: *November 1, 2022* **Sampled By:** *Waleed El-Taweel - Cambium Inc.*

Location: *BH 102-22 SS 4* **Depth:** *2.3 m to 2.9 m* **Lab Sample No:** *S-22-1651*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 102-22	SS 4	2.3 m to 2.9 m	1	14	57	28	17.6

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Clayey Silt some Sand trace Gravel	ML	0.0110	0.0024	-	-	-

Additional information availabe upon request

Issued By: _____ *Date Issued:* *December 19, 2022*

(Senior Project Manager)

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Grain Size Distribution Chart

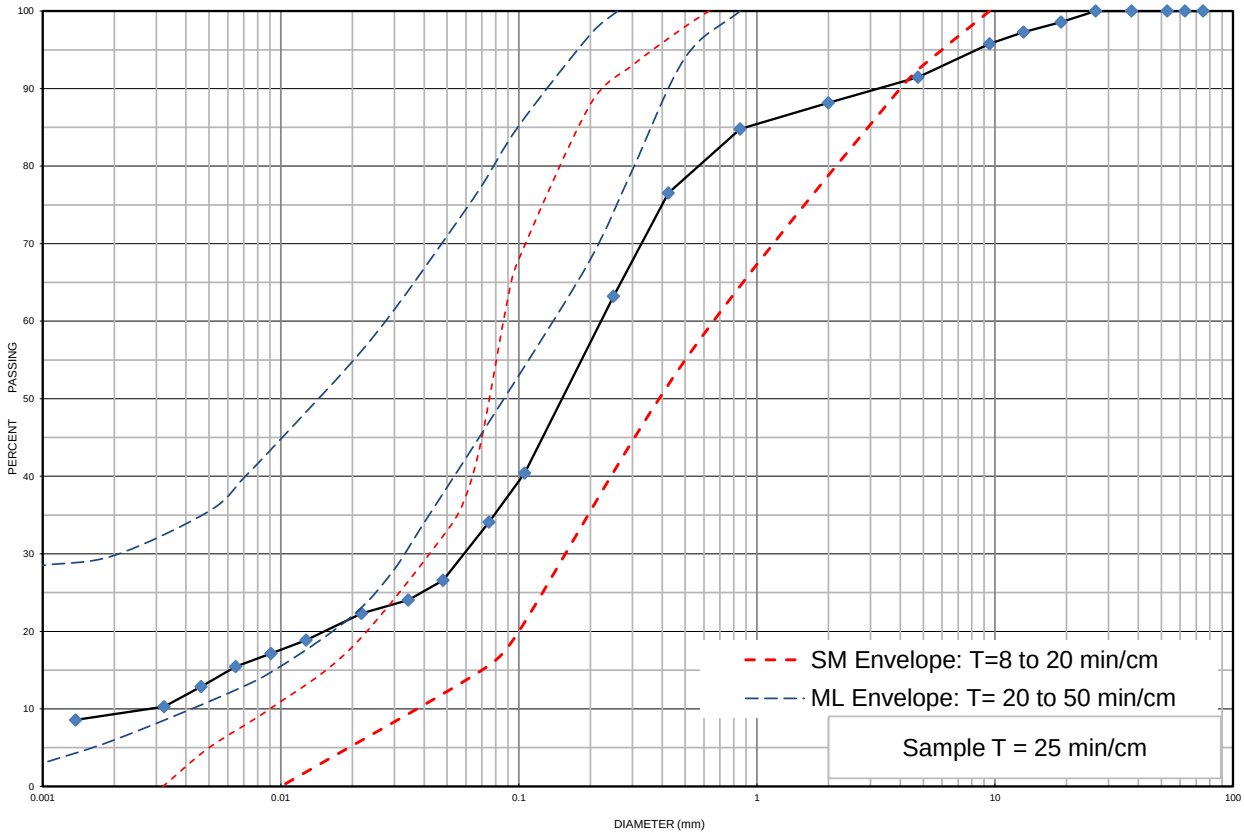
Project Number: *16304-001* **Client:** *Inspiration Group of Companies Ltd.*

Project Name: *Geotechnical Investigation - 582 Essa Road, Barrie*

Sample Date: *November 1, 2022* **Sampled By:** *Waleed El-Taweel - Cambium Inc.*

Location: *BH 103-22 SS 5* **Depth:** *3 m to 3.7 m* **Lab Sample No:** *S-22-1652*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
BH 103-22	SS 5	3 m to 3.7 m	9	57	25	9	8.6

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand trace Gravel trace Clay	SM	0.2250	0.0590	0.0025	90.00	6.19

Additional information availabe upon request

Issued By: _____ *Date Issued:* *December 19, 2022*

(Senior Project Manager)

Cambium Inc. (Laboratory)
866.217.7900 | cambium-inc.com
194 Sophia St. | Peterborough | ON | K9H 1E5

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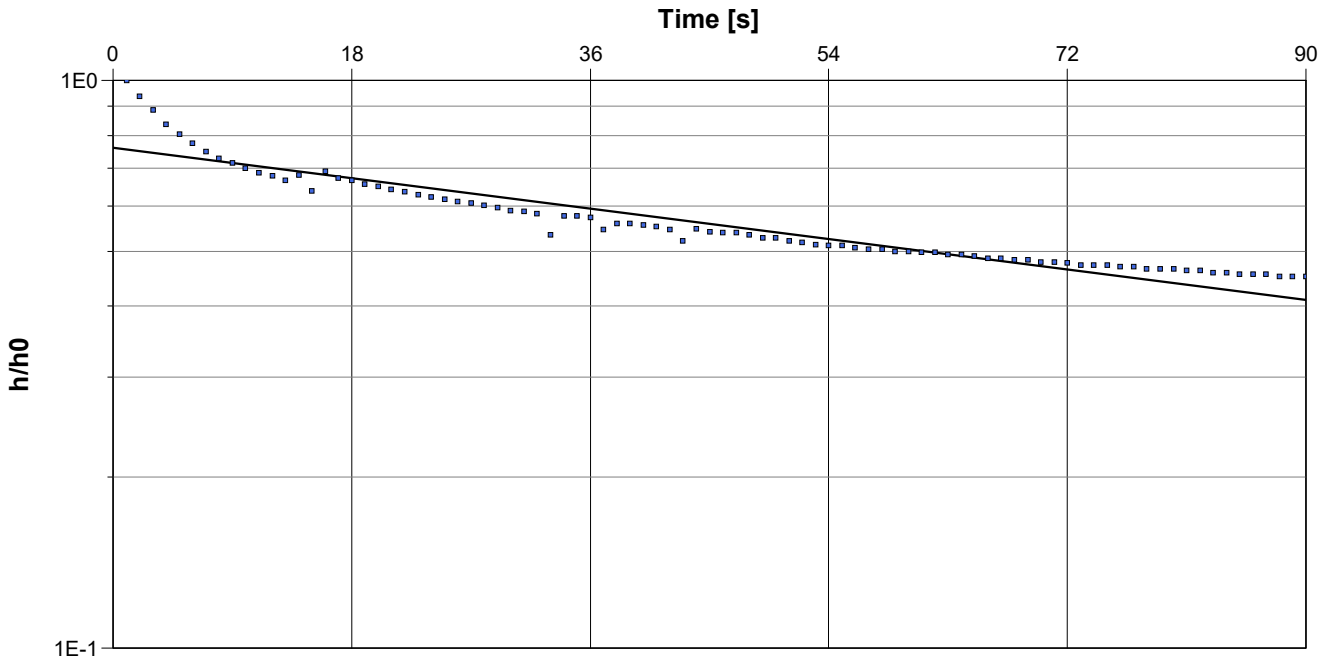
Appendix E

Aquifer Test Pro Results

Cambium Inc. 135 Bayfield St #102, Barrie, ON L4M 3B3	**Slug Test Analysis Report**
	Project: Hydrogeological Assessment
	Number: 16304-002
	Client: 2858098 Ontario Inc.

Location: 582 Essa Road, Barrie, ON	Slug Test: FBH101	Test Well: FBH101
Test Conducted by: C. Malliaros		Test Date: 12/19/2022
Analysis Performed by: Sudhakar Kurli	Hvorslev	Analysis Date: 1/2/2023
Aquifer Thickness: 2.96 m		

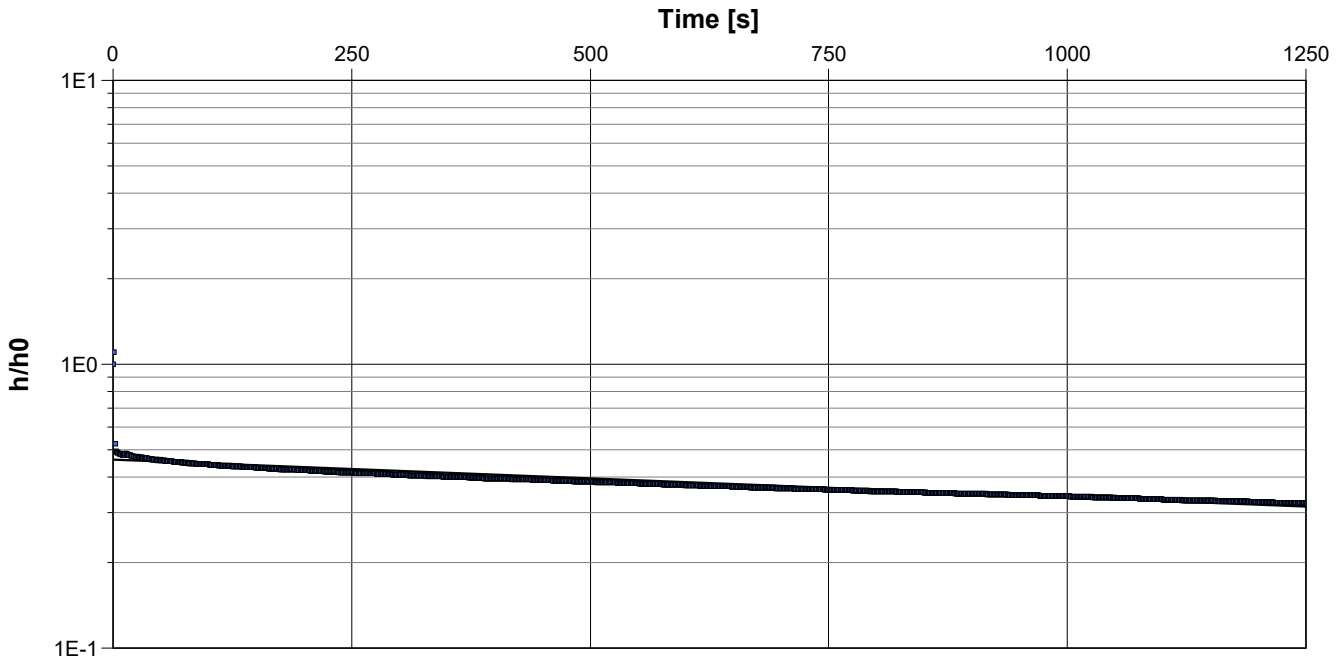


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
FBH101	2.95×10^{-6}	

Cambium Inc. 135 Bayfield St #102, Barrie, ON L4M 3B3	**Slug Test Analysis Report**
	Project: Hydrogeological Assessment
	Number: 16304-002
	Client: 2858098 Ontario Inc.

Location: 582 Essa Road, Barrie, ON	Slug Test: FBH102	Test Well: FBH102
Test Conducted by: A. Bunn		Test Date: 12/13/2022
Analysis Performed by: Sudhakar Kurli	Hvorslev	Analysis Date: 12/13/2022
Aquifer Thickness: 3.14 m		

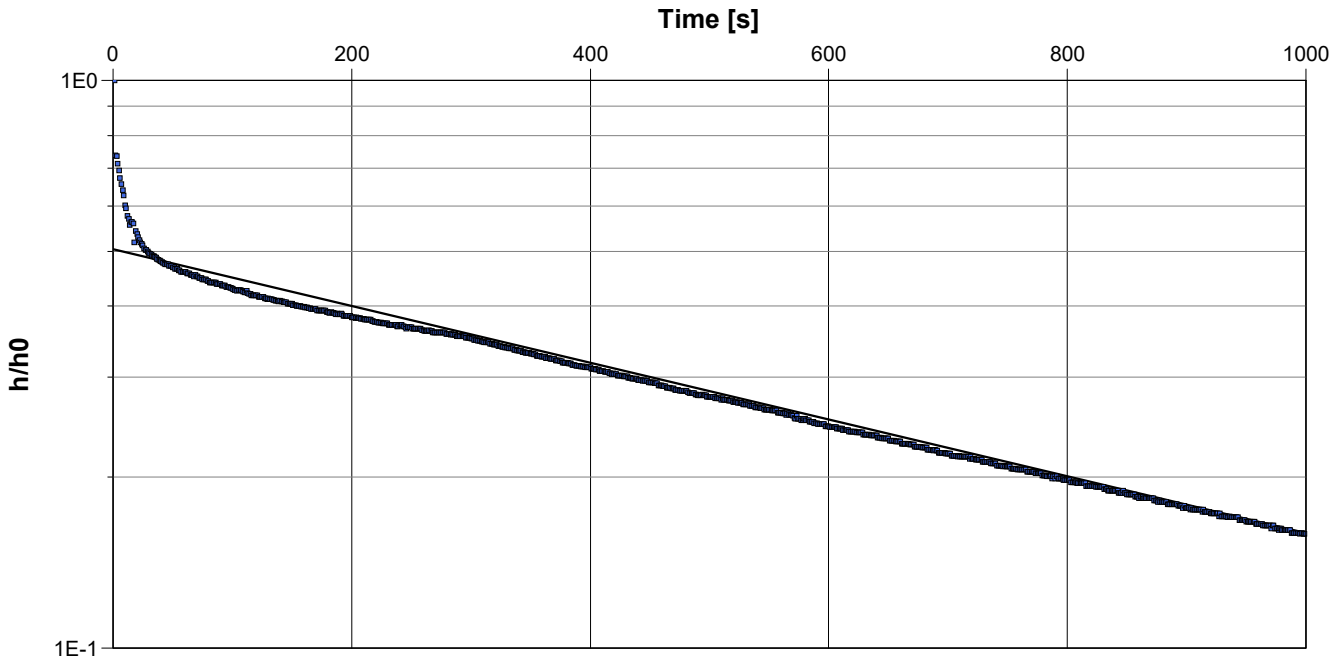


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
FBH102	1.30×10^{-7}	

Cambium Inc. 135 Bayfield St #102, Barrie, ON L4M 3B3	**Slug Test Analysis Report**
	Project: Hydrogeological Assessment
	Number: 16304-002
	Client: 2858098 Ontario Inc.

Location: 582 Essa Road, Barrie, ON	Slug Test: FBH103	Test Well: FBH103
Test Conducted by: C.Malliaros		Test Date: 12/19/2022
Analysis Performed by: Sudhakar Kurli	Hvorslev	Analysis Date: 1/2/2023
Aquifer Thickness: 3.58 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
FBH103	4.93×10^{-7}	

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Appendix F

Dewatering Estimates

Short Term Dewatering Calculations (1 Level) - 582 Essa Road, Barrie, ON

Scenario	Depth	Equivalent Radius	Static Level	Dewatered level	Aquifer Thickness	Drawdown	Conductivity (K)	Length to Zero Drawdown (R_0)	(H^2-h^2)	Est. Inflow		
	(mbgs)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m)	(m)	(L/min)	(m^3/day)	(L/day)
Hydraulic Conductivity (Low)	4.16	29	1.24	5.16	10	3.92	1.30E-07	33	53.31	10	14	13,742
Hydraulic Conductivity (High)	4.16	29	1.24	5.16	10	3.92	2.95E-06	49	53.31	56	81	80,543
Hydraulic Conductivity (Mean)	4.16	29	1.24	5.16	10	3.92	5.74E-07	38	53.31	21	31	30,910
Safety Factor - 1.5										84	121	120,814
ln(Ro/rw) (high)	0.53											
ln(Ro/rw) (low)	0.14											
Hydraulic Conductivity (m/s) (high)	2.95E-06											
Hydraulic Conductivity (m/s) (low)	1.30E-07											
Length to Zero Drawdown	Equivalent Radius + 3000*(DRAWDOWN)*(HYDRAULIC CONDUCTIVITY^0.5)											
(H^2-h^2)	((AQUIFER THICKNESS-STATIC LEVEL)^2)-((AQUIFER THICKNESS-DEWATERED LEVEL)^2)											
Estimated Inflow	((K(H^2-h^2))/(5.31E-6(ln(R_0/Equivalent Radius)))											

Long Term Dewatering Calculations (1 Level) - 582 Essa Road, Barrie, ON

Q	KiA					
i	hydraulic gradient		m/m			
k	hydraulic conductivity		m/sec	5.74E-07		
A	Area		m2	2059		
i	drawdown / radius of influence					
Drawdown	2.42		m			
R0	3000 * Drawdown * k 1/2					
	5.50					
					Without safety factor	With safety factor 1.5
i	0.44					
Q	0.00052		0.000052	m3/sec		
		45	4	m3/day		
		44,927	**4,493**	**L/day**	**49,419**	**74,129**
Kh hydraulic conductivity (Horizontal) 5.74 E-7						
Kv hydraulic conductivity (vertical)=1/10 Kh) 5.74 E-8				5.74E-08		
Perimeter Drainage Width		45.36 m				
Perimeter Drainage Length		45.40 m				
Perimeter Drainage Area		2059 m2		2059		

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Appendix G

C of A – Groundwater Quality

Your Project #: 16304-002
Your C.O.C. #: 910893-01-01

Attention: Nicole Heikoop

Cambium Environmental Inc
194 Sophia Street
PO Box 325
Peterborough, ON
CANADA K9H 1E5

Report Date: 2023/01/12
Report #: R7464833
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C2AG003
Received: 2022/12/13, 16:12

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Biochemical Oxygen Demand (BOD)	1	2022/12/14	2022/12/19	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	1	N/A	2022/12/20	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	1	N/A	2022/12/19	CAM SOP-00416	SM 23 5220 D m
Total Cyanide	1	2022/12/14	2022/12/14	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2022/12/16	2022/12/16	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2022/12/16	2022/12/16	CAM SOP-00453	EPA 7470A m
Elements by ICPMS Low Level (total) (1)	1	2022/12/22	2022/12/22	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Animal and Vegetable Oil and Grease	1	N/A	2022/12/20	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2022/12/20	2022/12/20	CAM SOP-00326	EPA1664B m,SM5520B m
OC Pesticides (Selected) & PCB (2)	1	2022/12/19	2022/12/22	CAM SOP-00307	EPA 8081A/8082B m
PAH Compounds in Water by GC/MS (SIM)	1	2022/12/18	2022/12/20	CAM SOP-00318	EPA 8270D m
pH	1	2022/12/16	2022/12/16	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2022/12/20	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2022/12/20	CAM SOP-00464	EPA 375.4 m
Sulphide	1	N/A	2022/12/20	CAM SOP-00455	SM 23 4500-S G m
Total Kjeldahl Nitrogen in Water	1	2022/12/16	2022/12/16	CAM SOP-00938	OMOE E3516 m
Total PAHs: Barrie/Mississauga Sewer Use (3)	1	N/A	2022/12/21	CAM SOP - 00301	
Mineral/Synthetic O & G (TPH Heavy Oil) (4)	1	2022/12/20	2022/12/20	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2022/12/16	2022/12/17	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2022/12/18	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.

Your Project #: 16304-002
Your C.O.C. #: 910893-01-01

Attention: Nicole Heikoop

Cambium Environmental Inc
194 Sophia Street
PO Box 325
Peterborough, ON
CANADA K9H 1E5

Report Date: 2023/01/12
Report #: R7464833
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C2AG003
Received: 2022/12/13, 16:12

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
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) This test was performed by Bureau Veritas Burnaby, 4606 Canada Way , Burnaby, BC, V5G 1K5
(2) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane
(3) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(4) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Gemarie Balatico, Project Manager
Email: Gemarie.Balatico@bureauveritas.com
Phone# (905)817-5787
==========
Bureau Veritas 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 Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C2AG003
Report Date: 2023/01/12

Cambium Environmental Inc
Client Project #: 16304-002
Sampler Initials: AB

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID				UOR087			UOR087		
Sampling Date				2022/12/12 12:40			2022/12/12 12:40		
COC Number				910893-01-01			910893-01-01		
	UNITS	Criteria	Criteria-2	MW101	RDL	QC Batch	MW101 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Total Animal/Vegetable Oil and Grease	mg/L	150	-	0.70	0.50	8400303			
Inorganics									
Total BOD	mg/L	300	15	<2	2	8402721			
Total Chemical Oxygen Demand (COD)	mg/L	600	-	13	4.0	8408739			
Fluoride (F-)	mg/L	10	-	0.15	0.10	8408369			
Total Kjeldahl Nitrogen (TKN)	mg/L	100	-	0.16	0.10	8408011			
pH	pH	6.0:9.5	6.0:9.5	7.82		8408372			
Phenols-4AAP	mg/L	0.1	-	<0.0010	0.0010	8414943			
Total Suspended Solids	mg/L	350	15	**1100**	10	8407655			
Dissolved Sulphate (SO4)	mg/L	1500	-	7.0	1.0	8408735			
Sulphide	mg/L	1	-	0.094	0.020	8408944			
Total Cyanide (CN)	mg/L	1.2	-	<0.0050	0.0050	8403655			
Dissolved Chloride (Cl-)	mg/L	1500	-	28	1.0	8408729			
Metals									
Total Aluminum (Al)	ug/L	50000	-	8770	6.0	8422287	8040	6.0	8422287
Total Antimony (Sb)	ug/L	5000	-	0.204	0.040	8422287	0.182	0.040	8422287
Total Arsenic (As)	ug/L	1000	-	6.06	0.040	8422287	5.73	0.040	8422287
Total Barium (Ba)	ug/L	5000	-	195	0.10	8422287	182	0.10	8422287
Total Bismuth (Bi)	ug/L	5000	-	0.058	0.020	8422287	0.054	0.020	8422287
Total Cadmium (Cd)	ug/L	700	1	0.056	0.010	8422287	0.051	0.010	8422287
Total Chromium (Cr)	ug/L	2000	80	70.9	0.20	8422287	65.3	0.20	8422287
Total Cobalt (Co)	ug/L	5000	-	5.10	0.020	8422287	4.71	0.020	8422287
Total Copper (Cu)	ug/L	2000	10	**19.8**	0.20	8422287	**18.6**	0.20	8422287
Total Iron (Fe)	ug/L	50000	-	27100	10	8422287	25600	10	8422287
Total Lead (Pb)	ug/L	700	50	8.31	0.040	8422287	7.74	0.040	8422287
Total Manganese (Mn)	ug/L	5000	-	527	0.20	8422287	481	0.20	8422287
Total Molybdenum (Mo)	ug/L	5000	-	12.1	0.10	8422287	11.8	0.10	8422287
Total Nickel (Ni)	ug/L	2000	50	13.5	0.20	8422287	12.4	0.20	8422287
Total Phosphorus (P)	ug/L	10000	-	567	10	8422287	527	10	8422287

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

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of Barrie Discharges to Sanitary Sewers By Law 2021-002
Criteria-2: The City of Barrie Discharges to Storm Sewers By Law 2021-002

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C2AG003
Report Date: 2023/01/12

Cambium Environmental Inc
Client Project #: 16304-002
Sampler Initials: AB

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID				UOR087			UOR087		
Sampling Date				2022/12/12 12:40			2022/12/12 12:40		
COC Number				910893-01-01			910893-01-01		
	UNITS	Criteria	Criteria-2	MW101	RDL	QC Batch	MW101 Lab-Dup	RDL	QC Batch
Total Selenium (Se)	ug/L	1000	-	<0.080	0.080	8422287	<0.080	0.080	8422287
Total Silver (Ag)	ug/L	400	-	0.064	0.020	8422287	0.066	0.020	8422287
Total Tin (Sn)	ug/L	5000	-	3.00	0.40	8422287	2.88	0.40	8422287
Total Vanadium (V)	ug/L	5000	-	17.8	0.40	8422287	16.5	0.40	8422287
Total Zinc (Zn)	ug/L	2000	40	30.5	2.0	8422287	28.6	2.0	8422287
Total Gold (Au)	ug/L	5000	-	<0.20 (1)	0.20	8422287	<0.20	0.20	8422287
Total Platinum (Pt)	ug/L	5000	-	<0.20	0.20	8422287	<0.20	0.20	8422287
Petroleum Hydrocarbons									
Total Oil & Grease	mg/L	-	-	0.70	0.50	8413327			
Total Oil & Grease Mineral/Synthetic	mg/L	15	-	<0.50	0.50	8413331			

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

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of Barrie Discharges to Sanitary Sewers By Law 2021-002
Criteria-2: The City of Barrie Discharges to Storm Sewers By Law 2021-002
(1) Matrix Spike outside acceptance criteria due to sample matrix interference.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID			UOR087		
Sampling Date			2022/12/12 12:40		
COC Number			910893-01-01		
	UNITS	Criteria	MW101	RDL	QC Batch
Metals					
Mercury (Hg)	mg/L	0.01	<0.00010	0.00010	8407636

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 City of Barrie Discharges to Sanitary Sewers By Law 2021-002

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Bureau Veritas ID			UOR087		
Sampling Date			2022/12/12 12:40		
COC Number			910893-01-01		
	UNITS	Criteria	MW101	RDL	QC Batch
Calculated Parameters					
Total PAHs	ug/L	5	<0.20	0.20	8402150
Polyaromatic Hydrocarbons					
Acenaphthene	ug/L	-	<0.050	0.050	8410691
Acenaphthylene	ug/L	-	<0.050	0.050	8410691
Anthracene	ug/L	-	<0.050	0.050	8410691
Benzo(a)anthracene	ug/L	-	<0.050	0.050	8410691
Benzo(a)pyrene	ug/L	-	<0.0090	0.0090	8410691
Benzo(b/j)fluoranthene	ug/L	-	<0.050	0.050	8410691
Benzo(g,h,i)perylene	ug/L	-	<0.050	0.050	8410691
Benzo(k)fluoranthene	ug/L	-	<0.050	0.050	8410691
Chrysene	ug/L	-	<0.050	0.050	8410691
Dibenzo(a,h)anthracene	ug/L	-	<0.050	0.050	8410691
Fluoranthene	ug/L	-	<0.050	0.050	8410691
Fluorene	ug/L	-	<0.050	0.050	8410691
Indeno(1,2,3-cd)pyrene	ug/L	-	<0.050	0.050	8410691
1-Methylnaphthalene	ug/L	-	<0.050	0.050	8410691
2-Methylnaphthalene	ug/L	-	<0.050	0.050	8410691
Naphthalene	ug/L	-	<0.050	0.050	8410691
Phenanthrene	ug/L	-	<0.030	0.030	8410691
Pyrene	ug/L	-	<0.050	0.050	8410691
Surrogate Recovery (%)					
D10-Anthracene	%	-	103		8410691
D14-Terphenyl (FS)	%	-	117		8410691
D8-Acenaphthylene	%	-	89		8410691

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 City of Barrie Discharges to Sanitary Sewers By Law 2021-002

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

VOLATILE ORGANICS BY GC/MS (WATER)

Bureau Veritas ID			UOR087		
Sampling Date			2022/12/12 12:40		
COC Number			910893-01-01		
	UNITS	Criteria	MW101	RDL	QC Batch
Volatile Organics					
Benzene	ug/L	10	0.31	0.20	8407858
1,2-Dichlorobenzene	ug/L	50	<0.40	0.40	8407858
1,4-Dichlorobenzene	ug/L	80	<0.40	0.40	8407858
Ethylbenzene	ug/L	60	<0.20	0.20	8407858
Methylene Chloride(Dichloromethane)	ug/L	90	<2.0	2.0	8407858
1,1,2,2-Tetrachloroethane	ug/L	60	<0.40	0.40	8407858
Tetrachloroethylene	ug/L	60	<0.20	0.20	8407858
Toluene	ug/L	20	<0.20	0.20	8407858
Trichloroethylene	ug/L	50	<0.20	0.20	8407858
p+m-Xylene	ug/L	-	<0.20	0.20	8407858
o-Xylene	ug/L	-	<0.20	0.20	8407858
Total Xylenes	ug/L	300	<0.20	0.20	8407858
Surrogate Recovery (%)					
4-Bromofluorobenzene	%	-	88		8407858
D4-1,2-Dichloroethane	%	-	113		8407858
D8-Toluene	%	-	97		8407858

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 City of Barrie Discharges to Sanitary Sewers By Law 2021-002

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

Bureau Veritas ID			UOR087		
Sampling Date			2022/12/12 12:40		
COC Number			910893-01-01		
	UNITS	**Criteria**	**MW101**	**RDL**	**QC Batch**
Pesticides & Herbicides					
Hexachlorobenzene	ug/L	0.1	<0.005	0.005	8411288
Surrogate Recovery (%)					
2,4,5,6-Tetrachloro-m-xylene	%	-	51		8411288
Decachlorobiphenyl	%	-	78		8411288

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 City of Barrie Discharges to Sanitary Sewers By Law 2021-002

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

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C2AG003
Report Date: 2023/01/12

Cambium Environmental Inc
Client Project #: 16304-002
Sampler Initials: AB

TEST SUMMARY

Bureau Veritas ID: UOR087
Sample ID: MW101
Matrix: Water

Collected: 2022/12/12
Shipped:
Received: 2022/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	8402721	2022/12/14	2022/12/19	Gurjot Kaur
Chloride by Automated Colourimetry	KONE	8408729	N/A	2022/12/20	Alina Dobreanu
Chemical Oxygen Demand	SPEC	8408739	N/A	2022/12/19	Nimarta Singh
Total Cyanide	SKAL/CN	8403655	2022/12/14	2022/12/14	Chloe Pollock
Fluoride	ISE	8408369	2022/12/16	2022/12/16	Surinder Rai
Mercury in Water by CVAA	CV/AA	8407636	2022/12/16	2022/12/16	Jaswinder Kaur
Elements by ICPMS Low Level (total)	ICP/MS	8422287	2022/12/22	2022/12/22	Andrew An
Animal and Vegetable Oil and Grease	BAL	8400303	N/A	2022/12/20	Automated Statchk
Total Oil and Grease	BAL	8413327	2022/12/20	2022/12/20	Maulik Jashubhai Patel
OC Pesticides (Selected) & PCB	GC/ECD	8411288	2022/12/19	2022/12/22	Li Peng
PAH Compounds in Water by GC/MS (SIM)	GC/MS	8410691	2022/12/18	2022/12/20	Mitesh Raj
pH	AT	8408372	2022/12/16	2022/12/16	Surinder Rai
Phenols (4AAP)	TECH/PHEN	8414943	N/A	2022/12/20	Mandeep Kaur
Sulphate by Automated Colourimetry	KONE	8408735	N/A	2022/12/20	Samuel Law
Sulphide	ISE/S	8408944	N/A	2022/12/20	Taslima Aktar
Total Kjeldahl Nitrogen in Water	SKAL	8408011	2022/12/16	2022/12/16	Rajni Tyagi
Total PAHs: Barrie/Mississauga Sewer Use	CALC	8402150	N/A	2022/12/21	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	8413331	2022/12/20	2022/12/20	Maulik Jashubhai Patel
Total Suspended Solids	BAL	8407655	2022/12/16	2022/12/17	Masood Siddiqui
Volatile Organic Compounds in Water	GC/MS	8407858	N/A	2022/12/18	Gladys Guerrero

Bureau Veritas ID: UOR087 Dup
Sample ID: MW101
Matrix: Water

Collected: 2022/12/12
Shipped:
Received: 2022/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Elements by ICPMS Low Level (total)	ICP/MS	8422287	2022/12/22	2022/12/22	Andrew An

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GENERAL COMMENTS

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

Package 1	6.7°C

Revised Report (2023/01/12): Additional requested regulatory criteria have been included on this report.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			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
8407858	4-Bromofluorobenzene	2022/12/18	92	70 - 130	92	70 - 130	90	%				
8407858	D4-1,2-Dichloroethane	2022/12/18	107	70 - 130	102	70 - 130	104	%				
8407858	D8-Toluene	2022/12/18	104	70 - 130	106	70 - 130	101	%				
8410691	D10-Anthracene	2022/12/19	91	50 - 130	107	50 - 130	103	%				
8410691	D14-Terphenyl (FS)	2022/12/19	102	50 - 130	114	50 - 130	126	%				
8410691	D8-Acenaphthylene	2022/12/19	81	50 - 130	88	50 - 130	85	%				
8411288	2,4,5,6-Tetrachloro-m-xylene	2022/12/22	57	50 - 130	64	50 - 130	64	%				
8411288	Decachlorobiphenyl	2022/12/22	93	50 - 130	81	50 - 130	86	%				
8402721	Total BOD	2022/12/19					<2	mg/L	2.2	30	104	80 - 120
8403655	Total Cyanide (CN)	2022/12/14	76 (1)	80 - 120	93	80 - 120	<0.0050	mg/L	NC	20		
8407636	Mercury (Hg)	2022/12/16	100	75 - 125	104	80 - 120	<0.00010	mg/L	NC	20		
8407655	Total Suspended Solids	2022/12/17					<10	mg/L	0	20	95	85 - 115
8407858	1,1,2,2-Tetrachloroethane	2022/12/18	109	70 - 130	102	70 - 130	<0.40	ug/L	NC	30		
8407858	1,2-Dichlorobenzene	2022/12/18	97	70 - 130	96	70 - 130	<0.40	ug/L	NC	30		
8407858	1,4-Dichlorobenzene	2022/12/18	111	70 - 130	110	70 - 130	<0.40	ug/L	NC	30		
8407858	Benzene	2022/12/18	92	70 - 130	90	70 - 130	<0.20	ug/L	2.5	30		
8407858	Ethylbenzene	2022/12/18	92	70 - 130	94	70 - 130	<0.20	ug/L	NC	30		
8407858	Methylene Chloride(Dichloromethane)	2022/12/18	107	70 - 130	102	70 - 130	<2.0	ug/L	NC	30		
8407858	o-Xylene	2022/12/18	89	70 - 130	92	70 - 130	<0.20	ug/L	NC	30		
8407858	p+m-Xylene	2022/12/18	91	70 - 130	93	70 - 130	<0.20	ug/L	NC	30		
8407858	Tetrachloroethylene	2022/12/18	88	70 - 130	91	70 - 130	<0.20	ug/L	NC	30		
8407858	Toluene	2022/12/18	95	70 - 130	96	70 - 130	<0.20	ug/L	NC	30		
8407858	Total Xylenes	2022/12/18					<0.20	ug/L	NC	30		
8407858	Trichloroethylene	2022/12/18	98	70 - 130	98	70 - 130	<0.20	ug/L	6.9	30		
8408011	Total Kjeldahl Nitrogen (TKN)	2022/12/16	90	80 - 120	96	80 - 120	<0.10	mg/L	13	20	96	80 - 120
8408369	Fluoride (F-)	2022/12/16	97	80 - 120	101	80 - 120	<0.10	mg/L	0.74	20		
8408372	pH	2022/12/16			102	98 - 103			1.3	N/A		
8408729	Dissolved Chloride (Cl-)	2022/12/20	NC	80 - 120	104	80 - 120	<1.0	mg/L	1.0	20		
8408735	Dissolved Sulphate (SO4)	2022/12/20	NC	75 - 125	103	80 - 120	<1.0	mg/L	1.2	20		
8408739	Total Chemical Oxygen Demand (COD)	2022/12/19	94	80 - 120	101	80 - 120	<4.0	mg/L	14	20		
8408944	Sulphide	2022/12/20	85	80 - 120	99	80 - 120	<0.020	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
8410691	1-Methylnaphthalene	2022/12/20	87	50 - 130	97	50 - 130	<0.050	ug/L	NC	30		
8410691	2-Methylnaphthalene	2022/12/20	82	50 - 130	87	50 - 130	<0.050	ug/L	8.9	30		
8410691	Acenaphthene	2022/12/20	88	50 - 130	90	50 - 130	<0.050	ug/L	NC	30		
8410691	Acenaphthylene	2022/12/20	87	50 - 130	89	50 - 130	<0.050	ug/L	NC	30		
8410691	Anthracene	2022/12/20	100	50 - 130	104	50 - 130	<0.050	ug/L	NC	30		
8410691	Benzo(a)anthracene	2022/12/20	97	50 - 130	97	50 - 130	<0.050	ug/L	NC	30		
8410691	Benzo(a)pyrene	2022/12/20	92	50 - 130	96	50 - 130	<0.0090	ug/L	NC	30		
8410691	Benzo(b/j)fluoranthene	2022/12/20	88	50 - 130	100	50 - 130	<0.050	ug/L	NC	30		
8410691	Benzo(g,h,i)perylene	2022/12/20	100	50 - 130	109	50 - 130	<0.050	ug/L	NC	30		
8410691	Benzo(k)fluoranthene	2022/12/20	94	50 - 130	95	50 - 130	<0.050	ug/L	NC	30		
8410691	Chrysene	2022/12/20	94	50 - 130	98	50 - 130	<0.050	ug/L	NC	30		
8410691	Dibenzo(a,h)anthracene	2022/12/20	97	50 - 130	99	50 - 130	<0.050	ug/L	NC	30		
8410691	Fluoranthene	2022/12/20	108	50 - 130	115	50 - 130	<0.050	ug/L	NC	30		
8410691	Fluorene	2022/12/20	92	50 - 130	96	50 - 130	<0.050	ug/L	NC	30		
8410691	Indeno(1,2,3-cd)pyrene	2022/12/20	103	50 - 130	116	50 - 130	<0.050	ug/L	NC	30		
8410691	Naphthalene	2022/12/20	68	50 - 130	81	50 - 130	<0.050	ug/L	5.4	30		
8410691	Phenanthrene	2022/12/20	93	50 - 130	98	50 - 130	<0.030	ug/L	NC	30		
8410691	Pyrene	2022/12/20	108	50 - 130	116	50 - 130	<0.050	ug/L	NC	30		
8411288	Hexachlorobenzene	2022/12/22	70	50 - 130	81	50 - 130	<0.005	ug/L	NC	30		
8413327	Total Oil & Grease	2022/12/20			99	85 - 115	<0.50	mg/L	0.76	25		
8413331	Total Oil & Grease Mineral/Synthetic	2022/12/20			96	85 - 115	<0.50	mg/L	1.0	25		
8414943	Phenols-4AAP	2022/12/20	100	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		
8422287	Total Aluminum (Al)	2022/12/22	NC	80 - 120	102	80 - 120	<3.0	ug/L	8.7	20		
8422287	Total Antimony (Sb)	2022/12/22	101	80 - 120	102	80 - 120	<0.020	ug/L	12	20		
8422287	Total Arsenic (As)	2022/12/22	108	80 - 120	103	80 - 120	<0.020	ug/L	5.5	20		
8422287	Total Barium (Ba)	2022/12/22	NC	80 - 120	99	80 - 120	<0.050	ug/L	7.2	20		
8422287	Total Bismuth (Bi)	2022/12/22	98	80 - 120	96	80 - 120	<0.010	ug/L	5.5	20		
8422287	Total Cadmium (Cd)	2022/12/22	100	80 - 120	99	80 - 120	<0.0050	ug/L	9.4	20		
8422287	Total Chromium (Cr)	2022/12/22	NC	80 - 120	96	80 - 120	<0.10	ug/L	8.2	20		
8422287	Total Cobalt (Co)	2022/12/22	94	80 - 120	96	80 - 120	<0.010	ug/L	8.0	20		
8422287	Total Copper (Cu)	2022/12/22	88	80 - 120	93	80 - 120	<0.10	ug/L	6.3	20		

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			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
8422287	Total Gold (Au)	2022/12/22	26 (1)	80 - 120	75 (2)	80 - 120	<0.10	ug/L	NC	20		
8422287	Total Iron (Fe)	2022/12/22	NC	80 - 120	98	80 - 120	5.9, RDL=5.0 (3)	ug/L	5.4	20		
8422287	Total Lead (Pb)	2022/12/22	100	80 - 120	97	80 - 120	<0.020	ug/L	7.2	20		
8422287	Total Manganese (Mn)	2022/12/22	NC	80 - 120	99	80 - 120	<0.10	ug/L	9.2	20		
8422287	Total Molybdenum (Mo)	2022/12/22	NC	80 - 120	101	80 - 120	<0.050	ug/L	1.9	20		
8422287	Total Nickel (Ni)	2022/12/22	97	80 - 120	98	80 - 120	<0.10	ug/L	8.8	20		
8422287	Total Phosphorus (P)	2022/12/22	104	80 - 120	102	80 - 120	6.0, RDL=5.0 (3)	ug/L	7.3	20		
8422287	Total Platinum (Pt)	2022/12/22	100	80 - 120	98	80 - 120	<0.10	ug/L	NC	20		
8422287	Total Selenium (Se)	2022/12/22	102	80 - 120	97	80 - 120	<0.040	ug/L	NC	20		
8422287	Total Silver (Ag)	2022/12/22	101	80 - 120	97	80 - 120	<0.010	ug/L	3.4	20		
8422287	Total Tin (Sn)	2022/12/22	106	80 - 120	101	80 - 120	<0.20	ug/L	4.0	20		
8422287	Total Vanadium (V)	2022/12/22	106	80 - 120	96	80 - 120	<0.20	ug/L	7.1	20		
8422287	Total Zinc (Zn)	2022/12/22	94	80 - 120	99	80 - 120	<1.0	ug/L	6.6	20		

N/A = Not Applicable

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

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

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

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

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

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

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

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

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

(2) Blank Spike outside acceptance criteria (10% of analytes failure allowed).

(3) Method blank exceeds acceptance limits- 2X RDL acceptable for low level metals determination.

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VALIDATION SIGNATURE PAGE

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

Anastassia Hamanov, Scientific Specialist

Cristina Carriere, Senior Scientific Specialist

David Huang, BBY Scientific Specialist

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Page 1 of 1

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:	
Company Name:	#17950 Cambium Environmental Inc	Company Name:		Quotation #:	C21984
Attention:	ACCOUNTS PAYABLE	Attention:	Nicole Heikoop	P.O. #:	
Address:	194 Sophia Street PO Box 325	Address:		Project:	16304-002
	Peterborough ON K9H 1E5			Project Name:	
Tel:	(705) 742-7900 Fax: (705) 742-7907	Tel:	(866) 217-7900 Fax:	Site #:	
Email:	accounting@cambium-inc.com	Email:	nicole.heikoop@cambium-inc.com	Sampled By:	Andrew Bunn

13-Dec-22 16:12
Gemarie Balatico
C2AG003
RUK ENV-1746

Bottle Order #: 910893
Project Manager: Gemarie Balatico

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

Regulation 153 (2011)
- ☐ Table 1 ☐ Res/Park ☐ Medium/Fine
- ☐ Table 2 ☐ Ind/Comm ☐ Coarse
- ☐ Table 3 ☐ Agri/Other ☐ For RSC
- ☒ Table as per quote

Other Regulations
- ☐ CCME ☐ Sanitary Sewer Bylaw
- ☐ Reg 558. ☐ Storm Sewer Bylaw
- ☐ MISA Municipality
- ☐ PWQO ☐ Reg 406 Table
- ☐ Other

Special Instructions

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

Field Filtered (please circle): Metals / Hg / Cr VI

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Barrie San. Sewer excl. Rh (2021-002)	# of Bottles	Comments
1		MW101	2022/12/12	12:40	W	X	14	
2								
3								
4								
5								
6								
7								
8								
9								
10								

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 #)*

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Andrew Bunn	2022/12/12	16:00	[illegible]	2022/12/13	16:12	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	6/6/8	Present	Y	
		Intact	Y	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S 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.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-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.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/CHAIN-CUSTODY-FORMS-COCS.

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

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

#629280

Exceedance Summary Table – Barrie Sanitary Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
MW101	UOR087-04	Total Suspended Solids	350	1100	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 – Barrie Storm Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
MW101	UOR087-07-Lab Dup	Total Copper (Cu)	10	18.6	0.20	ug/L
MW101	UOR087-07	Total Copper (Cu)	10	19.8	0.20	ug/L
MW101	UOR087-04	Total Suspended Solids	15	1100	10	mg/L

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

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DRAFT

Appendix H

Water Balance Assessment

	THORNTHWAITE-TYPE MONTHLY WATER-BALANCE MODEL												
	modified from Dingman 2001: ex. 7-13, Box 7-3 using ET model of Hamon (1963)												
	Input Data				Computed Values				**Surplus**	**388**	mm/yr		
Location:	**Barrie**			**Lat. =**	**44.2**	**degree**			***SOILmax =***	**150**	**mm**		
					0.77	rad							
Declination (deg)	-21.3	-13.3	-2.0	9.8	18.9	23.3	21.3	13.7	3.0	-9.0	-18.6	-23.3	
Declination (rad)	-0.37	-0.23	-0.03	0.17	0.33	0.41	0.37	0.24	0.05	-0.16	-0.32	-0.41	
DayLength (hr)*	9.0	10.2	11.7	13.3	14.6	15.3	15.0	13.8	12.4	10.8	9.5	8.7	
*For lat. > 66.5, replace #NUM! with 24 in summer; 0 in winter.													
			MONTHLY WATER BALANCE DATA										
			Temperatures in C, water-balance terms in mm.										
Month:	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**Year**
P	**83**	**62**	**58**	**62**	**82**	**85**	**77**	**90**	**94**	**78**	**89**	**74**	933
T	**-7.7**	**-6.6**	**-2.1**	**5.6**	**12.3**	**17.9**	**20.8**	**19.7**	**15.3**	**8.7**	**2.7**	**-3.5**	
F	0.00	0.00	0.00	0.93	1.00	1.00	1.00	1.00	1.00	1.00	0.45	0.00	
RAIN	0	0	0	58	82	85	77	90	94	78	40	0	604
SNOW	83	62	58	4	0	0	0	0	0	0	49	74	329
PACK	183	244	302	20	0	0	0	0	0	0	27	100	
MELT	0	0	0	286	20	0	0	0	0	0	22	0	329
INPUT (W_m)	0	0	0	344	103	85	77	90	94	78	62	0	932
PET	0	0	0	40	68	100	116	100	69	40	23	0	557
W_m - PET	0	0	0	304	35	-15	-39	-10	25	38	39	0	
SOIL	150	150	150	150	150	136	105	98	123	150	150	150	
Δ SOIL	0	0	0	0	0	-14	-31	-7	25	27	0	0	
ET	0	0	0	40	68	99	108	97	69	40	23	0	545
SURP=W-ET-Δ SOIL	0	0	0	304	35	0	0	0	0	10	39	0	388
DEFIC=PET-ET	0	0	0	0	0	1	8	3	0	0	0	0	12

DETAILED WATER BALANCE CALCULATIONS
582 Essa Road, Barrie, Ontario

1 Climate Information

Precipitation	933	mm/a
Actual Evapotranspiration	545	mm/a
Water Surplus	388	mm/a

2 Infiltration Rates

Table 2 Approach - Infiltration factors

Topography: Flat topography	0.35
Soil Type: Silty Sand to Sandy Silt Till	0.15
Cover: Open Land	0.10
Total	**0.6**

Infiltration (0.65 x 388)	**233**	mm/a
Run-off (388-252)	**155**	mm/a

Table 3 Approach - Typical Recharge Rates

Coarse Sand and Gravel	>250	mm/a
Fine to medium sand	200-250	mm/a
Silty sand to sandy silt	150-200	mm/a
Silt	125-150	mm/a
Clayey Silt	100- 125	mm/a
Clay	<100	mm/a

Site development area is underlain predominantly by silty sand to sandy silt till

Based on the above, the recharge rate is typically	150-200	mm/a

3 Pre-Development Property Statistics	**ha**	**m2**
Paved Area	0.05	500
Roof Area	0.00	0
Landscape Area	0.33	3,272
Total	**0.38**	**3,772**

4 Post-Development Property Statistics	**ha**	**m2**
Paved Area	0.10	1,002
Total Building Roof Area	0.19	1,884
Landscape Area	0.09	886
Total Land Area	**0.38**	**3772**

5 Pre-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	500	467	47	0	420
	Roof Area	-	-	-	0	-
Pervious Areas	Landscape Area	3,272	3,053	1,783	762	508
		3,772	3,519	1,830	762	928
Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.						

6 Post-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	1,002	935	93	0	841
	Roof Area	1,884	1,758	176	0	1,582
Pervious Areas	Landscape Area	886	827	483	206	138
		3,772	3,519	752	206	2,561

7 Comparision of Pre- and Post -Development

	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	3,519	1,830	762	928
Post-Development	3,519	752	206	2,561
Change in Volume			- 555	1,633
Change in %			- 73	176

8 Requirement for Infiltration of Roof Run-off

Volume of Pre-Development Infiltration (m^3/annum)	762
Volume of Post-Development Infiltration (m^3/annum)	206
Deficit from Pre to Post Development Infiltration (m^3/annum)	- 555
Percentage of Roof Runoff required to match the pre-development infiltration (%)	35