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A REPORT TO
547 BAYFIELD INC.

HYDROGEOLOGICAL ASSESSMENT
PROPOSED CAR WASH FACILITY
545 AND 547 BAYFIELD STREET (PHASE 1 LAND)
CITY OF BARRIE

REFERENCE NO. 2402-W095

JUNE 28, 2024

DISTRIBUTION

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1.0 EXECUTIVE SUMMARY

Soil Engineers Ltd. (SEL) was retained by 547 Bayfield Inc. to conduct a hydrogeological assessment for the properties with municipal addresses of 545 and 547 Bayfield Street, the city of Barrie, Ontario (the Subject Site).

The surrounding land uses includes existing commercial properties, vacant lands and Hanmer Street West to the south and Bayfield Street to the west of the Subject Site. The Subject Site currently consists with two (2) commercial building, parking lots and access roads.

It is understood the proposed development will include the repurposing of the existing buildings for the development of a car wash/detailing facility. Additionally, construction of underground settling tanks, a mud tank and installation of underground services are proposed at the Subject Site. The current investigation completed within the proposed development area of the Subject Site reveals that:

- The subsoil profile beneath the fill material mainly comprises of silty sand till deposits extending to the maximum termination depth of investigation at 4.8 mbgs within the investigated area of the Subject Site.
- The monitoring well remained dry over the monitoring program. As such, the shallow groundwater table is anticipated to be below the range of 281.6 masl to 281.9 masl.
- The calculated Hazen Equation interpreted results, indicate that the K estimate for the Sandy Silt Till is 4.0×10^{-6} m/s.
- Groundwater seepage is not expected during excavation for construction of the proposed Mud Tank, Settlement Tanks and underground services. However, stormwater during storm event should be controlled. The Total anticipated dewatering flow rate including precipitation for construction of the proposed development could reach up to 27,500.0 L/day including 4,900 L/day for the proposed settling tanks and 22,600 L/day for the installation of underground services.
- The estimated short-term dewatering flow rate remains below the MECP threshold of 50,000 L/day, and it is expected only from precipitation source. As such, filing EASR or applying for PTTW with MECP is not required.
- The excavation for the underground settling tanks and installation of underground services will be constructed above the shallow groundwater table, where the conceptual ZOI during short-term dewatering is not anticipated. As such:
    - Potential risk for ground settlement for the surrounding structures is not expected due to dewatering.
    - Potential risk for natural heritage features is not expected.

- A review of the MECP well records confirmed that there are twenty-seven (27) records for water supply wells that are registered within 500 m of the Subject Site. Since, excavation below the shallow groundwater table is not anticipated, no impacts to water supply wells are anticipated for the construction of the proposed commercial development.

2.0 INTRODUCTION

2.1 Site Location and Project Description

Soil Engineers Ltd. (SEL) was retained by 547 Bayfield Inc. to conduct a hydrogeological assessment for the properties with municipal addresses of 545 and 547 Bayfield Street, in the city of Barrie, Ontario (the Subject Site). The Subject Site is located south of Hanmer Street West and east of Bayfield Street. The Subject Site is bounded by commercial properties to the north, south and west, and residential properties and vacant lands to the east. Location of the Subject Site is shown on **Drawing 1**.

The Subject Site is currently occupied with two (2) commercial structures. It is understood that the proposed development will include the repurposing of the existing commercial buildings on the Subject Site.

2.2 Project Objectives

The current hydrogeological assessment report presents regional and local setting of the Subject Site. The findings of the fieldwork, including subsoil investigation, groundwater level monitoring, and hydraulic conductivity assessment based on Hazen Equation are presented in the report. Potential needs for short-term dewatering and long-term drainage control are assessed, and hydrogeological impacts of the proposed development to the nearby groundwater receptors including water supply wells, natural heritage features, and structures are assessed (if applicable). This report provides mitigation plans on the potential impacts of the proposed development to the groundwater receptors, and structures. Comments and recommendation are provided on any needs for applying for Permit to Take Water (PTTW), or posting Environmental Activity and Sector Registry (EASR) with the Ministry of the Environment, Conservation and Parks (MECP).

The current report is prepared in consideration of the Ontario Water Resource Act, Ontario Regulation 387/04.

2.3 Scope of Work

The scope of work for the hydrogeological assessment is summarized below:

- *Background Review:* Available background geological and hydrogeological information for the Subject Site including topographic mapping, surface geological, natural heritage features databases, City of Barrie, and MECP water well records were reviewed.
- *Short-Term Dewatering Needs:* Based on a review of the available design drawings, findings of the current subsurface investigation, and recommendations provided in the geotechnical investigation report (if available), short-term dewatering flow rate including groundwater

seepage, and anticipated water that should be collected over potential storm events was calculated. A mitigation plan was recommended to mitigate potential short-term dewatering impacts to the nearby groundwater receptors (including natural heritage features and water supply wells), and structures, if applicable.

- *Long-Term Dewatering Needs:* Based on a review of the available design drawings, findings of the current subsurface investigation, and recommendations provided in the geotechnical investigation report (if available), comments were provided if the long-term foundation drainage management is required.
- *Permit Requirements:* Considering the preliminary estimated short-term construction dewatering flow rates, recommendations were provided on any need for applying for a PTTW or posting on the EASR with the MECP, if required.

3.0 APPLICABLE REGULATIONS AND OFFICIAL PLANS

The regulations and policies relevant to this hydrogeological assessment and the location of the Subject Site within the official plans are summarized below.

3.1 Nottawasaga Valley Conservation Authority Policies and Regulation (O. Reg. 172/06)

Under Section 28 of the Conservation Authorities Act, local conservation authorities are mandated to protect the health and integrity of the regional greenspace system and to maintain or improve the hydrological and ecological functions performed by valley and stream corridors. The LSRCA, through its regulatory mandate, is responsible for issuing permits under Ontario Regulation (O. Reg.) 166/06, Development, Interference with Wetlands and Alterations to Shorelines and Watercourses for development proposal or Site alteration work to shorelines and watercourses within the regulated areas.

NVCA Regulated Area online mapping was reviewed on June 28, 2024. It is our understanding that the Subject Site is not located within the Regulated Area. As such, it is anticipated that obtaining a permit from the NVCA under O. Reg. 172/06 will not be required for the proposed development.

3.2 Clean Water Act

The MECP mandates the protection of existing and future sources of drinking water under the Clean Water Act, 2006 (CWA). Initiatives under the CWA include the delineation of Wellhead Protection Areas (WHPAs), significant groundwater recharge areas (SGRAs) and Highly Vulnerable Aquifers (HVAs) as well as the assessment of drinking water quality and quantity threats within Source Protection Regions. Source Protection Plans are developed under the CWA and include the restriction and prohibition of certain types of activities and land uses within WHPAs.

Based on a regional-scale source water protection mapping (Source Water Protection Information atlas) provided by the MECP on June 17, 2024, the Subject Site is located within Wellhead Protection Area Q1 and Q2 with low stress. However, the Subject Site is not located within Issue Contributing Area and Intake Protection Zone, Event Based Area, and SGRA, or HVA area.

3.3 City of Barrie official plans

The City of Barrie Plan sets up policies that deal with legislative and administrative concerns, guides physical growth, and addresses social, economic, and environmental concerns. The Official Plan provides land use planning designations and identifies areas of environmental significance where more stringent policies may apply for development applications.

City of Barrie Official Plan maps were reviewed for the current study with the results summarized as

below:

- Map 1 (Community Structure) – A review of the map, dated May 2024, indicates that the Subject Site is located as a Strategic Growth Atea (SGA).
- Map 2 (Land Use Designation) - A review of the map, dated May 2024, indicates that the Subject Site is located within an area designated as Commercial District.
- Map 3 (Natural Heritage Protection Overlays) - A review of the map, dated May 2024, indicates that the Subject Site is not located within an Environmental Protection Area.
- Map 7 (Drinking Water System Vulnerable Areas) – A review of the map, dated May 2024, indicates that the Subject Site is designated as a Significant Groundwater Recharge Areas (SGRAs).
- Appendix I (Conservation Authority Area) – A review of the map, dated May 2024, indicates that the Subject Site is located in an the Nottawasaga Valley Conservation Authority.

4.0 METHODOLOGY

4.1 Borehole Advancement and Monitoring Well Installation

Drilling boreholes and construction of monitoring wells were conducted for geotechnical investigation by SEL on March 15, 2024 within the proposed development portion of the Subject Site. The program consisted of the drilling of two (2) boreholes (BH) and installation of two (2) monitoring wells for geotechnical and hydrogeological assessment purposes. The locations of the boreholes and monitoring wells are shown on **Drawing 2**.

Borehole drilling and monitoring well construction were completed by a licensed water well contractor, under the full-time supervision of a drilling supervisor from SEL. SEL's geotechnical supervisor logged the soil strata encountered during borehole advancement and collected representative soil samples for textural classification. The boreholes were drilled using a track-mounted drill rig equipped with continuous flight, hollow-stem augers. Detailed descriptions of the encountered subsoil and groundwater conditions are provided by SEL and presented on the borehole and monitoring well logs, on the enclosed **Appendix A**.

The monitoring wells were constructed using 50-mm diameter Trilock pipes 1.5 m long well screens, which were installed in the two (2) geotechnical boreholes. All monitoring wells were equipped with monument protective casings.

The UTM coordinates and ground surface elevations at the monitoring wells' locations, as well as the monitoring well construction details, are presented in **Table 4-1**. The ground surface elevations and horizontal coordinates at the monitoring well locations were determined at the time of the investigation, using a Trimble Geoexplorer 6000 series GeoXH handheld Global Navigation Satellite System.

Table 4-1- Monitoring Well Installation Details

Monitoring Well ID	Installation Date	UTM Coordinates (m)		Ground El. (masl)	Screen Interval (mbgs)	Soil in the Screen Interval	Casing Dia. (mm)	Protective Casing Type
		Easting	Northing					
BH/MW 1	March 15, 2024	602508	4918878	286.6	3.1-4.6	Silty Sand Till	50	Flush Mount
BH/MW 2	March 15, 2024	602554	4918898	286.3	3.1-4.6	Silty Sand Till	50	Flush Mount

Notes:
mbgs metres below ground surface
masl metres above sea level

4.2 MECP Water Well Records Review

MECP Water Well Records (WWRs) were reviewed for the registered wells located at the Subject Site and within 500 m radius of the Subject Site boundaries (Study Area). The water well records indicate that forty five (45) wells are located within the 500 m zone of influence Study Area relative to the Subject Site. The findings of the MECP well records are summarized in the **Section 3.6** of the current report.

4.3 Groundwater Monitoring

Two (2) installed monitoring wells were utilized to measure and monitor groundwater levels. Monitoring wells were developed, and the groundwater monitoring program confirmed the stabilized groundwater level beneath the Subject Site. The stabilized groundwater levels were manually measured over four (4) monitoring events, from March 22, 2024 to June 14, 2024, with the results presented in **Section 7.1**.

4.4 In-Situ Hydraulic Conductivity Test

The in-situ hydraulic conductivity test (falling head and rising head) provides estimated hydraulic conductivity (K) for subsoil strata at the depths of the well screens. The in-situ falling head hydraulic conductivity test involves the placement of a slug of known volume into the monitoring well, below the water table, to displace the groundwater level upward. The in-situ rising head hydraulic conductivity test involves removing a volume of water from the monitoring well to displace the groundwater level downward. The rate at which the water level recovers to static conditions (rising head/falling head) is tracked manually using a water level tape and a data logger. Slug tests in the monitoring wells with partially submerged screens may exhibit a double straight-line effect due to filter pack drainage. Therefore, the data that represents the filter pack around the screen is eliminated during the interpretation of the slug test. The rate at which the water table recovers to static conditions is used to estimate the K value for the water-bearing strata formation at the well screen depth using the Bouwer and Rice method (1976).

The two (2) installed groundwater monitoring wells were recorded dry over the four (4) monitoring events. Therefore, no Single Well Response Tests (SWRTs) were completed at the monitoring wells.

4.5 Hydraulic Conductivity Based on Grain Size Distribution Graphs

The Hazen equation estimation method was also used to estimate the hydraulic conductivity (K) for saturated subsoils at selected depths beneath the groundwater table beneath the Subject Site. The method provides alternative hydraulic conductivity (K) estimates which are derived from the grain size diameter, whereby 10% by weight of the soil particles are finer and 90% are coarser (Freeze and Cherry, 1979). The soils chosen for Hazen to estimate were selected primarily from above the well screen depths. Findings are presented in **Section 7.3**.

4.6 Groundwater Quality Assessment

Groundwater quality assessment is required to characterize its quality for evaluation against the City of Barrie Sewer-Use By-Law. This is performed to assess whether any anticipated dewatering effluent can be disposed of into the City of Barrie Sewer system during construction, or following site development

for any long-term foundation drainage. Based on the results, recommendations for any pre-treatment for any dewatering/drainage effluent can be developed, if required.

The two (2) installed groundwater monitoring wells were recorded dry over the four (4) monitoring events. Therefore, no groundwater samples were collected for groundwater quality assessment.

4.7 Review of Regional Data and Available Reports for the Subject Site

The maps, data, and documents provided by the MECP, Ontario Geological Survey (OGS), Oak Ridges Moraine Groundwater Program (ORGMP), and Ministry of Natural Resource and Forestry (MNRF). Additionally, an issued geotechnical report was reviewed at the time of preparation of the current hydrogeological assessment report, with the findings summarized in S**ections 5 and 6**.

5.0 REGIONAL AND LOCAL SITE SETTING

5.1 Regional Geology

The current understanding of the surface geological setting of the Subject Site is based on scientific work conducted by the OGS (OGS, 2003). The east portion of the Subject Site is located within an area comprising of Till (5b), comprising of stone-poor sandy silt to silty sand-textured till, and the west portion of it is mapped within the Glaciofluvial ice-contact stratified deposits (6), comprising of sand and gravel. **Drawing 3** illustrates the mapped surficial geology for the Subject Site and the surrounding area.

The Oak Ridges Moraine Groundwater Program produces cross-sectional geological map to aid in the characterization of the general area. Considering the regional cross-section, it is understood that the overburden units prevalent in this area are as follows, with the youngest unit at the top:

- *Undifferentiated Upper Sediments:* Undifferentiated sediments present in ground surface, with an approximate thickness between 0.8 m and 4.8 m.
- *Halton Till:* The Halton Till is mainly comprised of sandy silt to clayey silt till interbedded with silt, clay, and a number of discontinuous sand and gravel lenses. It was deposited approximately 12,500 years ago. Based on cross-section, the Halton Till or equivalent is present beneath the undifferentiated upper sediments with an approximate average thickness of up to 1.0 m.
- *Oak Ridges Moraine and Channels:* The Oak Ridges Aquifer Complex (ORAC) is a regionally significant aquifer in southern Ontario. The majority of the aquifer's recharge occurs at the crest of the moraine north of the Site. It is primarily composed of interbedded fine sand and silt deposits with localized coarse sand and gravel deposits. Channel aquifers are not expected beneath the Site. Approximate average thickness of the ORAC could reach to 11.40 m beneath the Subject Site.
- *Newmarket Till (Upper Till):* The Newmarket till is a regionally extensive till formation that acts as an aquitard separating the Oak Ridge's Aquifer Complex (ORAC) from the underlying Thorncliffe Formation. Based on the ORMGP cross-section, Newmarket Till mapped beneath the ORAC. The Newmarket Till can be contacted at approximately beneath the undifferentiated upper sediments. The Newmarket till has an approximate thickness of 74.0 m.
- *Sunnybrook Drift:* The Sunnybrook Drift consists of silt to silty clay materials deposited 45,000 years ago and acts as a regional aquitard. Based on the ORMGP cross-section, the Sunnybrook Drift layer has an approximate thickness of 35.0 m beneath the Subject Site.
- *Scarborough Formation:* The Scarborough Formation consists of sands over silt and clay materials deposited approximately 70,000 to 90,000 years ago and acts as an aquifer. Based on the ORMGP cross-section, the Scarborough Formation layer has an average thickness of 41.0 m beneath the Subject Site.

The underlying bedrock at the Subject Site is the Shadow Lake Formation, which consists of limestone, dolostone, shale, arkose and sandstone (OGS, 2007). A review of the ORMGP cross-section indicates that the bedrock could be contacted at an approximate elevation of 127.0 metres above sea level (masl) beneath the Subject Site.

5.2 Regional Physiography

The Subject Site is located within a regional physiography of Southern Ontario known as Simcoe Uplands, which comprises of Drumlinized Till Plains. It consists primarily of glacial till deposits comprising of a mixture of clay, silt, sand, gravel, and boulders deposited directly by the movement (Chapman and Putnam, 1984). **Drawing 4** shows the location of the Subject Site within the regional physiography map.

5.3 Regional Topography and Drainage

A review of a regional topography map presented on **Drawing 5** indicates that topography of the proposed development portion of the Subject Site is relatively flat. The ground surface elevation ranges approximately between 286.3 masl to 286.6 masl based on ground surface elevations measured at the borehole and monitoring wells' locations.

5.4 Watershed Setting

The Subject Site is located within the Nottawasaga River Watershed of the Nottawasaga Valley Conservation Authority (NVCA) jurisdiction.

5.5 Local Surface Water and Natural Heritage Features

MNRF database was reviewed for any natural heritage features including, watercourses, bodies of water, wetland features, Area of Natural and Scientific Interest (ANSI) and wooded areas. **Drawing 6** shows the location of the Subject Site within the surrounding Natural Heritage Features.

Record review indicates that there are no records for natural heritage features including wetland, water bodies, watercourses and ANSI within the Subject Site. Record review indicates that wooded areas are situated approximately 230 m to the north and northeast of the Subject Site. The wetland record, which is not evaluated as per Ontario Wetland Evaluation System (OWES), can be found approximately 430 m southeast of the Subject Site. A water course is also generated 400 m northeast of the Subject Site and flows northerly direction. Little Lake is also located approximately 2.5 km to the east of the Subject Site.

5.6 Ground Water Resources (MECP Well Records)

MECP well record database was reviewed for records located within a radius of 500 m from the approximate Site boundary (Study Area). The records indicate that forty-five (45) well records are located within the Study Area relative to the Subject Site boundaries. A summary of data obtained from records review is presented in **Table 5-1**.

The locations of the well records, based on the UTM coordinates provided by the records, are shown on **Drawing 7**. Details of the MECP water well records that were reviewed are provided in **Appendix B**.

Table 5-1 - MECP Well Record Summary

Water Use (Final Status)	
Status	**Number of Records**
Unknown	3
Observation well	2
Abandoned-Supply	2
Abandoned-Other	10
Test Hole	1
Water Supply	27

The above summary indicates that there are Twenty-Seven (27) records of water supply wells within a radius of 500 m from the Subject Site Boundary. Water supply well for commercial use at a depth of 36.6 mbgs is within the subject site established on October 18, 1964.

5.7 Active Permit to Take Water Application Record Review

MECP website was reviewed for any active PTTW application records within 1.0 km radius of the Subject Site on June 18, 2024. Record review indicates there are no records for active PTTW within the Study Area.

6.0 SOIL LITHOLOGY AND SUBSURFACE INVESTIGATION

The subsoil investigation has revealed that beneath the existing pavement structure, the Subject Site within the footprint of the proposed development mainly comprises of earth fill layer, extended to a maximum depth of 1.4 metres below ground surface (mbgs), that is underlain by a silty sand till layer extending to the maximum termination depth of investigation at 4.8 mbgs. Information regarding borehole logs is presented in **Appendix A**. The approximate locations of boreholes are shown on **Drawing 2**. Additionally, a Key plan and subsoil profile are presented on **Drawings 8-1** and **8-2**, respectively. Based on a review of the geotechnical investigation report prepared by SEL, the stratigraphy beneath the investigated areas of the Subject Site generally consists of the followings:

6.1 Pavement Structure (All BH/MWs)

The pavement structure consisted of 51 mm thick layer of asphalt, overlaying granular fill consisting of 100 mm in thickness in both BH/MWs.

6.2 Earth Fill (All BH/MWs)

The layer of earth fill was contacted in both BH/MWs extend to depths ranging from 0.8 mbgs to 1.4 mbgs. The earth fill mainly consists of dark brown sandy silt with gravel. The moisture content for the retrieved subsoil ranges from 13 to 14% indicating moist conditions.

6.3 Silty Sand Till (All BH/MWs)

The silty sand till layer was encountered at both boreholes locations below the earth fill layer and extends to the maximum termination depth of investigation at 4.8 mbgs. It is brown in color, with compact to very dense relative density. The layer comprises of silty sand till with traces of clay, gravel and occasional cobbles and boulders. The moisture content for the retrieved subsoil samples range from 6% to 15%, indicating dry to moist conditions.

7.0 LOCAL HYDROGEOLOGICAL STUDY

7.1 Monitoring Well Development and Groundwater Level Monitoring

The groundwater levels in the monitoring wells were measured, manually between March 22 and June 14, 2024 to record the fluctuation of the shallow groundwater table beneath the Subject Site.

Monitoring wells were developed and groundwater levels were monitored over four (4) monitoring events. SEL measured the groundwater levels using an interface probe (Solinst Interface Metre). A summary of the groundwater level observations and their corresponding elevations are provided in **Table 7-1**.

Table 7-1- A Summary of Groundwater Monitoring

MW* ID	Unit	Groundwater Level			
		March 22, 2024	April 18, 2024	May 12, 2024	June 14, 2024
BH/MW 1	mbgs	Dry	Dry	Dry	Dry
	masl	-	-	-	-
BH/MW 2	mbgs	Dry	Dry	Dry	Dry
	masl	-	-	-	-

Notes:
mbgs metres below ground surface
masl metres above sea level

As shown in **Table 6-1**, all the monitoring wells were dry over the four (4) monitoring events.

7.2 Shallow Groundwater Flow Pattern

The two (2) installed monitoring wells were observed dry during the monitoring events. As such, the shallow groundwater flow pattern for the Subject Site could not be interpreted.

7.3 Assessment of Hydraulic Conductivity Based on the Hazen Equation

The two (2) installed monitoring wells were consistently dry over the monitoring periods. As such, no single well response tests were completed at the installed monitoring wells. The hydraulic conductivity (K) estimates for the subsoils were estimated based on soil grain size analyses using the Hazen method instead.

The Hazen Equation estimation method provides an indication of the yield capacity for the groundwater-bearing substrata in the vicinity and at depths where the soil samples were retrieved for grain size analyses.

The Hazen Equation method relies on the interrelationship between hydraulic conductivity and effecetive soil grain size, d_{10}, in the soil media. This empirical relation predicts a power-law relation with K, as follow:

$$K = Ad_{10}^2$$

where;

d_{10}: Value of the grain size gradation curve as determined by sieve analysis, whereby 10% by weight of the soil particles are finer and 90% by weight of the soil particles are coarser.

A: Coefficient; it is equal to 1, when K is in cm/sec and d_{10} is in mm

The calculated results indicate that the K estimate for the silty sand till retrieved from a depth of approximately 2.3 m at BH/MW 1 and gravelly sand sample from a depth of approximately 4.6 m at BH/MW 2 is 4.0 x 10^{-6} cm/sec for both monitoring wells. The result for the Hazen method estimate is provided in **Table 7-2** below.

Table 7-2 A Summary of Hazen Equation Results

MW* ID	Sample Depth (mbgs)	Description of Soil Strata	$D_{10\ (mm)}$	Hydraulic Conductivity (K) (m/sec)
BH/MW 1	2.3	Silty Sand Till	0.02	4.0 x 10^{-6}
BH/MW 2	4.6	Silty Sand Till	0.02	4.0 x 10^{-6}

Notes:
mbgs metres below ground surface
masl metres above sea level

The K estimate determined from the Hazen method suggests a moderate hydraulic conductivity (K) for the silty sand till layers contacted beneath the subject site.

7.4 Groundwater Quality

The two (2) installed monitoring wells were consistently dry over the monitoring periods. As such, no groundwater sample was retrieved from the installed monitoring wells.

8.0 DISCHARGE WATER CONTROL

8.1 A review of Proposed Development Plans

The provided plan titled Site Plan, DWG No. A1, dated June 2022 prepared by Bicorp Design Group Ltd. Was reviewed for the current assessment. A review of the site drawing indicates that the proposed development at the Subject Site will include repurposing of existing two (2) commercial buildings, at-grade pavement parking, and underground settling tanks. **Appendix C** presents the reviewed design drawings.

8.2 A review of Geotechnical Investigation Report

A review of the Geotechnical Investigation report prepared by SEL Ltd. dated April 2024 indicates that:

- The existing asphalt can be pulverized and reused on site as the granular sub-base or removed off-site.
- The existing granular fill is not suitable for structural use and should therefore be sub excavated, inspected, assessed, sorted free of organic matter and any deleterious materials, and properly compacted.
- The final subgrade should be graded towards the catch basins or subdrains to remove any subsurface water percolated through the pavement structure.
- The subgrade for underground services should consist of native soil or compacted inorganic earth fill. Class 'B' bedding, consisting of compacted 19-mm Crusher-Run Limestone (CRL), is recommended for the construction of the underground services.

8.3 Construction Dewatering Requirements

As per the provided site plan, it is understood that current commercial buildings on the Subject Site will be repurposed. It is understood the repurposing the buildings will not include excavation. As such, short-term dewatering is not expected for the repurposing the existing buildings. Furthermore, underground settling tanks, a mud tank and underground services are proposed at the Subject Site. Therefore, potential needs for short-term dewatering will be assessed for the proposed tanks. The Following sections present the estimated dewatering flow rates for the proposed development including the proposed mud tank, settling tanks and underground services.

8.3.1 Methodology

Short-Term Dewatering Calculation: The pumping rate calculation for the construction for the proposed development was performed based on the assumption with each excavation acting as trench and single

well considering the dimensions of the proposed excavation boxes. The calculation was based on the equations provided by Powers et al. (2007). For the purposes of this analysis, steady state flow into an open excavation is assumed. Additionally, the equations of radial flow have the following assumptions:

- Ideal aquifer conditions (homogeneous, isotropic, uniform thickness and has infinite areal extent)
- Fully penetrating pumping well
- Only lateral flow to the pumping well

The following equations were used for open trenches and is based on unconfined aquifer conditions (Powers et. al., 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_0 / r_s)} + 2\left[\frac{xK(H^2 - h^2)}{2L}\right]$$

Where:

Q = Anticipated pumping Rate (m3/day)
K = Hydraulic Conductivity (m/day)
H = Distance from the static water level to the bottom of the saturated aquifer (m)
h = Depth of water in the well while pumping (m)
R_o = Distance from a point of greatest drawdown to a point where there is zero drawdown (radius of influence) (m)
r_s = Distance to the wellpoints from the centre of the trench, assumed to be half of the trench width (m) for Trench base calculation
X = Trench Length (m)
L = Distance from a line source to the trench, Ro (m)/2

The calculated pumping rate was multiplied by a factor of safety of 1.5 to account for uncertainties and natural variability in the range of hydraulic conductivity.

Zone of Influence for Dewatering: An estimate of the Zone of Influence (ZOI) for dewatering in unconfined aquifers can be calculated using the following equation (Bear, 1979):

$$R_0 = 2.45\sqrt{\frac{HK}{S_y}}t$$

where,

R_o = Zone of Influence (m), beyond which there is negligible drawdown
H = Distance from initial static water level to bottom of saturated aquifer (m)
Sy = Specific yield of the aquifer formation
t = Time, in seconds, required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)
K = Hydraulic Conductivity (m/s)

Stormwater flow Estimate: The amount of runoff that could accumulate in the excavation box was also considered for any construction dewatering needs assessment. Therefore, the dewatering flow rates at the Subject Site should also include removing stormwater from the excavation. Additionally, the anticipated flow through infiltration after storm event for the post-development site should be considered.

A review of intensity duration frequency curve (IDF curve) for the year 2010 for the coordinates 44° 24' 45" N, 79° 42' 45" W, the rainfall depth considering 2-year storm event over a 3-hour period per day is approximately 30.22 mm, and a 100-year storm event over a 12-hour period per day is 102.00 mm. The data was taken from the Ministry of Transportation's (MTO) website.

The accumulated runoff associated with rainfall events within the anticipated excavations for the proposed underground basements was calculated using the estimated rainfall depth multiplied by the estimated area of the proposed excavation footprint of the proposed development.

8.3.2 Short-Term Dewatering Proposed Underground Settling Tanks

Based on a review of the provided Site Plan, dated June 2022 prepared by Bicorp Design Group Ltd., indicated that the proposed mud tank and settlement tanks will be constructed below grade at various depths. A summary of the dimensions considered for the proposed mud tank and settlement tanks compared to shallow groundwater table are present in **Table 8-1**. Shallow groundwater table was not contacted in the monitoring wells, indicating the groundwater table is deeper than the termination depth of investigation at each BH/MW location. A review of **Table 8-1** indicates that the proposed Mud Tank 1 and Settling Tanks will be constructed above shallow groundwater table. As such, groundwater seepage is not expected for excavation and construction of the proposed tanks.

Table 8-1- Proposed Mud Tank and Settling Tank Details Compared to Shallow Groundwater Table

Parameters	Mud Tank 1	Settling Tank 7	Meter/Backflow Preventer Chamber	Settling Tanks 2-8
Dimensions (m)	2.40 x 2.40	2.70 x 5.00	3.00 x 7.00	40.50 x 2.70
Excavation Area (m²)	5.76	13.50	21.00	109.35
Bottom of Excavation (masl)	284.30	284.30	283.01	284.30
Assumed Grading Elevations (masl)*	286.30	286.60	286.60	286.30
Highest Measured Shallow Groundwater Elevation (masl)	below 281.9	-below 281.9	-below 281.9	-below 281.6

*Existing Ground Surface Measured at BH/MWs Locations

As previously mentioned, potential stormwater during storm event should be collected from the excavation boxes for construction of the proposed Mud Tank 1 and Settling tanks. The anticipated stormwater and the total dewatering flow rates are presented in **Table 8-2**.

Table 8-2- Dewatering Flow Rate Estimates for the Proposed Mud and Settlement Tanks

Parameters	Mud Tank 1	Settling Tank 7	Meter/Backflow Preventer Chamber	Settling Tanks 2-8
Excavation Area (m²)	5.76	13.50	21.00	109.35
Estimated Dewatering flow rates	NE*	NE	NE	NE
Anticipated Storm Flow (2- year storm event with duration of 3 hr/day) (L/day)	200.00	500.00	700.00	3,500.00
Total Anticipated Flow (L/day)	200.00	500.00	700.00	3,500.00

*NE: Not Expected

For the purpose of short-term dewatering flow rates estimate, SEL assumes that settling tanks 2-8, with the exception of settling tank 7, will be constructed within the same excavation box.

The maximum anticipated storm flow considering 100-year storm event can also reach up to 11,400.00 L/day from an excavation box for construction of the proposed underground settling tanks 2-8 with the exception of settling tank 7.

8.3.3 Short-Term Dewatering Proposed Underground Services

The excavation depth for the installation of the underground services (storm and sanitary services) were based on the proposed manhole (MH) depths shown on Servicing Plan Phase 1 on Drawing No. S1, prepared by SCS Consulting Group Ltd, dated May 2024. The current ground surface elevation measured on SEL's borehole investigation was considered for the current assessment. The proposed underground services lengths were also based on the lengths shown on Drawing No. S-1, prepared by SCS Consulting Group Ltd.

The summary of the proposed underground services details compared to shallow groundwater conditions is presented in **Table 8-3**.

Table 8-3 Proposed Underground Services Details Compared to Shallow Groundwater Table

Parameters	MH16008-MH5A	MH5A-MH4A	MH4A-MH3A	MH3A-MH2A	MH2A-DP1	TFS-M/BP	M/BP-EX. WM	ST7-ST6
Dimensions (m)	2.00x7.50[1]	2.00x44.70	2.00x7.60	2.00x63.30	2.00x14.30	2.00x129.00	4.00x40.00[2]	2.00x20.40
Excavation Area (m²)	15.00	89.40	15.20	126.60	28.60	258.00	160.00	40.80
Assumed Grading Elevations (masl)[3]	286.60	286.60	286.30	286.30	286.30	286.30	286.60	286.60
Proposed Invert El (masl)	282.94[4]	283.25[4]	283.80[4]	284.08[4]	284.80[4]	283.60[4]	283.68[4]	283.43[5]
Highest Measured Shallow Groundwater Elevation (masl)	below 281.9	below 281.9	below 281.6	below 281.6	below 281.6	below 281.6	below 281.9	below 281.9

1The width of 2.0 m was assumed for the excavation trench.
2The width of 4.0 m was assumed for the excavation trench.
3Existing Ground Surface Measured at BH/MWs Locations.
4 Based on Servicing Plan Phase 1 by SCS Consulting Group ltd., drawing No. S-1, dated May 10, 2024.
5 Based on Site Plan by Bicorp Design Group ltd., drawing No. A1, dated January 30, 2023

A review of **Table 8-3** indicates that the proposed underground services will be constructed above shallow groundwater table. As such, groundwater seepage is not anticipated for installation of the proposed alignments. However, potential stormwater during storm event should be collected from the excavation trenches for construction of the proposed alignments. The anticipated stormwater and the total dewatering flow rates are presented in **Table 8-4**.

Table 8-4 Dewatering Flow Rate Estimates for the underground services

Parameters	MH16008-MH5A	MH5A-MH4A	MH4A-MH3A	MH3A-MH2A	MH2A-DP1	TFS-M/BP	M/BP-EX. WM	ST7-ST6
Excavation Area (m²)	15.00	89.40	15.20	126.60	28.60	258.00	160.00	40.80
Anticipated Storm Flow (2-year storm event with duration of 3 hr/day) (L/day)	500.00	2,800.00	500.00	3,900.00	900.00	7,800.00	4,900.00	1,300.00
Total Anticipated Flow	500.00	2,800.00	500.00	3,900.00	900.00	7,800.00	4,900.00	1,300.00

8.4 Long-Term Drainage

Groundwater seepage is not expected for the proposed tanks. As such, long-term drainage control is not expected.

8.5 Permit Requirements

Short-Term Construction Dewatering: Water takings of more than 50,000.00 L/day but less than 400,000.00 L/day is to be registered on EASR, while water takings of more than 400,000.00 L/day require a PTTW issued by the MECP. If it is identified that an EASR or PTTW is required for the Subject Site, a hydrogeological assessment report will need to be submitted in support of the application.

A summary of the anticipated short-term dewatering flow rate for each section of the proposed development is summarized in **Table 8-5**.

Table 8-5- Estimated Short-Term Dewatering Flow Rate Summary

Proposed Development	Proposed Excavation	Groundwater Seepage	2-Year Storm Event (L/day)	Total Flow (L/day)
Settling Tanks	Mud Tank 1	NE	200.00	200.00
	Settling Tanks 2-8	NE	3,500.00	3,500.00
	Settling Tank 7	NE	500.00	500.00

Proposed Development	Proposed Excavation	Groundwater Seepage	2-Year Storm Event (L/day)	Total Flow (L/day)
	Meter/Backflow Preventer Chambers	NE	700.00	700.00
	Total	NE	**4,900.00**	**4,900.00**
Underground Services	MH16008-MH5A	NE	500.00	500.00
	MH5A-MH4A	NE	2,800.00	2,800.00
	MH4A-MH3A	NE	500.00	500.00
	MH3A-MH2A	NE	3,900.00	3,900.00
	MH2A-DP1	NE	900.00	900.00
	TFS-M/BP	NE	7,800.00	7,800.00
	M/BP-EX. WM	NE	4,900.00	4,900.00
	ST7-ST6	NE	1,300.00	1,300.00
	Total	NE	**22,600.00**	**22,600.00**

NE: Not Expected

A review of the total anticipated dewatering flow rate presented in the above table indicates that, total anticipated dewatering flow remains below the MECP threshold of 50,000.00 L/day, and it is expected during storm event from precipitation source. As such, filing EASR with MECP is not required. However, if the design drawings change, dewatering flow rates must be revised to account for the changes.

Obtaining a discharge permit from the City of Barrie will be required for the potential collected discharge water during construction if it is proposed to be directed to the town's sewer system. Alternatively, potential collected water can be hauled off-site by hiring a licensed contractor.

8.6 Potential Dewatering Impacts and Mitigation Plan

8.6.1 Short-Term Discharge Water Quality

The dewatering system must be appropriately filtered to prevent the pumping of fines and loss of ground during the dewatering activities, if dewatering is required. The final design for any temporary construction dewatering effluent pre-treatment system is the responsibility of the contractors responsible for construction, or the water treatment system design specialists, if required.

8.6.2 Ground Settlement

The excavation for the proposed commercial building and installation of underground services will be constructed above the shallow groundwater table. As such, the conceptual ZOI during short-term dewatering is not anticipated. Potential risk for ground settlement for the surrounding structures is not expected due to dewatering.

8.6.3 Surface Water, Wetlands and Areas of Natural Significance

The record review indicates there are no natural heritage features, wetlands, wooded areas and ANSI identified on the Subject Site. Additionally, proposed excavation and construction at the subject site will be constructed above shallow groundwater table. As such, potential impacts to the nearby natural features are not anticipated with respect to the proposed development.

8.6.4 Water Supply Wells and Zone of Influence

A review of the MECP well records confirmed that here are twenty-seven (27) records for water supply wells that are registered within 500 m of the Subject Site. Since the proposed excavation and construction at the Subject Site will be completed above shallow groundwater table a private water supply well monitoring is not required.

9.0 CONCLUSIONS AND RECOMMENDATIONS

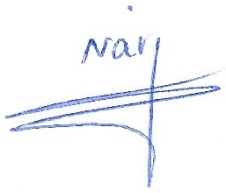
- The east portion of the Subject Site is located within an area comprising of Till (5b), comprising of stone-poor sandy silt to silty sand-textured till, and the west portion of it is mapped within the Glaciofluvial ice-contact stratified deposits (6), comprising of sand and gravel.
- The Subject Site is located within a regional physiography of Southern Ontario known as Simcoe Uplands, which comprises of Drumlinized Till Plains.
- The subsoil profile beneath the fill material mainly comprises of silty sand till deposits extending to the maximum termination depth of investigation at 4.8 mbgs within the investigated area of the Subject Site.
- The monitoring well remained dry over the monitoring program. As such, the shallow groundwater table is anticipated to be below the range of 281.6 masl to 281.9 masl.
- The calculated Hazen Equation interpreted results, indicate that the K estimate for the Sandy Silt Till is 4.0×10^{-6} m/s.
- Groundwater seepage is not expected during excavation for construction of the proposed Mud Tank, Settlement Tanks and underground services. However, stormwater during storm event should be controlled. The Total anticipated dewatering flow rate including precipitation for construction of the proposed development could reach up to 27,500.0 L/day including 4,900 L/day for the proposed settling tanks and 22,600 L/day for the installation of underground services.
- The estimated short-term dewatering flow rate remains below the MECP threshold of 50,000 L/day, and it is expected only from precipitation source. As such, filing EASR or applying for PTTW with MECP is not required.
- The excavation for the construction of the proposed settling tanks and installation of underground services will be constructed above the shallow groundwater table. As such, the conceptual ZOI during short-term dewatering is not anticipated, and potential risk for ground settlement for the surrounding structures is not expected due to dewatering.
- The record review indicates there are no natural heritage features, wetlands, wooded areas and ANSI identified on the Subject Site.
- A review of the MECP well records confirmed that there are twenty-seven (27) records for water supply wells that are registered within 500 m of the Subject Site. Since, excavation below the shallow groundwater table is not anticipated, no impacts to water supply wells are anticipated for the construction of the proposed commercial development.

10.0 CLOSURE

We trust that the above-noted information is suitable for your review. If you have any questions regarding this information, please do not hesitate to contact the undersigned.

Yours truly,
SOIL ENGINEERS LTD.

Alaa Alborno, B.Eng., E.I.T.
Project Manager



Narjes Alijani, M.Sc., P.Geo.
Department Manager - Hydrogeological Services

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7. Ministry of Natural Recourses and Forestry, 2024. Natural Heritage Interactive Map.

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TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

DRAWINGS

REFERENCE NO. 2402-W095

601800
602400
603000
4919200
4918600

BAYFIELD STREET NORTH
NICKLAUS DRIVE
PLAYER DRIVE
PALMER DRIVE
WATSON DRIVE
MASTERS DRIVE
MONIQUE CRESCENT
CASSANDRA DRIVE
MICHAEL CRESCENT
DUVAL DRIVE
HANMER STREET EAST
TREVINO CIRCLE
HANMER STREET WEST
GROVE CRESCENT
SNELLS
KOZLOV STREET
PEARCEY CRESCENT
FORSYTH CRESCENT
BAYFIELD STREET
BIRCHWOOD DRIVE
STANLEY STREET
LIVINGSTONE STREET EAST
FARMINGDALE CRESCENT
SPRINGDALE DRIVE

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References: Ontario Ministry of Natural Resources and Forestry
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Key Map

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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Major Road
- Local Road
- Watercourse

Soil Engineers Ltd.

Site Location Plan

Hydrogeological Assessment
Proposed Car Wash Facility
545 and 547 Bayfield Street
City of Barrie

Reference No. 2402-W095

Date: June 12, 2024

Scale:

0 30 60 120 180 240 300
Metres

Drawing No. 1

602600

602800

4919000

4918800

HANMER STREET EAST

TREVINO CIRCLE

BAYFIELD STREET

BH/MW 2

BH/MW 1

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References: Ontario Ministry of Natural Resources and Forestry
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Key Map

Legend

- Approximate Boundary of Subject Site
- Borehole With Monitoring Well
- Major Road
- Local Road

Soil Engineers Ltd.

Borehole and Monitoring Well Location Plan

Hydrogeological Assessment
Proposed Car Wash Facility
545 and 547 Bayfield Street
City of Barrie

Reference No. 2402-W095

Date: June 12, 2024

Scale:

0 5 10 20 30 40 50

Metres

Drawing No. 2

602000
602500
603000
603500
4919500
4919000
4918500

9b
5b
6

BAYFIELD STREET NORTH
NICKLAUS DRIVE
PLAYER DRIVE
PALMER DRIVE
WATSON DRIVE
MASTERS DRIVE
CASSANDRA DRIVE
MONIQUE CRESCENT
MICHAEL CRESCENT
NICOLE MARIE AVENUE
DUVAL DRIVE
HANMER STREET EAST
HANMER STREET WEST
TREVINO CIRCLE
COUPLES COURT
ARCH BROWN COURT
BIRCHWOOD DRIVE
SNELGROVE CRESCENT
PEARCEY CRESCENT
KOZLOV STREET
FORSYTH CRESCENT
LYFYTT CRESCENT
BAYFIELD STREET
STANLEY STREET
LIVINGSTONE STREET EAST
FARMINGDALE CRESCENT
SPRINGDALE DRIVE
HAZEL AVENUE

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Key Map

Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Major Road
- Local Road
- 5b: Till; consisting of diamicton
- 6: Glaciofluvial ice-contact stratified deposits; consisting of sand, gravel clay, silt, diamicton:ice-contact
- 9b: Glaciolacustrine beach and bar sediments; consisting of sand, gravel: littoral/foreshore

Soil Engineers Ltd.

Surface Geology Map

Hydrogeological Assessment
Proposed Car Wash Facility
545 and 547 Bayfield Street
City of Barrie

Reference No. 2402-W095

Date: June 12, 2024

Scale:
0 60 120 180 240 300
Metres

Drawing No. 3

602000
602500
603000
603500
4919500
4919000
4918500

BAYFIELD STREET NORTH
NICKLAUS DRIVE
PLAYER DRIVE
PALMER DRIVE
WATSON DRIVE
MASTERS DRIVE
MONIQUE CRESCENT
CASSANDRA DRIVE
MICHAEL CRESCENT
NICOLE MARIE AVENUE
DUVAL DRIVE
HANMER STREET EAST
TREVINO CIRCLE
COUPLES COURT
ARCH BROWN COURT
HANMER STREET WEST
SNELGROVE CRESCENT
KOZLOV STREET
PEARCEY CRESCENT
FORSYTH CRESCENT
LIFFTT CRESCENT
BAYFIELD STREET
Till Plains
(Drumlinized)
Simcoe
Uplands
STANLEY STREET
BIRCHWOOD DRIVE
LIVINGSTONE STREET EAST
FARMINGDALE CRESCENT
SPRINGDALE DRIVE
HAZELL AVENUE

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Source: Chapman, L.J. and Putnam, D.F. 2007. Physiography of Southern Ontario;
Ontario Geological Survey, Miscellaneous Release--Data 228 ISBN 978-1-4249-5158-1

N

Key Map

Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Major Road
- Local Road
- Region Boundary
- Till Plains (Drumlinized)

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Physiographic Map

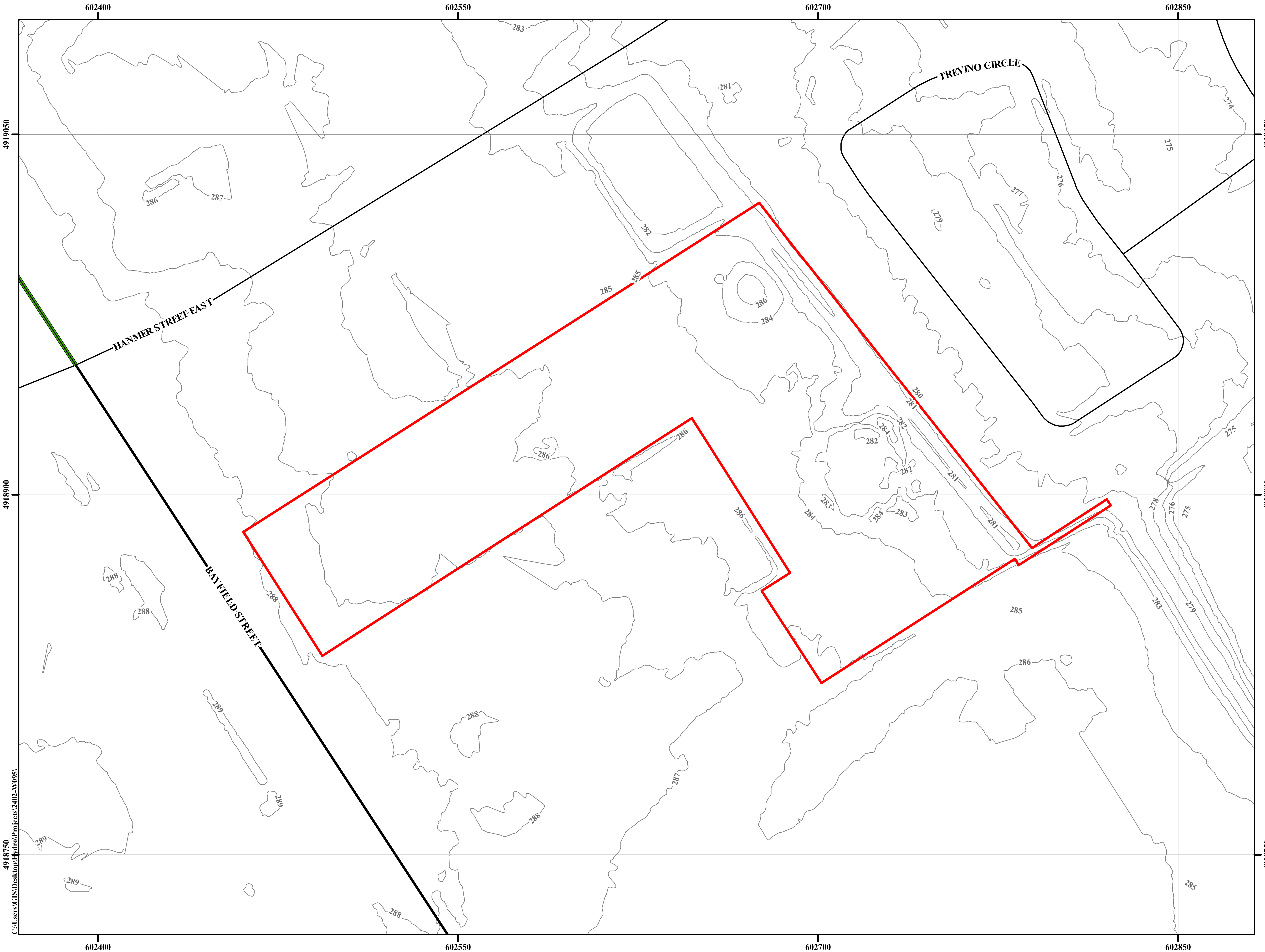
Hydrogeological Assessment
Proposed Car Wash Facility
545 and 547 Bayfield Street
City of Barrie

Reference No. 2402-W095

Date: June 12, 2024

Scale:
0 30 60 120 180 240 300
Metres

Drawing No. 4



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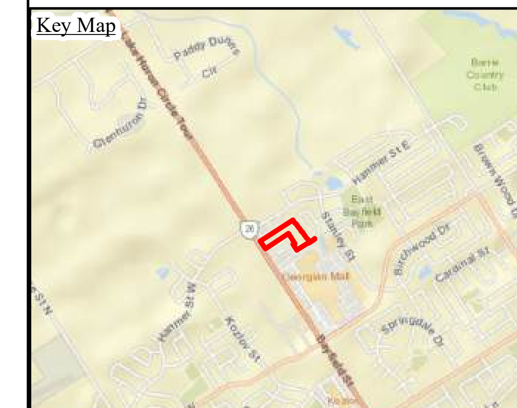
Key Map



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Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Major Road
- Local Road
- Barrie - 1 m

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Topographic Map

Hydrogeological Assessment
Proposed Car Wash Facility
545 and 547 Bayfield Street
City of Barrie

Reference No. 2402-W095

Date: June 12, 2024

Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 5

602000
602500
603000
603500
4919500
4919000
4918500

BAYFIELD STREET NORTH
HANMER STREET WEST
HANMER STREET EAST
DUVAL DRIVE
TREVINO CIRCLE
COUPLES COURT
ARCH BROWN COURT
NICKLAUS DRIVE
PLAYER DRIVE
PALMER DRIVE
WATSON DRIVE
MASTERS DRIVE
MONIQUE CRESCENT
CASSANDRA DRIVE
MICHAEL CRESCENT
NICOLE MARIE AVENUE
BIRCHWOOD DRIVE
SNELGROVE CRESCENT
KOZLOV STREET
PEARCEY CRESCENT
FORSYTH CRESCENT
LYFYTT CRESCENT
BAYFIELD STREET
STANLEY STREET
LIVINGSTONE STREET EAST
FARMINGDALE CRESCENT
SPRINGDALE DRIVE
HAZEL AVENUE

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Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Major Road
- Local Road
- Watercourse
- Wooded Area *Wooded Area*
- Wetland (Not evaluated per OWES)

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Natural Features and Protection Area Plan

Hydrogeological Assessment
Proposed Car Wash Facility
545 and 547 Bayfield Street
City of Barrie

Reference No. 2402-W095

Date: June 12, 2024

Scale:

0 60 120 180 240 300
Metres

Drawing No. 6

602000
602500
603000
603500
4919500
4919000
4918500

BAYFIELD STREET NORTH
BAYFIELD STREET
HANMER STREET EAST
HANMER STREET WEST
DUVAL DRIVE
NICKLAUS DRIVE
PLAYER DRIVE
CALLAWAY COURT
PALMER DRIVE
WATSON DRIVE
MASTERS DRIVE
MONIQUE CRESCENT
CASSANDRA DRIVE
MICHAEL CRESCENT
NICOLE MARIE AVENUE
COUPLES COURT
TREVINO CIRCLE
STANLEY STREET
ARCH BROWN COURT
CELESTE DRIVE
LIVINGSTONE STREET EAST
BIRCHWOOD DRIVE
FARMINGDALE CRESCENT
SPRINGDALE DRIVE
HAZEL AVENUE
PARKWAY PLACE
FORSYTH CRESCENT
PEARCEY CRESCENT
KOZLOV STREET
FINLAY ROAD

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

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Key Map

Legend

- Approximate Boundary of Subject Site
- 500 Metres From Subject Site Boundary
- Expressway/Freeway
- Major Road
- Local Road
- Watercourse
- Unknown (3)
- Abandoned-Other (10)
- Abandoned-Supply (2)
- Observation Wells (2)
- Test Hole (1)
- Water Supply (27)

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MECP Well Location Plan

Hydrogeological Assessment
Proposed Car Wash Facility
545 and 547 Bayfield Street
City of Barrie

Reference No. 2402-W095

Date: June 12, 2024

Scale:

0 30 60 120 180 240 300
Metres

Drawing No. 7

A A'

4919600

4919600

HANMER STREET EAST

TREVINO CIRCLE

BAYFIELD STREET

BH/MW 2

BH/MW 1

N

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Key Map

Legend

- Approximate Boundary of Subject Site
- Borehole With Monitoring Well
- Cross Section
- Major Road
- Local Road

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Cross-Section Plan

Hydrogeological Assessment
Proposed Car Wash Facility
545 and 547 Bayfield Street
City of Barrie

Reference No. 2402-W095

Date: June 12, 2024

Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 8-1

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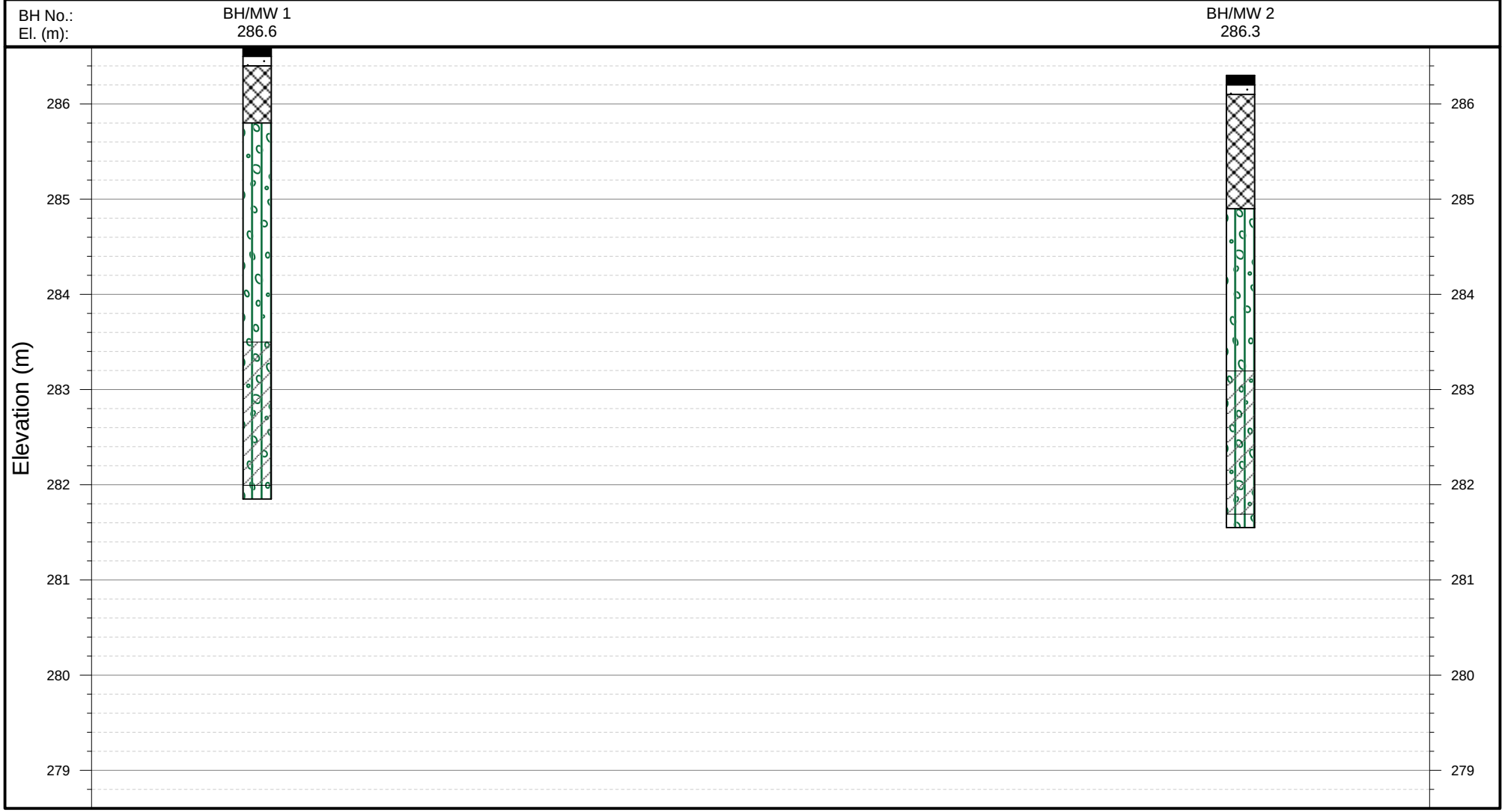
SUBSURFACE PROFILE
CROSS SECTION
DRAWING NO. 8-2
SCALE: AS SHOWN

JOB NO.: 2402-W095
REPORT DATE: June 2024
PROJECT DESCRIPTION: Proposed Car Wash Facility
PROJECT LOCATION: 545 and 547 Bayfield Street, City of Barrie

LEGEND
ASPHALT | FILL | GRANULAR | SILTY SAND TILL | SCREEN



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90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX 'A'

BOREHOLE AND MONITORING WELL LOGS AND GRAIN SIZE DISTRIBUTION GRAPHS

REFERNCE NO. 2402-W095

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Standard Penetration Resistance or 'N' Value:

The number of blows of a 63.5 kg hammer falling from a height of 76 cm required to advance a 51 mm outer diameter drive open sampler 30 cm into undisturbed soil, after an initial penetration of 15 cm.

Plotted as '○'

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows per each 30 cm of penetration of a 51 mm diameter, 90° point cone driven by a 63.5 kg hammer falling from a height of 76 cm.

Plotted as '—●—'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/30 cm)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
>50	very dense

Cohesive Soils:

Undrained Shear Strength (kPa)	'N' (blows/30 cm)	Consistency
<12	<2	very soft
12 to <25	2 to <4	soft
25 to <50	4 to <8	firm
50 to <100	8 to <15	stiff
100 to 200	15 to 30	very stiff
>200	>30	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding
△ Laboratory vane test

METRIC CONVERSION FACTORS

1 ft = 0.3048 m
1 inch = 25.4 mm
1 lb = 0.454 kg
1 ksf = 47.88 kPa

JOB NO.: 2402-W095

LOG OF BOREHOLE:BH/MW 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Car Wash Facility

METHOD OF BORING: Soild Stem Augers

PROJECT LOCATION: 545 and 547 Bayfield Street, City of Barrie

DRILLING DATE: March 15, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
286.6	Pavement Surface							
0.0	**51 mm ASPHALT**				0			
	100 mm GRANULAR FILL							
	EARTH FILL Dark brown, sandy silt with gravel	1	DO	14			14	
285.8								
0.8		2	DO	15	1		15	
	some clay							
	Brown, compact to very dense **SILTY SAND TILL** traces of clay and gravel occ. cobbles and boulders	3	DO	40			7	
		4	DO	90	2		7	
		5	DO	50/15	3		6	
281.9		6	DO	50/15	4		7	
4.8	**END OF BOREHOLE**				5			
	Installed 50 mm Ø monitoring well to 4.6 m completed with 1.5 m screen Sand backfill from 2.5 m to 4.6 m Bentonite seal from 0.0 m to 2.5 m Provided with a flush mount casing				6			Dry on Apr 18, 2024 Dry on May 12, 2024
					7			
					8			

Soil Engineers Ltd.

JOB NO.: 2402-W095

LOG OF BOREHOLE:BH/MW 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Car Wash Facility

METHOD OF BORING: Soild Stem Augers

PROJECT LOCATION: 545 and 547 Bayfield Street, City of Barrie

DRILLING DATE: March 15, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
286.3	Pavement Surface							
0.0	**51 mm ASPHALT** **100 mm GRANULAR FILL**				0			
	EARTH FILL Dark brown, sandy silt with gravel	1	DO	12			13	
		2	DO	5	1		13	
284.8								
1.4		3	DO	64			8	
	Brown, very dense **SILTY SAND TILL** traces of clay and gravel occ. cobbles and boulders	4	DO	50/15	2		8	
		5	DO	50/15	3		7	
281.6		6	DO	50/15			7	
4.8	**END OF BOREHOLE**				4			
	Installed 50 mm Ø monitoring well to 4.6 m completed with 1.5 m screen Sand backfill from 2.5 m to 4.6 m Bentonite seal from 0.0 m to 2.5 m Provided with a flush mount casing				5			
					6			
					7			
					8			

Dry on Apr 18, 2024
Dry on May 12, 2024

Soil Engineers Ltd.

Soil Engineers Ltd. GRAIN SIZE DISTRIBUTION

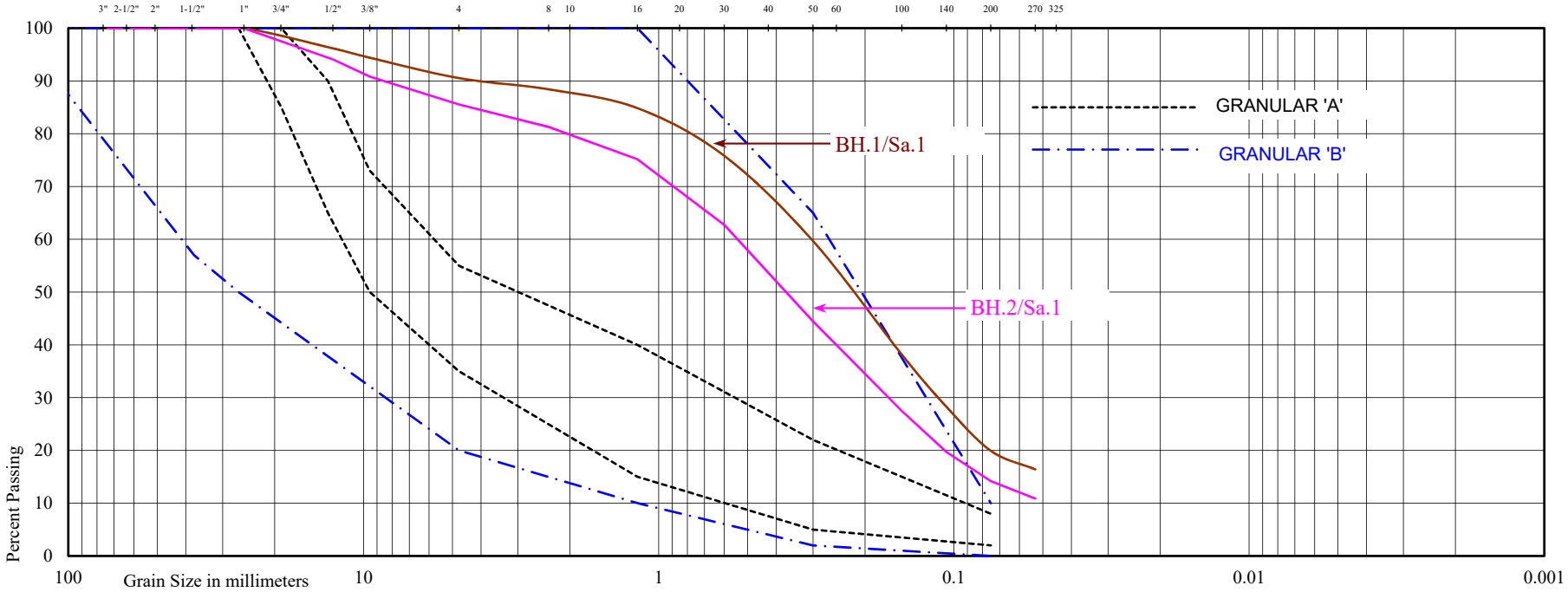
Reference No: 2402-S095

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Car Wash Facility

Location: 545 and 547 Bayfield Street, City of Barrie

Borehole No:	1	2
Sample No:	1	1
Depth (m):	0.2	0.2
Elevation (m):	286.5	286.2

BH./Sa.	1/1	2/1
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	14	13
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}

Classification of Sample [& Group Symbol]: GRANULAR FILL

Figure: 3

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

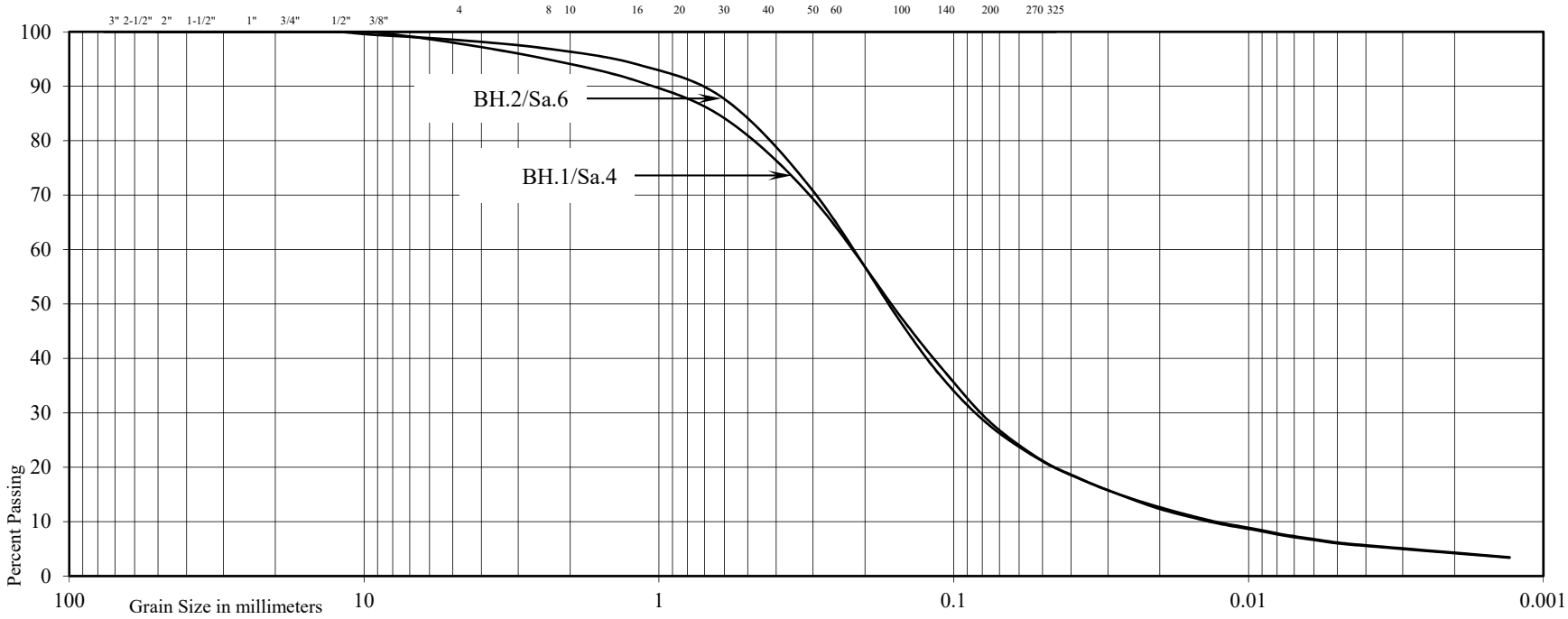
Reference No: 2402-S095

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Car Wash Facility

Location: 545 and 547 Bayfield Street, City of Barrie

Borehole No:	1	2
Sample No:	4	6
Depth (m):	2.3	4.6
Elevation (m):	284.3	281.7

BH./Sa.	1/4	2/6
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	7	7
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-4}

Classification of Sample [& Group Symbol]: SILTY SAND TILL, traces of clay and gravel

Figure: 4

Soil Engineers Ltd.
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GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

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APPENDIX ‘B’

MECP WATER WELL RECORDS

REFERNCE NO. 2402-W095

MECP Well Records Summary

WELL ID	MECP* WWR ID	Construction Method	Well Depth (m)**	Well Usage		Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**	Date Completed
				Final Status	First Use				
1	5704714	Cable Tool	36.6	Water Supply	Livestock	15.5	34.1	36.6	1959-08-30
2	5704715	Cable Tool	71.3	Water Supply	Commercial	53.0	70.4	71.3	1964-10-18
3	5704717	Cable Tool	29.3	Water Supply	Domestic	21.6	-	-	1958-10-14
4	5704718	Cable Tool	29.3	Water Supply	Domestic	10.1	27.4	29.3	1959-01-29
5	5704754	Cable Tool	28.3	Water Supply	Commercial	19.8	25.9	26.8	1960-05-10
6	5704755	Cable Tool	33.5	Water Supply	Commercial	21.0	-	-	1956-08-18
7	5704756	Cable Tool	29.6	Water Supply	Domestic	19.2	27.4	29.6	1954-07-18
8	5704759	Cable Tool	86.6	Abandoned-Supply	-	-	-	-	1967-09-07
9	5704760	Cable Tool	88.4	Water Supply	Domestic	53.3	80.8	88.4	1967-10-04
10	5705559	Cable Tool	36.0	Water Supply	Domestic	22.9	35.1	36.0	1968-10-28
11	5706175	Cable Tool	37.2	Water Supply	Domestic	23.8	35.7	36.6	1969-02-01
12	5705957	Cable Tool	29.3	Water Supply	Domestic	17.4	28.0	29.3	1968-03-20
13	5707313	Rotary (Convent.)	133.5	Water Supply	Commercial	54.6	85.3	91.4	1970-06-26
14	5707083	Cable Tool	33.5	Water Supply	Domestic	23.8	31.7	32.6	1970-01-23
15	5708457	Rotary (Convent.)	74.7	Water Supply	Commercial	21.9	55.2	56.4	1971-08-18
16	5708656	Cable Tool	35.7	Water Supply	Domestic	27.1	34.7	35.7	1971-11-02
17	5708779	Rotary (Convent.)	162.2	Test Hole	-	-	-	-	1972-04-27
18	5709258	Rotary (Convent.)	97.5	Water Supply	Commercial	51.2	85.6	86.9	1972-08-10
19	5709390	Cable Tool	41.1	Water Supply	Commercial	20.1	32.0	37.8	1972-10-24
20	5709912	Cable Tool	32.0	Water Supply	Commercial	23.5	29.6	30.8	1973-04-16
21	5710069	Rotary (Convent.)	74.7	Water Supply	Commercial	24.1	50.3	52.7	1973-07-30
22	5711655	Cable Tool	37.2	Water Supply	Domestic	25.0	36.3	37.2	1974-09-23
23	5711883	Rotary (Convent.)	86.3	Water Supply	Commercial	49.7	78.6	80.2	1974-09-19
24	5716864	Cable Tool	36.6	Water Supply	Commercial	22.9	32.6	34.1	1980-01-28
25	5717968	Rotary (Convent.)	43.0	Water Supply	Domestic	22.6	41.1	42.4	1981-09-28
26	5727813	Rotary (Convent.)	70.1	Water Supply	Domestic	12.5	31.4	33.8	1990-06-22
27	5739660	Other Method	-	Abandoned-Other	-	-	-	-	2005-04-20
28	5740465	Rotary (Convent.)	33.5	Water Supply	Domestic	21.6	32.3	33.5	2005-12-21
29	5740562	-	36.6	Abandoned-Other	-	-	-	-	2006-02-07
30	5740877	-	-	Abandoned-Other	-	-	-	-	2006-04-19
31	7100140	-	-	Abandoned-Other	-	-	-	-	2007-12-04
32	7135764	-	-	Abandoned-Supply	-	-	-	-	2009-11-02
33	7143516	-	-	Abandoned-Other	-	21.9	19.8	22.9	2009-12-16
34	7143516	-	-	Abandoned-Other	-	21.9	19.8	22.9	2009-12-16
35	7143516	-	-	Abandoned-Other	-	21.9	19.8	22.9	2009-12-16
36	7143516	-	-	Abandoned-Other	-	21.9	19.8	22.9	2009-12-16
37	7174843	-	-	Abandoned-Other	-	-	-	-	2011-08-18
38	7174886	-	-	Abandoned-Other	-	-	-	-	2011-08-18
39	7174903	Rotary (Air)	29.9	Water Supply	Domestic	22.3	28.7	29.9	2011-10-29

WELL ID	MECP* WWR ID	Construction Method	Well Depth (m)**	Well Usage		Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**	Date Completed
				Final Status	First Use				
40	7174908	Rotary (Air)	23.5	Observation Wells	Monitoring	-	8.2	23.5	2011-11-09
41	7203417	Rotary (Convent.)	90.0	Observation Wells	Monitoring	-	24.4	27.4	2012-05-18
42	7232580	-	-	-	-	-	-	-	2014-11-10
43	7264531	Rotary (Convent.)	35.1	Water Supply	Public	23.1	30.8	32.0	2016-03-09
44	7298723	-	-	-	-	-	-	-	2017-10-19
45	7310869	-	-	-	-	-	-	-	2018-01-18

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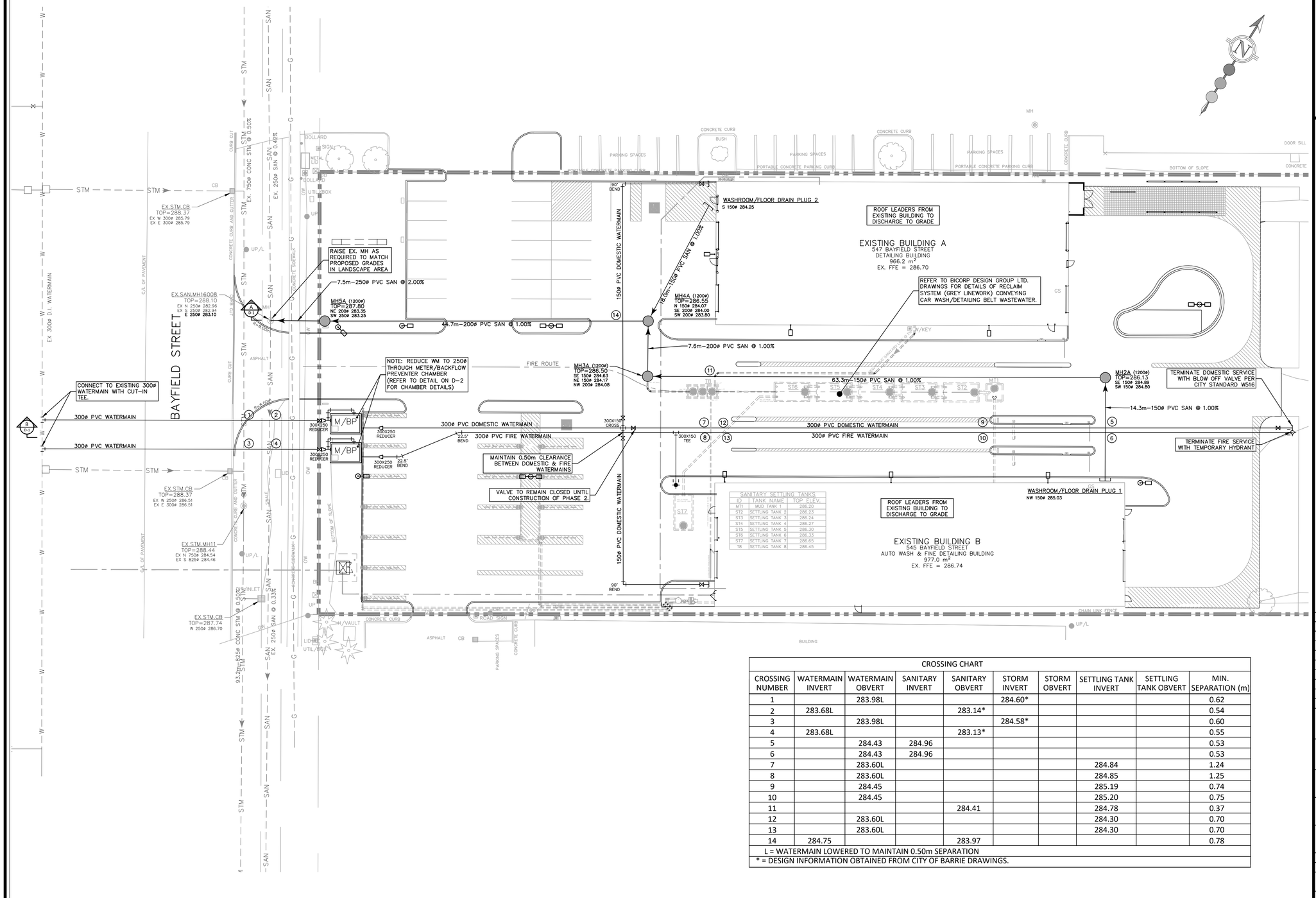
APPENDIX 'C'

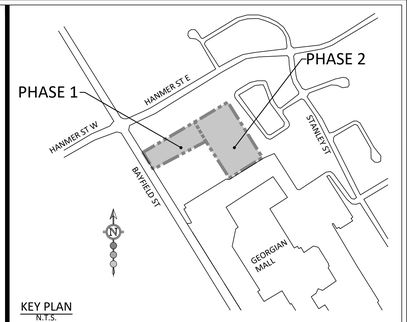
REVIEWED PLANS

REFERNCE NO. 2402-W095



CROSSING CHART									
CROSSING NUMBER	WATERMAIN INVERT	WATERMAIN OBVERT	SANITARY INVERT	SANITARY OBVERT	STORM INVERT	STORM OBVERT	SETTLING TANK INVERT	SETTLING TANK OBVERT	MIN. SEPARATION (m)
1		283.98L			284.60*				0.62
2	283.68L			283.14*					0.54
3		283.98L			284.58*				0.60
4	283.68L			283.13*					0.55
5		284.43	284.96						0.53
6		284.43	284.96						0.53
7		283.60L					284.84		1.24
8		283.60L					284.85		1.25
9		284.45					285.19		0.74
10		284.45					285.20		0.75
11				284.41			284.78		0.37
12		283.60L					284.30		0.70
13		283.60L					284.30		0.70
14	284.75			283.97					0.78

L = WATERMAIN LOWERED TO MAINTAIN 0.50m SEPARATION
* = DESIGN INFORMATION OBTAINED FROM CITY OF BARRIE DRAWINGS.



KEY PLAN
N.T.S.

BENCHMARK: 03120080033 ELEV. 277.889

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY CONTROL No. 03120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES (CGVD28: 78)

LEGEND:

- LIMIT OF PROPERTY
- PROPOSED SANITARY SEWER AND MAINTENANCE HOLE
- PROPOSED WATERMAIN & VALVE
- PROPOSED HYDRANT
- STM — EXISTING STORM SEWER
- SAN — EXISTING SANITARY SEWER
- W — EXISTING WATERMAIN
- G — EXISTING GAS MAIN
- BB — EXISTING BELL BOX
- CB — EXISTING CATCH BASIN
- MH — EXISTING MANHOLE
- WV — EXISTING WATER VALVE
- GM — EXISTING GAS METER
- HM — EXISTING HYDRO METER
- W/KEY — EXISTING WATER KEY
- UP — EXISTING UTILITY POLE
- FH — EXISTING FIRE HYDRANT
- GUY — EXISTING GUY WIRE/POLE
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE

TOPOGRAPHIC SURVEY PROVIDED BY SCHAEFFER DZALDOV PURCELL LTD., OCTOBER 2023

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR SITE PLAN APPLICATION	MAY.10/24	P.C.	

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

CITY OF BARRIE
70 COLLIER STREET
BARRIE, ONTARIO L4M 4T5
TEL: (705) 726-4242
FAX: (705) 739-4237

547 BAYFIELD INC.

547 BAYFIELD STREET - KLASSIC CAR WASH & DETAILING CENTRE

SERVICING PLAN - PHASE 1

DATE:	MAY 2024	DESIGNED BY: D.S.	CHECKED BY: P.C.
SCALE:	1:250	DRAWN BY: D.S.	CHECKED BY: P.G.

1 0 5 10 15 20

PROJECT No: 2700

DRAWING No: S-1

INFORMATION TAKEN FROM:
PLAN OF SURVEY OF
PART OF LOTS 18
CONCESSION 4
[FORMERLY THE TOWNSHIP OF VESPRA COUNTY OF SIMCOE]
CITY OF BARRIE
COUNTY OF SIMCOE

MARSHALL MACKLIN MONAGHAN ONTARIO LIMITED
O.S.L. 2006

REG' D. PLAN 51R-35109

AREA OF UPDATE

Toys "R" Us BUILDING

KEY PLAN
NOT TO SCALE

BAYFIELD ROAD

PART 1, PLAN 51R-35109

PIN 58928 - 0138
[SUBJECT TO A RIGHT AS IN INST. No. RO426419]

SITE PLAN
SCALE: 1:200

1
A1

10	-	-	7	-	-	4	-	-	1	01-15-2023	UPDATED SITE PLAN
11	-	-	8	-	-	5	-	-	2	01-30-2023	UPDATED RECLAIM TANKS + PIPING
12	-	-	9	-	-	6	-	-	3	04-25-2024	UPDATED RECLAIM TANKS + PIPING

REVISIONS

THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING AND VERIFING ALL DIMENSIONS INCLUDING DATUM ELEVATIONS SHOWN ON ARCHITECTURAL DRAWINGS WITH STRUCTURAL, MECHANICAL, ELECTRICAL AND SITE SERVICE DRAWINGS AND REPORT ANY ERRORS OR OMMISSIONS TO BICORP DESIGN GROUP LTD. [B.D.G.] BEFORE COMMENCING THE WORK.

ALL WORK MUST CONFORM TO THE LATEST LOCAL BUILDING CODE, LOCAL RULES AND REGULATIONS OF LOCAL CODES AND AUTHORITIES HAVING JURISDICTION.

DRAWINGS MUST NOT BE SCALED

BICORP DESIGN GROUP LTD.
1235 FAIRVIEW STREET, SUITE 290, BURLINGTON, ONTARIO L7S 2K9
TEL: 416-705-9526
bicorpdesign@gmail.com

KLASSIC CAR WASH
BARRIE ONTARIO

PROJECT: KLASSIC CAR WASH - DETAILING CENTRE
547 BAYFIELD STREET
BARRIE, ONTARIO

TITLE: SITE PLAN

DRAWN BY: | CHECKED BY: | APPROVED BY:
SCALE: 1:200 | DATE: JUNE 2022 | PRINTED: 10-16-2022

BLOCK: 1 | AREA:

DRAWING NO: A1

PROJECT NO: