FUNCTIONAL SERVICING REPORT

PROPOSED RESIDENTIAL DEVELOPMENT AT 7085 GOREWAY DRIVE

PRESTON HOMES
REDWOOD PROPERTIES INC.

CITY OF MISSISSAUGA
Project: 2020-4866 **March 2023**

Revision	Description	Prepared		Checked	
		By:	**Date:**	**By:**	**Date:**
2.	Updated as per City Comments	I. Chandan H. Milukow	March 2023	K. Shahbikian	March 2023
1.	Revised as per updated site plan and City Comment	G. Volpe	May 2022	K. Shahbikian	May 2022
0.	Original Report	D. Tabuas	May 2020	H. Sarkissian	May 2020

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1.0 INTRODUCTION

1.1 Objective

This Functional Servicing Report is provided in support of the proposed residential development located at 7085 Goreway Drive in the City of Mississauga and prepared at the request of Preston Homes, in association with Redwood Properties Inc. The property is legally defined as Part of Lot 11, Concession 8, east of Hurontario Street, City of Mississauga, Regional Municipality of Peel.

The property is 0.99ha and is bound on the north by an existing fire station and residential properties, on the east at south by a Mimico Creek, and on the west by Goreway Drive, as shown in **Figure 1**.

This report evaluates the existing and proposed water supply, sanitary, and stormwater management services within and surrounding the subject property, thereby demonstrating the viability of the proposed development, and guiding its detailed design.

1.2 Existing Conditions/Site Constraints

Presently there is an existing commercial property adjacent to Goreway Drive with an associated parking area in the rear. Available topography indicates a variance in elevation of about 2m. The peak elevation is just above 166.0m at the northwest portion of the site, in the parking lot. The lowest point has an elevation just under 164.0m at the southeast portion of the site adjacent to the Creek. This suggests that the site drains to the southeast.

The surrounding properties are well developed with existing commercial along the eastern side of Goreway Drive, and existing single detached homes in the adjacent subdivision north of the site. Utility services exist off of Goreway Drive.

A Flood Hazard Assessment was conducted by Greck and Associates Limited (Greck), dated August 2019, which determined that there will be no negative impact to the flood hazard due to the proposed development. Since their original assessment, their findings have been updated as of May 2022. The results of their updated assessment have been considered in this report.

REDWOOD ON GOREWAY
7085 GOREWAY DRIVE

LEGEND

SUBJECT AREA

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FIGURE 1-1
LOCATION PLAN

2019-4866	MARCH 2023	SCALE: N.T.S.

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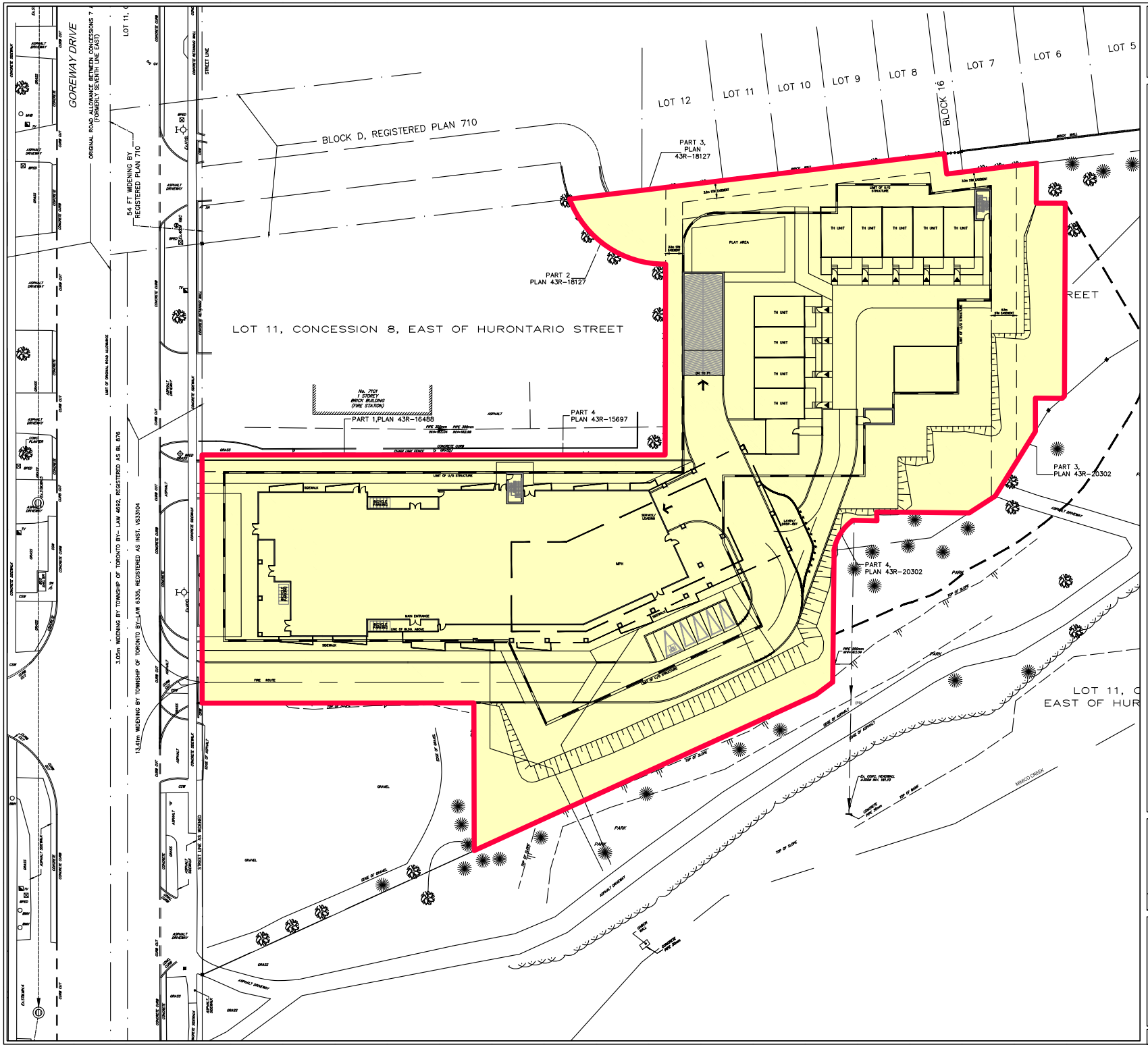

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FIGURE 1-2
DEVELOPMENT PLAN

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1.3 Proposed Development Plan and Population

The subject site has an area of 0.99ha and is proposed to consist of two (2) high-rise condominium; an 18-storey west tower and a 16-storey east tower, with shared 2-storey podium, as well as twelve (12) 2-storey townhouse units to be located at the rear of the property, all sharing 3 levels of underground parking. The site plan and associated site stats, prepared by IBI Group, have been included in **Appendix A** for reference.

The Region of Peel guidelines for sanitary sewer and water supply design recommends a population density of the greater between 475 persons/hectare for high-density residential land-use, or 2.7 people per residential unit, and a population density of 175 persons/hectare for row dwellings. Based on this criteria, the subject site's design population is **569 persons** (based on the more conservative 2.7ppu) as shown in **Table 1.1.**

Table 1.1: Estimated Population Summary

Land Use	Criteria	Qty	Population
1-bedroom	2.7 p.p.u.	72 units	194
2-bedroom	2.7 p.p.u.	84 units	227
3-bedroom	2.7 p.p.u.	32 units	86
Total Highrise based on Units	-	-	**507**
Residential Highrise based on Area	475 person/ha	0.64 ha	304
Total Townhouses based on Units	2.7 p.p.u.	20 units	54
Residential Townhouses based on Area	175 person/ha	0.35 ha	**62***
Design Total	-	-	**569**

Based on the proposed site plan, the high-rise portion of the development encompasses approximately 0.64 ha which includes the existing commercial building area as well as the proposed underground ramp, and the town house units encompass the remaining area at the very rear of the property, approximately 0.35 ha as shown on the site plan.

2.0 WATER SUPPLY

2.1 Existing Water Supply Services

The subject property is located within the South Peel Water Supply System Pressure Zone 4. Zone 4 is serviced by the Hanlan Reservoir and Pumping Station. Based on information received from the Region of Peel, the following watermains exist in the vicinity of the site:

- a 400mm diameter concrete watermain along the east side of Goreway Drive;
- a 150mm diameter PVC watermain along the west side of Goreway Drive;

There is an existing hydrant adjacent to the subject site. Existing water supply infrastructure can be seen schematically on **Figure 2**.

2.2 Design Criteria

The proposed water supply scheme will be designed in accordance with the Region of Peel design criteria for water systems. The following summarizes typical residential-use design criteria.

- The system shall be designed to provide sufficient flow and pressure to meet the greater of the Maximum Daily Demand Plus Fire Flow or the Maximum Hourly Demand;
- Average Daily Demand of 0.280 m^3/capita/day for residential areas;
- Maximum Daily Demand and Peak Hourly Demand factors shall be 2.0 and 3.0, respectively;
- Minimum watermain size of 300mm for residential areas;
- Operating pressure requirements are noted as follows:

Description	Pressure
Minimum Pressure	275 kPa (40 psi)
Maximum Pressure	690 kPa (100 psi)

- The dead ends shall be minimized by looping all watermains.
- Fire Flows in accordance with Water Supply for Public Fire Protection Survey;

2.3 Proposed Water Supply

One 200mm fire connection and one 150mm domestic water service connection are proposed to service the subject site. It is proposed that the subject site be serviced via connection to the existing 400mm watermain along the east side of Goreway Drive. A preliminary servicing scheme is illustrated in **Figure 2-1**.

Based on the Region of Peel's design criteria for water supply, the population of the site is 569 persons (as shown in **Table 1.1**: Estimated Population Summary). **Table 2-1** summarizes the estimated potable water demand.

Table 2.1: Summary of Estimated Potable Water Demand

Land Use	Population	Average Daily Demand (L/s)[1]	Maximum Daily Demand (L/s)[2]	Peak Hour Demand (L/s)[3]
Residential (High-Rise)	507	1.64	3.29	4.93
Residential (Townhouse)	62	0.20	0.28	0.60

1. Based on 0.280 m^3/capita/day
2. Based on a Max Day Factor of 2.0
3. Based on a Peak Hour Factor of 3.0

The fire flow demand for the high-rise building was calculated assuming the building will be fire-resistive construction, and that the vertical openings and exterior vertical communications are properly protected (one-hour rating). In addition, the fire flow demand for the townhouse units was calculated, considering non-combustible construction and sprinkler-free. A maximum fire flow of 7,000L/min, or 117L/s, has been calculated using FUS for the towns, which governs. Supporting calculations can be found in **Appendix B** for both the high-rise and townhomes.

It is anticipated that sufficient capacity and pressure will be available to service the proposed development. At the time of writing hydrant testing has not been available for the site due to weather conditions. Hydrant testing should be conducted, when weather conditions permit, to verify the adequacy of the water supply service.

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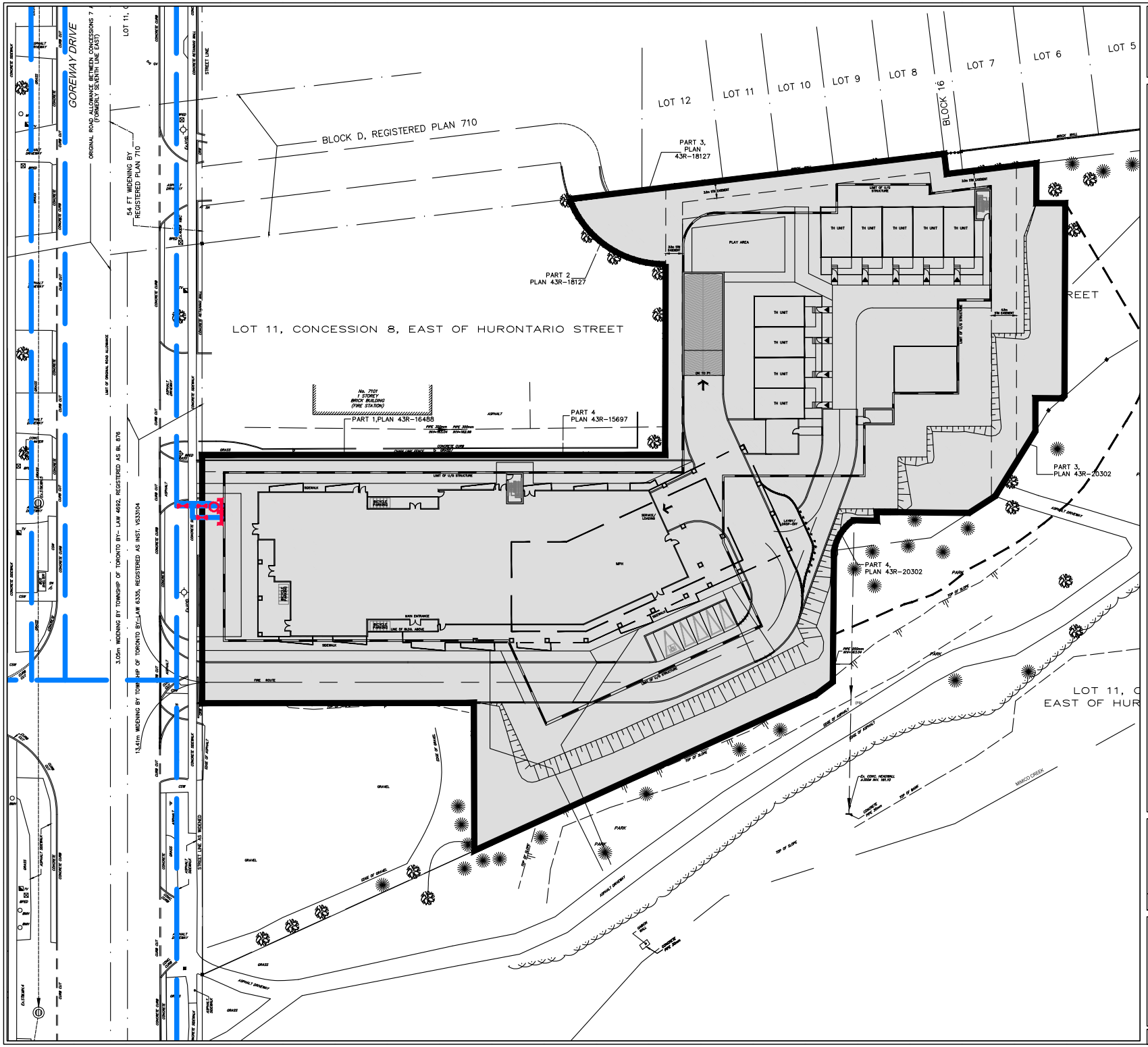

REDWOOD ON GOREWAY
7085 GOREWAY DRIVE

LEGEND

SUBJECT AREA

PROPOSED WATERMAIN

EXISTING WATERMAIN

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FIGURE 2-1
WATER SUPPLY SERVICING PLAN

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3.0 SANITARY SERVICING

3.1 Existing Sanitary Infrastructure

Based on information received from the Region of Peel, there is an existing 250mmØ sanitary sewer on the west side of Goreway Drive, which drains west on Dorcas Street and then south on Minotola Avenue. As the subject site is 0.99 ha, based on the Region's 50 persons per hectare population equivalency, we can expect that the site's existing design population to be approximately 50 persons.

3.2 Design Criteria

The proposed sanitary servicing of the subject site will be designed in accordance with the Region of Peel's "Public Works Design, Specifications and Procedures Manual". These criteria, where applicable to the proposed development, are summarized below.

- The design flow is equal to the Average Dry Weather Flow multiplied by the Average Peak Sanitary Flow Factor, plus the Infiltration Allowance;
- The Average Dry Weather Flow is based on 302.8 L/capita/day;
- If the population is less than 1000 persons, the domestic sewage flow shall be 13L/s plus the infiltration allowance;
- For residential areas, the peak sanitary flow factor is based on the Harmon formula ($M = 1 + 14/(4 + P^{0.5})$, where P is population in thousands;
- Except under unusual circumstances, infiltration allowance shall be determined at 0.2×10^{-3} $m^3/s/ha$ for all types of land use;
- Determination of pipe sizes and capacities to be based on Region of Peel standard drawing SD-2-9-3 or use Manning's Formula;

3.3 Proposed Sanitary Servicing

The subject development is proposed to be serviced via connection to the existing 250mm sewer along Goreway Drive (**Figure 2**).

A preliminary assessment of the anticipated design flow rates has been conducted in accordance with Region of Peel design criteria. With an estimated population of 569 persons, the expected design flow is **13.20 L/s** as according to the Region of Peel standard drawing 2-9-2, the domestic sewage flow for populations less than 1000 persons, shall be $0.013m^3/s$ plus the infiltration

allowance. **Table 3.1** summarizes the estimated sanitary flow demands, and supporting calculations can be found in **Appendix C**.

Table 3.1: Summary of Estimated Sanitary Flows

Land Use	Area (ha)	Expected Population [1]	Average Sewage Flow [2] (L/s)	Infiltration Inflow [3] (L/s)	Estimated Total Flow (L/s)
Residential (High-Rise)	0.64	507	1.80	0.13	9.93
Residential (Townhouse)	0.35	62	0.22	0.07	1.00
Total	**0.99**	**569**	**13.00**	**0.20**	**13.20**

[1] From Table 1.1
[2] According to the Region of Peel STD.DWG.2-9-2
[3] Infiltration rate of 0.2 L/s/ha (Region of Peel Design Criteria)

Based on the information received from the Region, the existing sanitary sewer estimated a population of 156 for 2.8 ha (6.9 acres) for an area which appears to only include the west side of Goreway Drive. As such, the downstream sanitary calculations which are included in **Appendix C** have added the east side of Goreway Drive, and analyzed the downstream sewers down to Minotola Avenue. The design sheets indicate sufficient capacity to convey the increased flows for the redevelopment. It should be noted that the sanitary design sheet provided by the Region of Peel (for Pastoria Holdings) included in **Appendix C** denotes mention of a 30" dia. trunk sewer, the location of which has not been provided based on the records obtained from the Region.

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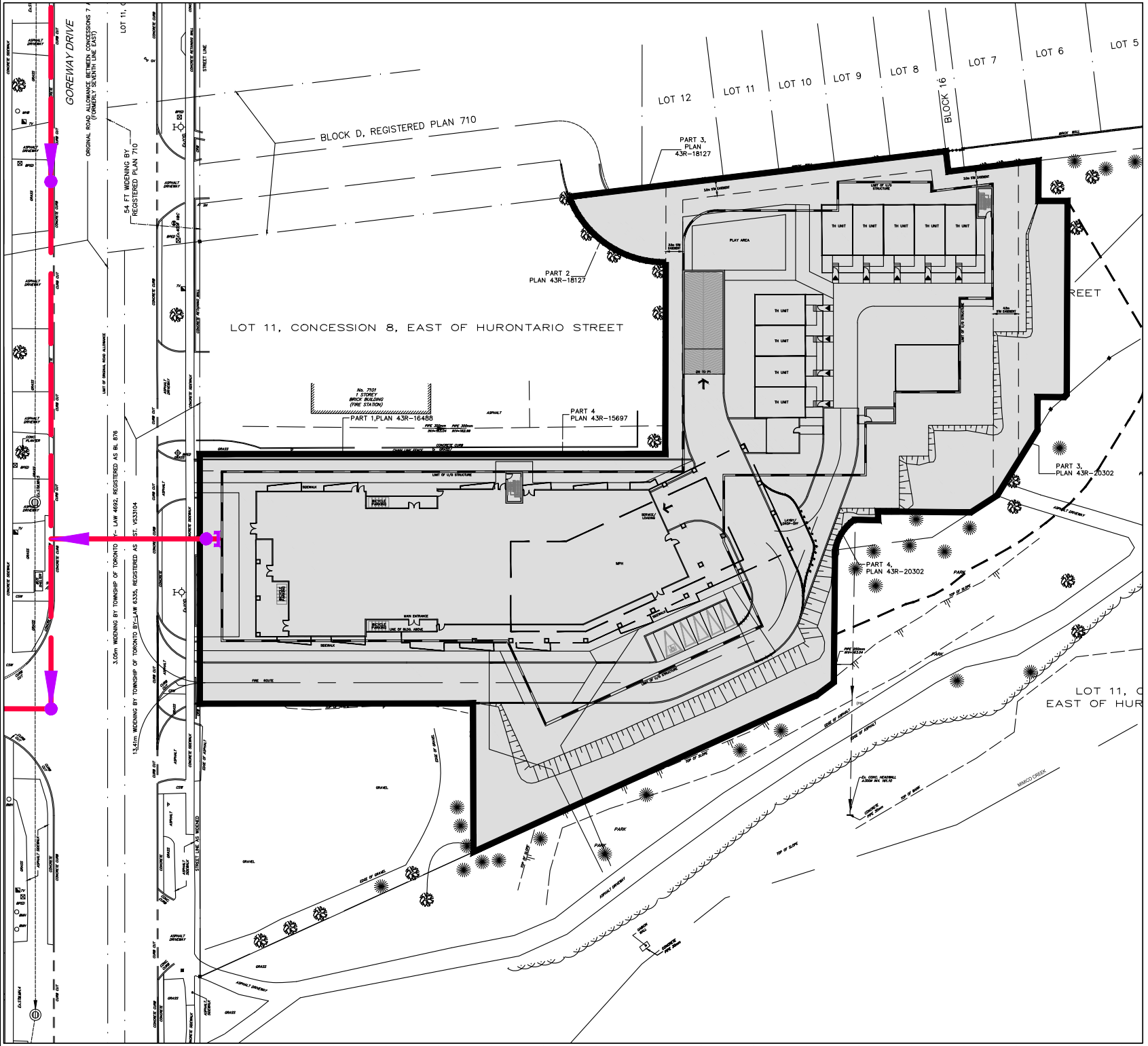

REDWOOD ON GOREWAY
7085 GOREWAY DRIVE

LEGEND

- SUBJECT AREA
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER

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FIGURE 3-1
SANITARY SERVICING PLAN

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4.0 STORM DRAINAGE

4.1 Existing Site Conditions and Servicing

As previously noted, the subject site currently consists of a commercial building and a large parking lot area, that appears to have been constructed during the years of 1980/1985 based on aerial photography per the City of Mississauga's Online Mapping Service. According to information provided by the City and Region, there is an **existing 450/525mmØ storm sewer** located on Goreway Drive, to the west of the subject site. Site investigations and the topographic survey indicate that the exiting site's flows are captured via various on-site catchbasins and discharge to the East Branch of Mimico Creek, located immediately south of the subject site. This drainage scheme will be maintained in the post-development condition, as the subject site is proposed to drain into Mimico Creek, discharging via a proposed headwall.

The subject site has an area of **0.987 ha**. In order to establish the site's allowable release rate to the East Branch of Mimico Creek, only the area draining directly east to the creek was considered. Removing the small (**0.017ha**) piece at the existing site's northwest corner which is currently draining west to the adjacent 7125 Goreway retail parcel gives a net area of **0.970 ha** drains east in existing conditions.

Furthermore, the existing site is partially located within the regulatory flood line per the information provided by Greck & Associates Ltd., and as part of the site's development it is proposed to re-grade within the public lands to the east of the site, and predominantly within the property in order to allow for the redevelopment to proceed. The proposed regulatory floodplain has been provided by Greck & Associates Ltd. (refer to **Appendix D**) and shown on the preliminary engineering plans.

As part of the aforementioned re-grading, approximately **0.205ha** of the subject lands will drain overland directly towards Mimico Creek. As this area will drain uncontrolled, and will be covered in pervious landscape (i.e., C = 0.25) this proposed land cover is considered to be an improvement over the current site land use conditions, which are predominantly paved parking and roof area. By providing entirely pervious cover in the proposed condition for the uncontrolled area, this ensures that post-development flows remain less than the existing condition for all storm events over this area.

Considering the above areas, it is proposed to establish the target release rates of the site based on the remaining **0.765 ha** (i.e., 0.987ha – 0.017ha – 0.205ha = 0.765ha).

It should be noted that site investigations have revealed that the stormwater flows from 7101 Goreway Drive (the adjacent Fire Station) are also discharged to Mimico Creek by a sewer which currently cuts through the middle of the subject site via an easement. As part of this redevelopment proposal, and as indicated on the site servicing plan SS-1, it is proposed to redirect the sewer around the proposed development via a new easement to Mimico Creek. The re-routed storm sewers leaving the subject site are proposed at 161.64m which is below the regulatory floodplain elevation. As the existing storm sewer from 7101 Goreway is located under the floodplain elevation, it is not feasible to raise the sewer above the regulatory (or 100-year) flood plain level and will therefore mimics the existing conditions.

As indicated on the Site Servicing drawing (SS-1) included in **Appendix E**, the subject site's flows will be discharging via a proposed storm sewer towards Mimico Creek. The proposed regulatory and 100-yr flood lines provided by Greck & Associates Ltd. are at elevations of **165.06m** and **163.23m**, respectively. The storm system leaving the subject site is proposed at 163.55m, which is 0.32m higher than the 100-year flood line, to mitigate flooding risks. In order to further mitigate the effects of the regulatory flood line, backwater preventers will be considered during the detailed design stage.

4.2 Design Criteria

The stormwater flow calculations are based on the following the City of Mississauga design criteria:

- As the storm flows will discharge to the Mimico Creek, Post to Pre-development controls for all storm events are to be provided;
- The first 5mm of runoff shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use;
- Storm sewers shall be designed using Rational Formula; Q = 0.0028 CIA, where Q is the flow rate in m^3/s, C is the runoff coefficient (dimensionless), I is rainfall intensity in mm/hr and A is area in ha;
- Storm sewer design should be based on City of Mississauga Rainfall Intensity Curves and a minimum time of concentration of 15 min. $I = A/ (T + B)^C$, where I is rainfall intensity in mm/hr, T is time of Concentration in hours, A = 610, B = 4.6, C = 0.78 for the 2-year storm event;

- Runoff Coefficient:
    - Impervious surfaces 0.90
    - Sodded/Pervious/surfaces 0.25
    - Runoff Coefficients are to be adjusted per the City's Design Criteria, to account for increase in runoff due to saturation of the catchment surface that would occur for larger, less frequent storms.

4.3 Stormwater Management Plan

As noted above, it is proposed to have the subject site's stormwater discharge mimic the pre-development scenario of discharging to Mimico Creek. To ensure post-development discharge does not exceed the pre-development site discharge for each storm return period, on-site attenuation is proposed. On-site detention, required to meet the target release rates, shown in **Table 4.1**, will be provided via an underground detention storage tank provided in the underground parking levels. An orifice control structure will be provided at the downstream end of the tank, and will be appropriately sized to restrict the site's release to the aforementioned peak flow rates.

The proposed storm drainage area and stormwater management features are shown in **Figure 3**, and supporting calculations are included in **Appendix D**. The new on-site storm sewers, which will be located within the parking garage, will be designed by the site mechanical engineer to meet the standards of the Ontario Building Code.

4.4 Allowable Release Rate

All storm flows will be directed to the proposed stormwater management tank and controlled to an allowable release rate which will conform to the requirements noted above. The pre-development and post-development hydrologic conditions for the site were established using the City's IDF data, a recommended entry time of 15 minutes, and weighted runoff coefficients.

As mentioned in Section 4.1, the site's-controlled release rates will be established based on the existing site area draining to Mimico Creek. In the estimation of the allowable release rates, a weighted pre-development runoff coefficient was calculated reflecting the imperviousness of the existing site area, which consists of predominantly building roof and paved parking area (i.e., C = 0.90). As per the City's design criteria, the pre-development runoff coefficient shall be limited to a maximum 0.50, and therefore governs in this case. Using the rational method, the peak release

rate was calculated for the subject site. The calculations have been included in **Appendix D**, and results summarized below.

Table 4.1: Pre-Development Conditions

Return Period (years)	Runoff Coefficient (1)	Intensity (mm/hr)	Peak Flow (L/s)
2	0.50	59.89	**63.7**
5	0.50	80.51	85.6
10	0.50	99.17	105.5
25	0.55	113.89	133.2
50	0.60	127.13	162.2
100	0.63	140.69	187.0

(1) RC adjusted per City of Mississauga design criteria.

4.5 Water Quantity Control

Stormwater management for the proposed development will consist of on-site detention to attenuate the site's post-development flows to levels that are less than or equal to the maximum allowable release rates by utilizing detention storage tanks equipped with orifice control structures upstream of the quality control devices to control flows.

The Modified Rational Method was used to calculate the required storage volume for each storm event based upon the allowable release rate during the 2-year through 100-year storm events. The Maximum Allowable Release Rate from the site is noted in the table above. The determination of the site's required storage was calculated using an assumed runoff coefficient of **0.85** for post-development conditions, considering that the proposed site will be made up of predominately impervious roof, drive isles, and landscape, with local pervious landscape and planters. The appropriate design runoff coefficient will be confirmed at the detailed design stage. Calculation of the site storage requirements are included in **Appendix D**, and are summarized in **Table 4.2**.

In order to simplify the proposed stormwater management tank design, it is proposed to control all storm events to the existing 2-year peak flow estimated and provided in **Table 4.2**. Furthermore, it is expected that approximately **0.023ha** of area fronting Goreway Drive will drain uncontrolled from the site due to grading constraints. Based on the site runoff coefficient of 0.85, a 100-year peak flow of 3.3L/s is expected to be generated by this uncontrolled area. As a result, the effective allowable release rate from the tank is expected to be 60.40 L/s (i.e., 63.70 L/s –

3.30 L/s = 60.40 L/s).

Based on the uncontrolled area to Goreway Drive, the remaining **0.742ha** (i.e., 0.765ha – 0.023ha = 0.742ha) will be controlled via an underground detention storage tank. The expected storage for the tank design is summarized in the table below. Based on the results below, the site will be provided a minimum **239m^3** of detention storage.

Table 4.2: Site Storage Requirements

Control Area (ha)	Design Runoff Coefficient (1)	Time of Concentration (min.)	Orifice Control Structure	Uncontrolled Site Release Rate (L/s)	Tank Release Rate (L/s)	Required Storage (m^3)	Total Release from Site (L/s)
0.742	1.00	10	172mmØ Plate	3.30	60.40 L/s	228	63.70

(1) RC adjusted per City requirements, with max RC of 1.0

Furthermore, it should be noted that as a result of the downstream storm sewer's elevations, a pumped solution is required in order to facilitate drainage from the site. In the proposed SWM scheme, storm water will be pumped from the proposed detention storage tank up to a stabilization chamber at a rate equal to the prescribed tank release rate in **Table 4.2**. Flows which enter the stabilization chamber via a pump will be discharged out of the site via gravity through the proposed orifice structure, listed in **Table 4.2.**

In order to ensure the release rate from the tank orifice does not exceed the allowable release rate, an overflow weir will be provided within the stabilization chamber to regulate the water elevation over the proposed orifice structure such that it does not exceed the allowable release rate. In this way, any excess flows, which may occur in the case which the pump releases at a rate greater than the allowable controlled release rate, can be safely discharged over the overflow weir and back into the detention storage tank. Details of the proposed tank and requirements for the proposed pump design will be finalized at the detailed design stage. It is lastly noted that any proposed pumping system shall be designed by the site mechanical engineer.

4.6 Water Balance & Quality Control

The City's T&W Development Requirements a 5mm runoff reduction is required for on-site waterbalance and retention. As such, **39 m^3** (0.765 ha x 5mm x 10 = 39 m^3) based on the site's impervious area is required to be retained on-site and managed by way of infiltration, evapotranspiration or re-use. Clean water will be re-used on-site by non-potable means such

irrigation and/or in the mechanical cooling system for the development. Specific re-uses, as well as the detailed re-use volume, will be confirmed at the detailed design stage.

On-site quality controls to provide 'Enhanced' (Level 1) protection is proposed for the subject site to meet site quality requirements. In order to achieve this, a treatment unit will be sized to provide the long-term average removal of 80% of Total Suspended Solids (TSS) on an annual loading basis, for 90% of the average annual site runoff. A preliminary Jellyfish Unit Sizing by Imbrium has been sized to provide an enhanced level of treatment. The sizing has been provided in **Appendix D** for reference. The final unit to be used on-site will be confirmed at the detailed design stage.

4.7 Groundwater and Foundation Drainage

Hydrogeological calculations and analysis for the subject site was undertaken by Grounded Engineering and summarized in their Geohydrology Assessment, to assess the potential effects of groundwater on the proposed development. They have noted that preliminary estimates for the long-term dewatering total 130,000 l/day (1.5 l/sec). As such, the foundation drainage / groundwater may discharge to the storm outlet for the site, which is directed to Mimico Creek.

As per the hydro-geotechnical reports the unfiltered groundwater sample exceeds the limits for storm sewer discharge, however, the groundwater sample meets the limits for sanitary and combined sewer discharge. It is understood that if the groundwater will be discharged to the City's storm sewer, it must meet the City's satisfaction for both quantity (combined stormwater and groundwater releases not to exceed the allowable release rate) and quality requirements (per the City Storm Sewer By-Law). The groundwater flows will be reviewed in greater detail during the detailed design of the development, but given the approximate flows noted by the hydrogeologist, quantity-related issues are not expected on this site. Refer to the hydro-geotechnical reports provided in **Appendix A** for details. It is currently proposed to discharge the groundwater flows to Mimico creek, where quality control is provided by the proposed Jellyfish unit (proven or equivalent).

4.8 External Drainage and Pipe Considerations

As discussed, 7101 Goreway's existing fire station site currently drains through an existing easement to Mimico Creek through the subject site. In order to continue facilitating drainage from the site in post development conditions, design sheets have been provided in **Appendix D** in support of a proposed by-pass sewer to convey the flows through the site separately. It should be

noted that in general site drainage from the eastmost property line of the 7101 Goreway Fire Station, directly adjacent to the site, drains east to west. Along the westmost boundary of the site, catchbasins are present at low points which capture and convey flows through the existing storm sewer which passes through the subject site. As a result of this it is expected that no overland drainage is or will be tributary to the subject site in post development conditions. Furthermore the pipe sizing of the proposed by-pass sewer has been designed such that it considers the full capture of all storm events up to and including the 100-year storm event from the 7101 Goreway site will be tributary to the proposed by-pass sewer to Mimico Creek. Therefore, it is expected that the proposed by-pass sewer will have sufficient capacity to convey flows from the Fire Station in post-development conditions.

In addition to the Fire Station, consideration has been made for external drainage from the existing single-detached homes north of the proposed development. As per the existing lot grading plan provided in **Appendix A**, for the site to the north, it was determined that these lots drain from the backyards south easterly towards Mimico Creek. In order to maintain this existing drainage condition, it is proposed to provided a swale running west to east along the site property boundary to convey flows from the external lands to Mimico, as it does in existing conditions. It is noted that these swales are also considered to convey some flows from grassed areas within the subject site to the creek. These areas have been identified in **Figure 4-2**. The design of the proposed swale will be confirmed at the detailed design stage.

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Phil Gotfried

REDWOOD ON GOREWAY
7085 GOREWAY DRIVE

LEGEND

SUBJECT AREA

EXISTING DRAINAGE AREA
(EXISTING DESIGN MAX COEFFICIENT)

WEST DRAINING - UNDEVELOPED

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FIGURE 4-1
EXISTING DRAINAGE PLAN

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REDWOOD ON GOREWAY
7085 GOREWAY DRIVE

LEGEND

- SUBJECT AREA
- CONTROLLED DRAINAGE AREA
- UNCONTROLLED TO GOREWAY
- UNCONTROLLED TO CREEK
- WEST DRAINING - UNDEVELOPED

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FIGURE 4-2
PROPOSED DRAINAGE PLAN

2019-4866	MARCH 2023	SCALE: N.T.S.

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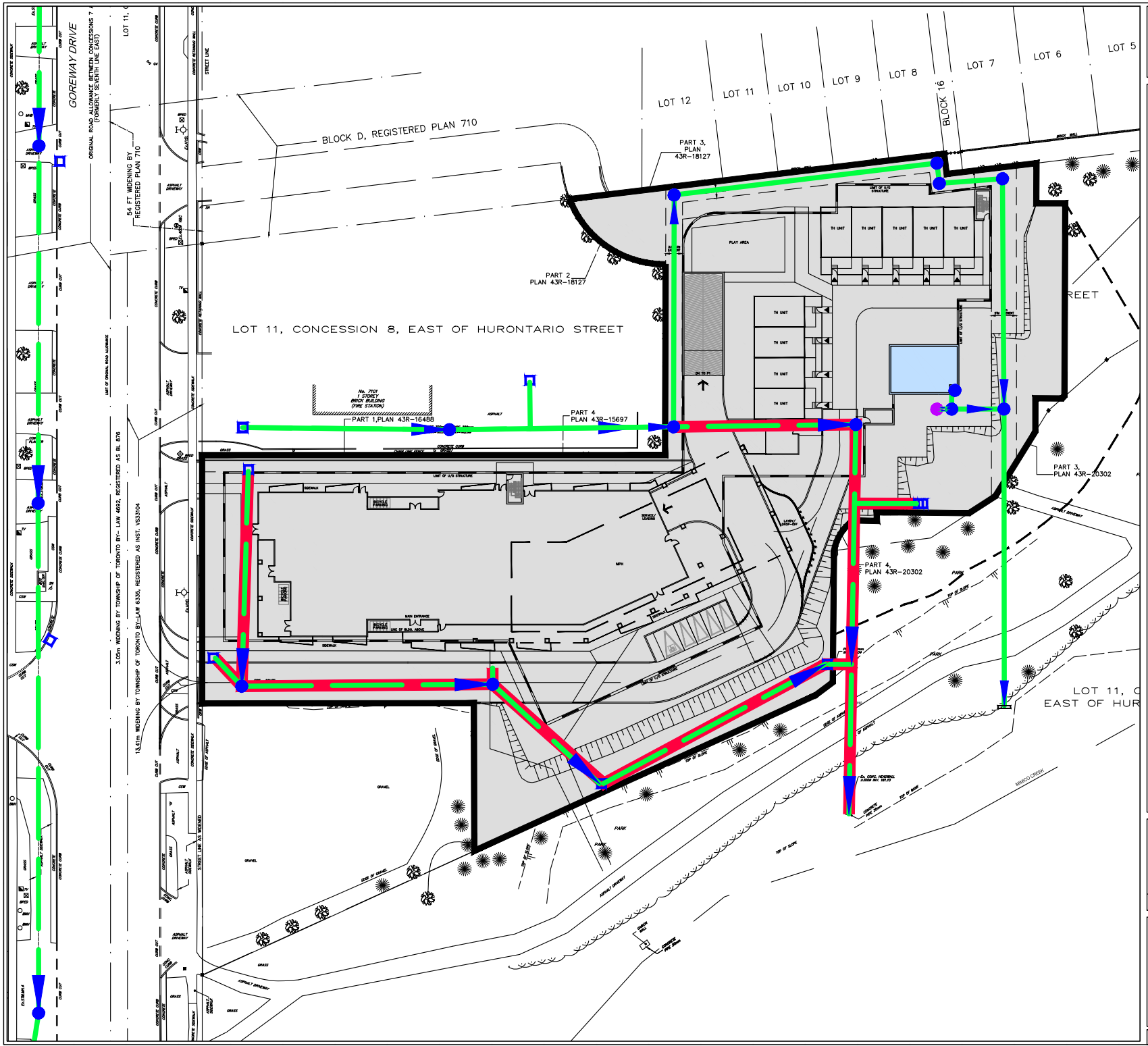

REDWOOD ON GOREWAY
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LEGEND

- SUBJECT AREA
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING STORM SEWER TO BE REMOVED
- PROPOSED SWM TANK
- FILTER UNIT

SCHAEFFERS
CONSULTING ENGINEERS
6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100 Email: general@schaeffers.com
www.schaeffers.com

FIGURE 4-3
STORM SERVICING PLAN

2019-4866	MARCH 2023	SCALE: N.T.S.

5.0 SUMMARY

This Functional Servicing Report provides an overview of the proposed servicing plan for the residential development located at 7085 Goreway Drive, within the City of Mississauga. This report demonstrates that adequate stormwater, sanitary, and water supply servicing will be available for the proposed development. In summary, the functional servicing analysis established the following:

Water Supply

- Water supply servicing will be provided from an existing 400 mm diameter watermain located along Goreway Drive.
- No servicing constraints are expected, and hydrant testing shall be conducted when weather conditions permit to verify the available pressure.

Sanitary Servicing

- The proposed developments will be serviced by the existing 250mm diameter sanitary sewer located along Goreway Drive.
- No constraints are expected on the downstream sanitary sewers as per the conducted sanitary analysis.

Stormwater Servicing

- Peak flows from the subject property will be controlled via on-site measures which include a storage tank within the underground parking, prior to discharging to Mimico Creek.
- 5mm retention will be provided via re-use, and on-site irrigation.
- Water quality control will be provided using an on-site filtration unit upstream of the site's control outlet.

We trust the above information is suitable for your needs at this time. Should you have any questions or comments, please do not hesitate to contact the undersigned.

Sincerely,

SCHAEFFER & ASSOCIATES LTD.

Ishraque Chandan, EIT.
Water Resources Analyst

Koryun Shahbikian, P.Eng.
Partner

Appendix A

Background Information

Project Statistics - 7085 Goreway Drive, Mississauga

2022-02-16

1.0 Site Area

	m2	ft2
Gross Lot Area	9,870	106,240

2.0 Density

F.S.I (Gross Floor Area / Gross Lot Area)	2.0

3.0 Building Area

* Excludes parking and loading areas within podium.

	Tower + 2 Storey Podium		Townhouses		Total	
	m2	ft2	m2	ft2	m2	ft2
Residential GFA	16,292	175,368	2,820	30,354	19,112	205,722

	m2	ft2
Commercial GFA	388	4,175

	m2	**ft2**
Total GFA	**19,500**	**209,897**

5.0 Building Height

* maximum height, excluding 6.0m mechanical penthouse.

	Tower + 2 Storey Podium		Townhouses		Podium Height	
	m	storeys	m	storeys	m	storeys
Residential	46.75	14	8.85	3	7.75	2

6.0 Unit Mix Summary

Unit Type	West Tower +2 Storey Podium		Townhouses		Total	
	No.	%	No.	%	No.	%
1 Bedroom	72	38.3%			72	35%
2 Bedroom	84	44.7%			84	40%
3 Bedroom	32	17.0%			32	15%
2 Bedroom Townhouse			20	100.0%	20	10%
Subtotal	188	100%	20	100%	208	100%

7.0 Parking

Resident Unit Type	Ratio	West Tower +2 Storey Podium	Townhouses	Total
1 Bedroom	1.00	72.0		72.0
2 Bedroom	1.15	96.6		96.6
2 Bed. Townhouses	1.15		23.0	23.0
3 Bedroom	1.40	44.8		44.8
Res. Pkg. Required		213	23	236
Vis. Pkg. Required	0.20	37.6	4	42
Comm. Pkg Required	1/18m2			22
Total Pkg. Required				300
Pkg. Provided (3 Levels of UG Parking)				371
Surplus (Deficit)				71

IBI GROUP
7th Floor-55 St. Clair Avenue West
Toronto ON M4V 2Y7 Canada
tel 416 596 1930 fax 416 596 0644
ibigroup.com

KEY PLAN

SUBMISSION

#	Date	By	Comment
4		DH	RE-ISSUED FOR OPA
3	2020.08.12	DH	ISSUED FOR OPA
2	2020.06.12	DH	ISSUED FOR OPA
1	2019.09.06	DH	ISSUED FOR DARC

True North Project North

SEAL :

ONTARIO ASSOCIATION OF ARCHITECTS DAVID WILLIAMS LICENCE 5941

PROJECT :

redwood PROPERTIES

REDWOOD ON GOREWAY

7085 Goreway Drive,
Mississauga, Ontario

TITLE : Statistics

DATE : 2022-02-02

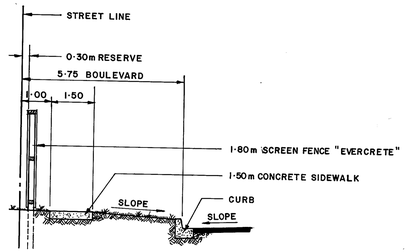
SCALE : N.T.S

DRAWN : SL/DV/EK

CHECKED : DH

PROJ. NO. 120212

A-001



SECTION 'B-B'

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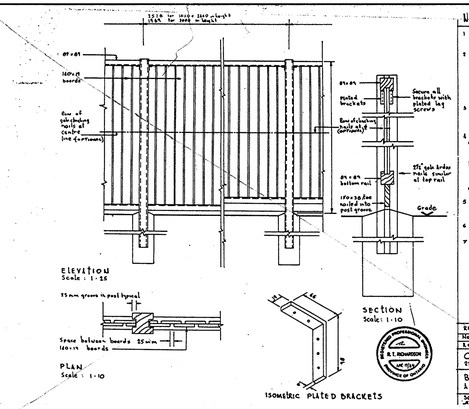
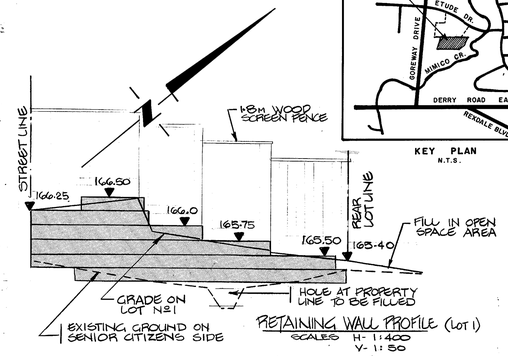
VERT. 1 : 50





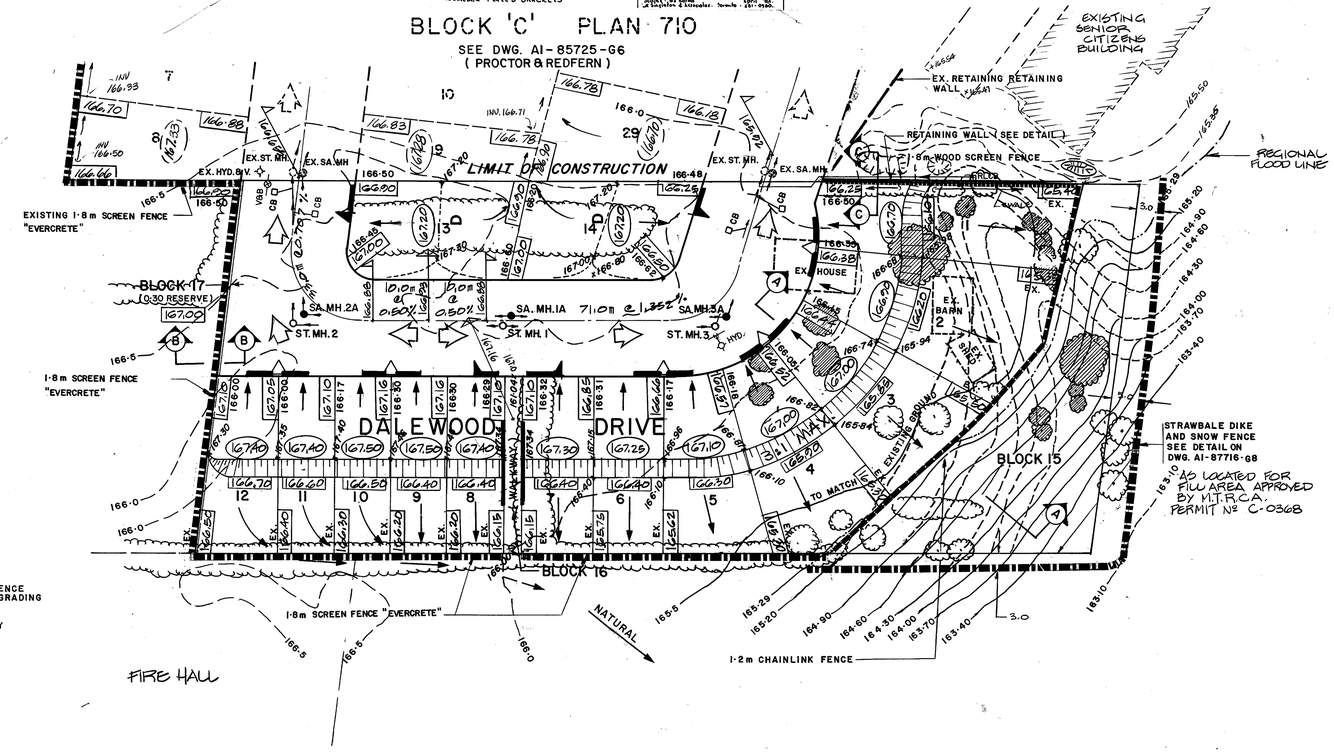
RETAINING WALL PROFILE (LOT 1)

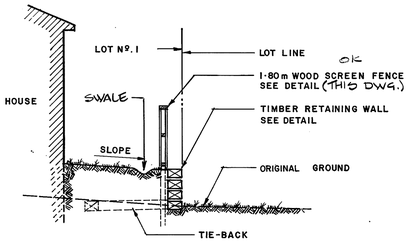
SCALES H- 1:400
V- 1:50

KEY PLAN
N.T.S.

BLOCK 'C' PLAN 710

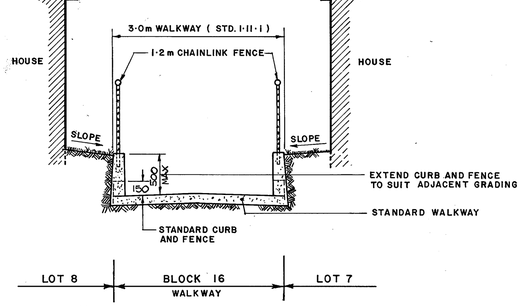
SEE DWG. AI-85725-66
(PROCTOR & REDFERN)





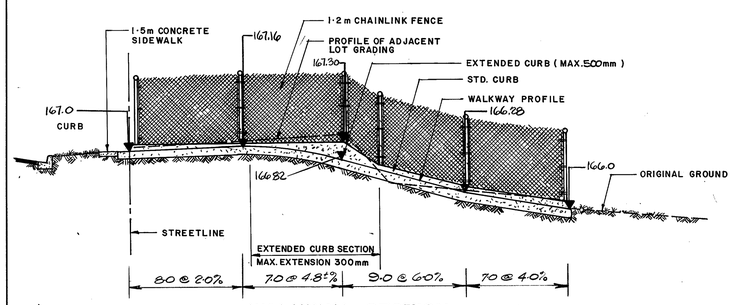
RETAINING-FENCE DETAIL SECTION 'C-C'

N.T.S.



WALKWAY SECTION DETAIL

SCALE 1 : 50



WALKWAY SECTION

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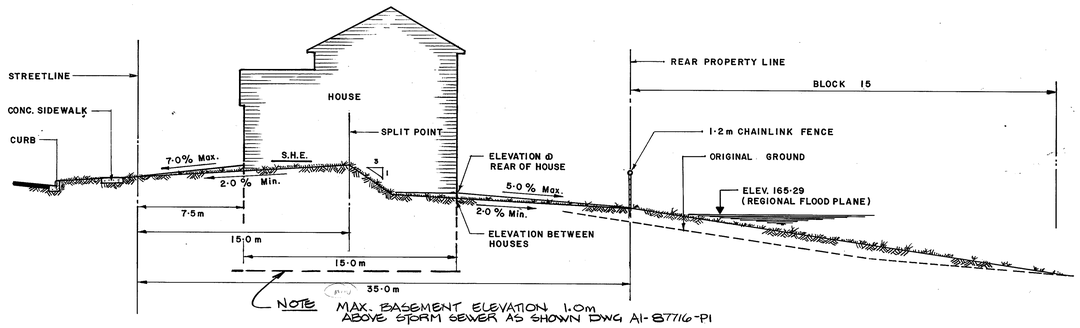
VERT. 1 : 50



SECTION THRU LOT 3 (Typical)

SCALE HOR. 1 : 200
VERT. 1 : 100

LEGEND

- 165·50 EXISTING ELEVATION
- 166.80 PROPOSED ELEVATION
- x 167.30 SPOT ELEVATION (PROPOSED)
- (167.10) SPECIFIED HOUSE ELEVATION
- DIRECTION OF FLOW
- OVERLAND FLOW DIRECTION
- D DRAINAGE TYPE
- RETAINING WALL
- DOUBLE SERVICE CONNECTION
- SINGLE SERVICE CONNECTION
- DRIVEWAY LOCATION
- CATCHBASIN
- HYDRANT
- VALVE & BOX
- 1·8m WOOD SCREEN FENCE (SEE DETAIL)
- 1·2m CHAINLINK FENCE
- EXISTING TREES TO BE REMOVED
- TREES TO BE RETAINED

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.
MAY, 1988	AS CONSTRUCTED	

GENERAL NOTES

- ALL DRIVEWAYS ASPHALT UNLESS OTHERWISE NOTED.
- ALL SERVICE LOCATIONS ARE APPROXIMATE AND MUST BE LOCATED ACCURATELY IN FIELD.
- ● DENOTES BUILDING – NOT LOCATED.
- ⊏ DENOTES BUILDING – LOCATED.
- T.T.B.M. No. ELEV.
- TEMP BENCH MARK ELEV. DESCRIPTION.

DESIGNED BY T.J.R. CHKD.

REGISTERED PROFESSIONAL ENGINEER G. T. COFFEY PROVINCE OF ONTARIO

APPROVED BY

Proctor & Redfern Limited
Consulting Engineers and Planners
Toronto

368569 ONTARIO LTD.

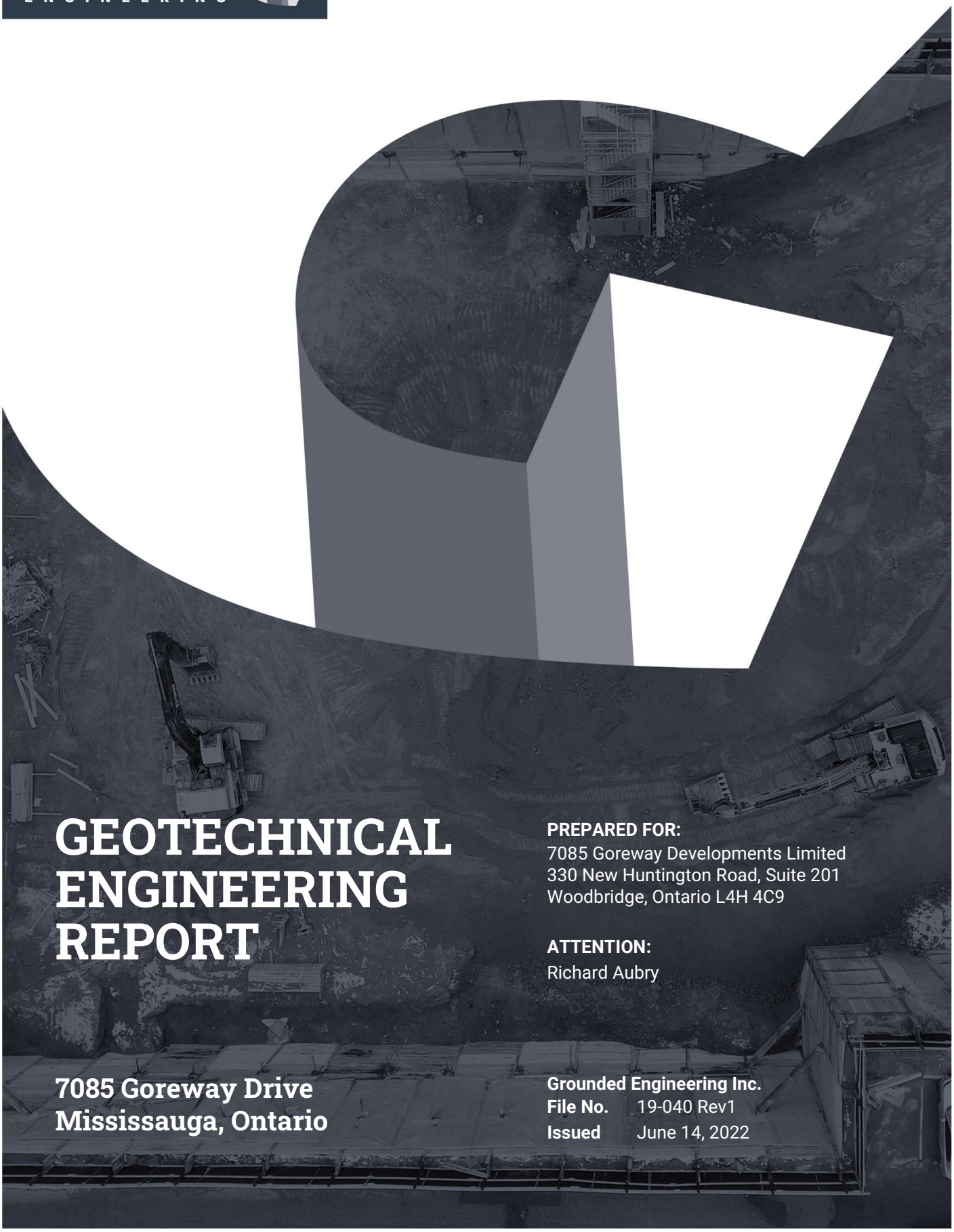
T-86033 Subdivision Plan
Block D, Plan 710

CITY OF MISSISSAUGA
ENGINEERING AND WORKS DEPARTMENT

LOT GRADING PLAN

SCALE AS SHOWN	AI-87716-G6	
DRAWN BY I.C.G.	CHECKED BY T.J.R.	PLAN No. C-23582
DATE MARCH 1987	SHEET OF	

C-23582



GEOTECHNICAL ENGINEERING REPORT

PREPARED FOR:
7085 Goreway Developments Limited
330 New Huntington Road, Suite 201
Woodbridge, Ontario L4H 4C9

ATTENTION:
Richard Aubry

7085 Goreway Drive
Mississauga, Ontario

Grounded Engineering Inc.
File No. 19-040 Rev1
Issued June 14, 2022

1 Banigan Drive, Toronto ON M4H 1G3 | (647) 264-7909 | groundedeng.ca | Grounded Engineering

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FIGURES

APPENDICES

1 Introduction

7085 Goreway Developments Limited has retained Grounded Engineering Inc. ("Grounded") to provide geotechnical engineering design advice for their proposed development at 7085 Goreway Drive, in Mississauga, Ontario.

The proposed project includes demolishing the existing structure and constructing a new 14-storey residential tower in the south portion and a block of 4-storey stacked townhouses in the north portion. All proposed structures will rest on a common underground parking structure beneath the entire site set at a lowest (P3) Finished Floor Elevation (FFE) of 155.8± m.

The site backs onto the unconfined valley of a branch of Mimico Creek. Although the valleylands are regulated by TRCA, a slope stability opinion or analysis is not required since it is an unconfined valley system with no defined top of bank. The development limits of the site will be regulated by the position of the flood plain as determined by others.

Grounded has been provided with the following reports and drawings to assist in our geotechnical scope of work:

- Site survey, prepared by KRCMAR Surveyors Ltd. (June 20, 2017).
- Architectural Drawings, "Redwood on Goreway"; Project 120212, dated June 13, 2022 (Reissued for OPA), prepared by IBI Group.

Grounded's subsurface investigation of the site to date includes eleven (11) boreholes (Boreholes 101 to 111) which were advanced from June 1st to 15th, 2020.

Based on the borehole findings, geotechnical engineering advice for the proposed development is provided for foundations, seismic site classification, earth pressure design, slab on grade design, basement drainage, and pavement design. Construction considerations including excavation, groundwater control, and geostructural engineering design advice are also provided.

Grounded Engineering must conduct the on-site evaluation of founding subgrade as foundation and slab construction proceeds. This is a vital and essential part of the geotechnical engineering function and must not be grouped together with other "third-party inspection services". Grounded will not accept responsibility for foundation performance if Grounded is not retained to carry out all the foundation evaluations during construction.

2 Ground Conditions

The borehole results are detailed on the attached borehole logs. Our assessment of the relevant stratigraphic units is intended to highlight the strata as they relate to geotechnical engineering. The ground conditions reported here will vary between and beyond the borehole locations.

The stratigraphic boundary lines shown on the borehole logs are assessed from non-continuous samples supplemented by drilling observations. These stratigraphic boundary lines represent transitions between soil types and should be regarded as approximate and gradual. They are not exact points of stratigraphic change.

Elevations are measured relative to geodetic datum (NAD 83). The horizontal coordinates are provided relative to the Universal Transverse Mercator (UTM) geographic coordinate system.

Asphalt and granular thicknesses reported here are observed in individual borehole locations through the top of the open borehole. Thicknesses may vary between and beyond the boreholes.

2.1 Soil Stratigraphy

The following soil stratigraphy summary is based on the borehole results and the geotechnical laboratory testing. A subsurface profile showing stratigraphy and engineering units is appended.

2.1.1 Surficial and Earth Fill

All boreholes encountered a 50 to 100 mm asphaltic pavement structure. The pavement structure was observed overlying a 25 to 100 mm thick aggregate layer in all boreholes except Boreholes 101, 107, and 108.

Underlying the surficial materials, all boreholes observed a layer of earth fill that extends to depths of 0.8 to 3.0 metres below grade (Elev. 165.4 to 161.3 metres). The earth fill varies in composition but generally consists of sand and gravel to sandy silt, and clayey silt. It contains trace aggregate, trace asphalt, trace organics, and trace rootlets. Due to the variation and inconsistent placement of the earth fill material, the consistency/relative density of the earth fill varies but is on average stiff/compact.

In Borehole 108, a 0.7 m thick zone of weathered native soil (sandy silt, some silt, some gravel) was observed between the earth fill and native soils.

2.1.2 Upper Till

Underlying the fill materials, all boreholes encounter an undisturbed native glacial till deposit generally with a matrix of silts (sandy silt to silty clay). These soils are grouped together as the “upper till unit”. This unit was encountered at 0.8 to 3.0 metres below grade (Elev. 165.4 to 161.3 m) and extends down to depths of 7.6 to 12.2 m below grade (Elev. 158.2 to 153.9m). The upper glacial till is generally mottled brown with grey, to grey, and moist. There are occasional wet sandy

seams within the till. Standard Penetration Test (SPT) results (N-Values) measured in the upper glacial till unit range from 8 to >50 blows per 300 mm of penetration ("bpf"), indicating a consistency/relative density ranging from loose/stiff to very dense/hard (on average, very stiff/compact).

2.1.3 Silts and Clays

Underlying the upper glacial till unit, all boreholes encounter an undisturbed native deposit of silts and clays. It contains some sand and trace gravel as well as clay nodules. This unit was encountered at 7.6 to 12.2 metres below grade (Elev. 158.2 to 153.9 m) and extends down to depths of 10.7 to 13.7 m below grade (Elev. 154.1 to 151.5 m). The silts and clays unit is grey, and moist. SPT N-values measured in this unit range from 2 to 35 bpf (on average stiff, but occasionally soft to firm).

2.1.4 Lower Till

Underlying the silts and clays unit, all boreholes encounter an undisturbed native glacial till deposit generally with a cohesionless matrix of sands and silts. It contains trace shale and limestone fragments. These soils are grouped together as the "lower till unit". This unit was encountered at 10.7 to 13.7 metres below grade (Elev. 154.1 to 151.5 m) and extends down to depths of 13.7 to 16.8 metres below grade (Elev. 150.6 to 148.8m). The lower glacial till is generally grey, and moist to wet. There are occasional seams of clayey silt, as well as wet sand within the till. SPT N-values measured in this unit range from 13 to >50 bpf (on average dense to very dense, but occasionally compact). Boreholes 101, 103, 109, and 111 were terminated in this unit.

2.1.5 Bedrock

All remaining boreholes indirectly inferred the top of weathered bedrock through auger cuttings, split spoon samples, and auger grinding/resistance observations. Each of these boreholes was terminated due to auger and sampler refusal (at target investigation depth) at 15.4 to 18.3 m below grade (Elev. 149.6 to 147.6 m).

2.2 Groundwater

Monitoring wells were installed in each of the boreholes, and stabilized groundwater levels were measured in each of the monitoring wells. The groundwater observations are shown on the Borehole Logs and are summarized as follows.

Borehole No.	Depth/Elev. Of well screen (m)	Strata Screened	Water Level in Well, Depth/Elev. (m)			
			Highest Level	Date	Most Recent Level	Date
101	12.2 – 15.2 / 153.0 – 150.0	Clays and Silts/Lower Till	1.5 / 163.7	2020-09-11	2.1 / 163.1	2022-05-11
102	15.2 – 18.3 / 150.6 – 147.6	Lower Till/Bedrock	2.4 / 163.5	2020-09-11	2.7 / 163.2	2022-05-11
103	12.4 – 15.5 / 153.8 – 150.8	Clays and Silts/Lower Till	2.6 / 163.6	2022-05-11	2.6 / 163.6	2022-05-11
105	3.8 – 6.8 / 161.7 – 158.6	Upper Till	1.6 / 163.8	2022-05-11	1.6 / 163.8	2022-05-11
107	13.7 – 16.8 / 150.9 – 147.9	Lower Till/Bedrock	1.2 / 163.4	2020-09-11	1.3 / 163.3	2022-05-11
109	7.6 – 10.7 / 156.9 – 153.8	Upper Till/Clays and Silts	1.8 / 162.7	2020-06-22	2.0 / 162.5	2022-05-11
110	4.6 – 7.6 / 160.6 – 157.6	Upper Till	2.2 / 163.0	2022-05-11	2.2 / 163.0	2022-05-11
111	1.5 – 4.6 / 163.4 – 160.3	Upper Till	1.4 / 163.5	2020-06-22	1.5 / 163.4	2022-05-11

Groundwater levels fluctuate with time depending on the amount of precipitation and surface runoff and may be influenced by known or unknown dewatering activities at nearby sites.

The groundwater table for engineering design purposes is at Elev. 163.8 m. The groundwater table is present within all soil and rock units. The upper till and silts and clays units have a very low permeability and will yield only minor seepage in the long-term. However, the lower till unit will yield free-flowing water when penetrated.

Grounded has prepared a hydrogeological report for this site (File No. 19-040).

2.3 Corrosivity and Sulphate Attack

Four (4) soil samples were submitted for corrosivity testing parameters (pH, Resistivity, Electrical Conductivity, Redox Potential, Sulphate, Sulphide and Chloride). The Certificate of Analyses and interpretation sheet is appended.

The soil samples were analysed for soluble sulphate concentration and compared to the Canadian Standard CAN3/CSA A23.1-M94 Table 3, *Additional Requirements for Concrete Subjected to Sulphate Attack*. The results are appended.

Corrosivity parameters are also used for assessing soil corrosivity applicable to cast iron alloys, according to the 10-point soil evaluation procedure described in the American Water Work Association (AWWA) C-105 standard. The results are appended.

The analytical results only provide an indication of the potential for corrosion. All four samples scored less than 10 points and corrosion protective measures are therefore not recommended for cast iron alloys. A more recent study by the AWWA has suggested that soil with a resistivity of less than about 2000 ohm.cm should be considered aggressive. Sample BH108-SS4 had resistivity measurements less than 2000 ohm.cm and should be considered **aggressive**.

3 Visual Slope Inspection

A visual inspection of the valleylands was conducted at the property on January 22nd, 2020, by Jory Hunter and Jason Crowder on February 5, 2020. Photographs of the valleylands with locations shown on the attached Figure 2. An MNR slope rating chart was completed for the subject slope. Based on the slope rating chart, the slope has a rating of 13, which indicates a low potential for instability.

For the purposes of discussion, Goreway Drive runs from north to south. The subject slope is present about 30 m south of the south property line. There is no identifiable slope crest since this is an unconfined valley system. The gradual slope has a height of no more than 2 ±m and an inclination of flatter than 3H:1V in all locations. Mimico Creek is present greater than 15 m from the toe of slope.

The tableland is occupied by an existing 1-storey building, with asphalt laneways and parking. There is a fence approximately at the slope crest on the south side of the property. No erosion was observed in the tableland.

The slope is vegetated with grass and young trees. No concentrated drainage was observed over the slope. No erosion was observed on the slope face. A public pathway (“Martin Greenway”) is present in the valleyland. The public path is in a good state of maintenance.

Mimico Creek flows from the east to the west in a meandering fashion. The banks of the creek are bare, and there is some evidence of minor undercutting.

The detailed visual slope inspection is summarized in the following table:

Item	Visual Observations within Study Area
Structures at Risk?	No
Valleyland Height	2 ±m
Valleyland Inclination	flatter than 3H:1V
Distance, structure to slope	Building is 10 ±m from sloping ground

Item	Visual Observations within Study Area
Seepage or wet ground?	None observed
Watercourse within 15 m?	No
Vegetation	Grass and young trees
Fallen/leaning trees?	No
Surficial erosion features	None observed
Slide features	None observed
Downspouts?	None observed
Retaining Walls or Structures?	Fence at the edge of valleyland, no retaining walls, pedestrian trail near creek
Drainpipes on slope?	None observed
Storm Water Outfalls?	None observed
MNR Slope Rating	13 (i.e., low potential)

Based on the observations made on site and lack of erosion features, it is Grounded's opinion that the sloping ground is stable in its current configuration and has a low potential for instability.

4 Geotechnical Engineering Recommendations

Based on the factual data summarized above, we are providing the following geotechnical engineering design recommendations. Contractors must review the factual data while bidding or scoping services for this project and must provide their own opinion as to means, methods, and schedule.

This report assumes that the design features relevant to the geotechnical analyses will be in accordance with applicable codes, standards, and guidelines of practice. If there are any changes to the site development features, or there is any additional information relevant to the interpretations made of the subsurface information with respect to the geotechnical analyses or other recommendations, then Grounded should be retained to review the implications of these changes with respect to the contents of this report.

4.1 Foundation Design Parameters

The topsoil and earth fill soils are considered unsuitable for the support of the proposed building foundations.

4.1.1 Spread Footings

4.1.1.1 Spread Footings Directly below P3 FFE

A softer silt and clay layer was identified at or directly below the proposed P3 FFE (Elev. 155.8± m). Conventional spread footings made to bear on this soil may be designed using a maximum factored geotechnical resistance at ULS of 250 kPa. The net geotechnical reaction at SLS is 150 kPa, for an estimated total settlement of 25 mm.

Due to consolidation settlement risk in the silt and clay layer, the SLS bearing pressures provided above also limit the maximum footing sizes for strip and spread footings to 750 and 1000 mm, respectively. This limitation renders large spread footings infeasible, and therefore a spread footing approach directly below the P3 FFE may not be feasible for the support of the proposed column loads.

4.1.1.2 Spread Footings Made as Drilled Piers

Higher capacity foundations may also be made as drilled piers within the lower till unit at approx. Elev. 152± m. Conventional spread footings made as drilled piers to bear on the lower till may be designed using a maximum factored geotechnical resistance at ULS of 1,000 kPa. The net geotechnical reaction at SLS is 800 kPa, for an estimated total settlement of 25 mm. These foundations will be about 4 m deep and can likely be inspected from the basement subgrade elevation.

Spread footing foundations for footing columns must be at least 1000 mm wide which applies in conjunction with the above recommended geotechnical resistance regardless of loading considerations. The geotechnical reaction at SLS refers to a settlement which for practical purposes is linear and non-recoverable. Differential settlement is related to column spacing, column loads, and footing sizes.

Footings in soil stepped from one elevation to another should be offset at a slope not steeper than 7 vertical to 10 horizontal.

The lowest levels of unheated underground parking structures two or more levels deep are, although unheated, still warmer than typical outdoor winter temperatures in the Greater Toronto Area. Interior foundations (or pile caps) with 900 mm of frost cover perform adequately, as do perimeter foundations with 600 mm of frost cover. Where foundations are next to ventilation shafts or are exposed to typical outdoor temperatures, 1.2 m of earth cover (or equivalent insulation) is required for frost protection.

The founding subgrade must be cleaned of all unacceptable materials and approved by Grounded prior to pouring concrete for the footings. Such unacceptable materials may include disturbed or caved soils, ponded water, or similar as indicated by Grounded during founding subgrade inspection. During the winter, adequate temporary frost protection for the footing bases and concrete must be provided if construction proceeds during freezing weather conditions. The bedrock surface can weather and deteriorate on exposure to the atmosphere or surface water; hence, foundation bases which remain open for an extended period of time should be protected by a skim coat of lean concrete.

4.1.2 Shallow Foundations Supported by Ground Improvement

The conventional spread footing capacities for directly below the P3 FFE (Elev. 155.8± m) provided above (Sec. 4.1.1.1) may not be sufficient to support the proposed structure. Although conventional spread footings may not be feasible due to the proposed column loads, the proposed structure can be supported by strip and spread footings resting on existing soil reinforced by ground improvement techniques. Conventional spread footings made to bear on existing soil reinforced by ground improvement techniques may be designed using an estimated maximum factored geotechnical resistance at ULS of 500 kPa. The net geotechnical reaction at SLS is estimated to be 300 kPa, for an estimated total settlement of 25 mm. GeoSolv must confirm these assumptions.

There are two general approaches to ground improvement that may be considered at this site: Geopier GeoConcrete® Column (GCC) elements, or Geopier® elements.

Geopier® elements are constructed by using displacement methods depending on soil conditions and project requirements. The aggregate is compacted in thin lifts using crowd pressure and a high energy vibratory hammer with a specialized tamper to densify the aggregate vertically and increase lateral stress in the soil matrix. The construction process results in a reinforced soil profile, providing positive settlement control and a resulting high bearing capacity that can support spread and strip footings.

Geopier GCC's are installed through a displacement process by driving a patented hollow mandrel to the design depth while simultaneously pumping concrete. The process forms an enlarged concrete base to efficiently develop geotechnical resistance. A Load Transfer Platform (LTP) may be constructed between the top of the GCCs and the bottom of footing.

We have spoken to GeoSolv Design/Build Ltd., regarding the suitability of installing ground improvement systems at the project site. Design of GeoSolv elements is typically performed as a design-build process, and GeoSolv has provided preliminary feedback via email for this site.

4.1.3 Caissons

The following advice pertains to drilled foundations with a minimum embedment below the P3 FFE of three times the diameter of the caisson. If the embedment of these caissons is less, then the design of these caissons should be as a spread footing using the capacities provided in Sec.

4.1.2. End-bearing caissons (embedment greater than three times diameter below P3) made to bear on weathered bedrock (approximate Elev. 149.6 to 147.6 m) may be designed using a maximum factored geotechnical resistance at ULS of 8 MPa. The geotechnical reaction at SLS is 5 MPa. Weathered bedrock elevations were identified on the appended borehole logs at the locations of Boreholes 102, 104 to 108, and 110. Top of weathered bedrock must be confirmed through Grounded's geotechnical engineering supervision during caisson installation.

4.2 Earthquake Design Parameters

The Ontario Building Code (2012) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.1.8.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration, and the site classification.

The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4A of the Ontario Building Code (2012). The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (v_s) measurements have been taken. Alternatively, the classification is estimated from the rational analysis of undrained shear strength (s_u) or penetration resistance (N-values) according to the OBC and National Building Code of Canada.

Below the nominal founding elevations (for spread footings or grade beams below the P3 level), the boreholes observe a firm to stiff silt and clay layer, overlying dense to very dense cohesionless till, overlying bedrock. There will be more than 2 m of soil between the top of bedrock and the base of grade beams, pile caps, or footings. Based on this information, the site designation for seismic analysis is **Class C**, per Table 4.1.8.4.A of the Ontario Building Code (2012). Tables 4.1.8.4.B and 4.1.8.4.C. of the same code provide the applicable acceleration- and velocity-based site coefficients.

4.3 Earth Pressure Design Parameters

At this site, the design parameters for structures subject to unbalanced earth pressures such as basement walls and retaining walls are shown in the table below.

Stratigraphic Unit	γ	φ	K_a	K_o	K_p
Compact Granular Fill Granular 'B' (OPSS.MUNI 1010)	21	32	0.31	0.47	3.25
Existing Earth Fill	19	29	0.35	0.52	2.88
Upper Till	21	32	0.31	0.47	3.25
Silts and Clays	22	30	0.33	0.50	3.00
Lower Till	21	36	0.25	0.41	3.85
Weathered Bedrock	26	26	n/a		

γ	=	soil bulk unit weight (kN/m^3)
φ	=	internal friction angle (degrees)
K_a	=	active earth pressure coefficient (Rankine, dimensionless)
K_o	=	at-rest earth pressure coefficient (Rankine, dimensionless)
K_p	=	passive earth pressure coefficient (Rankine, dimensionless)

These earth pressure parameters assume that grade is horizontal behind the retaining structure. If retained grade is inclined, these parameters do not apply and must be re-evaluated.

The following equation can be used to calculate the unbalanced earth pressure imposed on walls:

$$P = K[\gamma(h - h_w) + \gamma' h_w + q] + \gamma_w h_w$$

P	=	horizontal pressure (kPa) at depth h	γ	=	soil bulk unit weight (kN/m^3)
h	=	the depth at which P is calculated (m)	γ'	=	submerged soil unit weight (γ - 9.8 kN/m^3)
K	=	earth pressure coefficient	q	=	total surcharge load (kPa)
h_w	=	height of groundwater (m) above depth h			

If the wall backfill is drained such that hydrostatic pressures on the wall are effectively eliminated, this equation simplifies to:

$$P = K[\gamma h + q]$$

Where walls are made directly against shoring, prefabricated composite drainage panel covering the blind side of the wall is used to provide drainage. Water from the composite drainage panel is collected and discharged through the basement wall in solid ports directly to the sumps. This is discussed in Section 4.5.

The possible effects of frost on retaining earth structures must be considered. In frost-susceptible soils, pressures induced by freezing pore water are basically irresistible. Insulation typically addresses this issue. Alternatively, non-frost-susceptible backfill may be specified.

Foundation resistance to sliding is proportional to the friction between the soil subgrade and the base of the footing. The factored geotechnical resistance to friction ($\mathbf{R_f}$) at ULS provided in the following equation:

$$R_f = \Phi N \tan \varphi$$

R_f	=	frictional resistance (kN)
Φ	=	reduction factor per Canadian Foundation Engineering Manual (CFEM) Ed. 4 (0.8)
N	=	normal load at base of footing (kN)
φ	=	internal friction angle (see table above)

4.4 Slab on Grade Design Parameters

At the proposed lowest P3 elevation, the undisturbed native soils will provide adequate subgrade for the support of a conventional slab on grade. The modulus of subgrade reaction for slab-on-grade design supported by a clear stone drainage layer on undisturbed native soils is 30,000 kPa/m.

If this basement structure is made as a conventional drained structure, a permanent drainage system including subfloor drains is required (see Section 3.5). In this case, the slab on grade must be provided with a drainage layer and capillary moisture break, which is achieved by forming the slab on a minimum 300 mm thick layer of 19 mm clear stone (OPSS.MUNI 1004) vibrated to a dense state.

Given the nature of the soils at this site, recompaction or proof rolling of the undisturbed subgrade will weaken the subgrade materials. These activities should be specifically prohibited when preparing the subgrade. The subgrade should be cut neat and inspected by Grounded prior to placement of the capillary moisture break and construction of the slab. Disturbed or otherwise unacceptable material (as determined by Grounded) must be subexcavated and replaced with Granular B (OPSS.MUNI 1010) compacted to a minimum of 98% SPMDD.

4.5 Long-Term Groundwater and Seepage Control

To limit seepage to the extent practicable, exterior grades adjacent to foundation walls should be sloped at a minimum 2 percent gradient away from the wall for 1.2 m minimum.

For a conventional drained basement approach, perimeter and subfloor drainage systems are required for the underground structure. Subfloor drainage collects and removes the seepage that infiltrates under the floor. Perimeter drainage collects and removes seepage that infiltrates at the foundation walls. The exterior faces of foundation walls should be provided with a layer of waterproofing to protect interior finishes.

Subfloor drainage pipes are to be spaced at an average 6 m (measured on-centres). If subdrain elevation conflicts with top of footing elevation, footings should be lowered as necessary.

The walls of the substructure are to be fully drained to eliminate hydrostatic pressure. Where drained basement walls are made directly against shoring, prefabricated composite drainage panel covering the blind side of the wall is used to provide drainage. Seepage from the composite drainage panel is collected and discharged through the basement wall in solid ports directly to the sumps. A layer of waterproofing placed between the drain core product and the basement wall should be considered to protect interior finishes from moisture. Typical basement drainage details are appended.

The perimeter and subfloor drainage systems are critical structural elements since they eliminate hydrostatic pressure from acting on the basement walls and floor slab. The sumps that ensure the performance of these systems must have a duplexed pump arrangement providing 100% redundancy, and they must be on emergency power. The sumps should be sized by the mechanical engineer to adequately accommodate the estimated volume of water seepage.

The permanent dewatering requirements are provided in Grounded's Hydrogeological Report (File No. 19-040).

4.6 Site Servicing

All services must have at least 1.2 metres of earth cover or equivalent insulation for frost protection.

Where site services are not installed below the basement levels of the proposed development, the following recommendations apply.

4.6.1 Bedding

The soil subgrade encountered within utility trenches on site may consist of either earth fill or native soil. If earth fill is encountered, the subgrade must be compacted in place to a minimum 98% SPMDD. The trench base must be inspected for obvious loose, wet, or disturbed material. Any unsuitable material must be subexcavated and replaced with imported fill compacted to 98% SPMDD.

If trenches extend below the groundwater table, the groundwater table must be lowered to 1.2 m below the lowest excavation elevation prior to excavation.

Bedding material below the groundwater table must consist of well graded granular fill such as Granular A (OPSS.MUNI 1010). Clear stone is specifically prohibited below the groundwater table. The bedding material must be compacted to a minimum 95% SPMDD.

Where trenches are above the groundwater table, bedding material may consist of 19 mm clear stone (OPSS.MUNI 1004) or similar, vibrated to a dense state. Where the bedding material consists of clear stone, the bedding must be separated from the subgrade with a non-woven geotextile.

4.6.2 Backfill

Excavated earth fill and native soils on site will constitute adequate backfill material if the soil meets the backfill specifications:

- Any deleterious material in the earth fill is removed prior to reuse as backfill.
- The moisture content is within 2% of optimum, or moisture conditioned to within 2% of optimum.
- The backfill must be compacted to a minimum 98% SPMDD.

4.6.3 Trench Plugs

Trench plugs are installed when the invert of the trench is below the groundwater table, to prevent the groundwater from preferentially flowing through the granular bedding and backfill material, creating a local drawdown of the groundwater table. Where local drawdown is not tolerated, trench plugs can be installed in the granular bedding and backfill material. Trench plugs may be constructed as clay plugs or cut off collars around the pipe barrel.

Clay plugs should be installed every 50 m along the full length of the trench, where the trench invert is below the groundwater table. Clay plugs must be a minimum of 1 m thick along the length of the trench and will completely replace any bedding or backfill material around the pipe barrel. Material used for clay plugs must have greater than 15% of the particles finer than 2 microns and a coefficient of permeability of less than 10^{-8} m/s. The material must be compacted to 95% SPMDD. Unshrinkable fill is also a suitable clay plug material. A representative sample of clay plug material must be submitted prior to construction and during construction for permeability and particle size testing to confirm the material is adequate and in compliance with the above material specifications.

If cut off collars are used instead of clay plugs, the cut off collar must not be placed within 1 m of a pipe joint to ensure adequate compaction. The soils around the cut off collar must be compacted to 95% SPMDD. A watertight connection is required between the collar and the pipe wall.

5 Pavement Design Advice

It is expected that some of the pavements will be placed on top of the underground parking structure and not on soil subgrade. In this case, the pavements resting on parking structure should consist of two 40 mm thick lifts of HL3 surface course hot mix asphalt, resting on a minimum 100 mm thick layer of Granular A (OPSS.MUNI 1010). A waterproof membrane will be required between the Granular A and the concrete parking structure deck. For pavements placed on top of the underground parking structure, all drainage considerations for these areas must be designed separately and in conjunction with the civil engineering design of the underground parking structure. Wherever they have to connect to the adjacent roadways or driveways, those adjacent pavement profiles will be different and so taper transitions and run-outs must be designed for the connections.

5.1 Pavement Engineering Recommendations

The following design pertains to asphaltic concrete pavements ('pavement') where the pavement will rest on a soil subgrade as described above.

The following Ontario Provincial Standards Specifications (OPSS.MUNI) apply to the pavement construction and material requirements:

- OPSS.MUNI 310 - Hot Mix Asphalt
- OPSS.MUNI 501 - Compacting
- OPSS.MUNI 1010 - Aggregates – Base, Subbase, Select Subgrade, and Backfill Material
- OPSS.MUNI 1101 - Performance Graded Asphalt Cement
- OPSS.MUNI 1150 - Hot Mix Asphalt

The pavement construction and material should also follow the relevant city specifications, as applicable.

5.1.1 Pavement Subgrade Preparation

Topsoil and existing wet or organic rich earth fill soils are considered unsuitable for the pavement subgrade. These materials must be stripped down to acceptable subgrade prior to pavement construction.

Existing earth fill, if cleared of organic rich or wet soils, and native subgrade will provide adequate subgrade for the support of the pavement. The subgrade must be proof-rolled and inspected under the supervision of Grounded for obvious loose or disturbed soils or where there is deleterious materials or moisture. These areas can either be recompacted in place and retested or replaced with Granular B in lifts 150 mm thick or less and compacted to a minimum of 98% SPMDD.

The subgrade for all pavement structures shall be frost tapered at a 3H to 1V slope to match with existing pavement structures, to reduce differential settlements due to frost heave.

5.1.2 Pavement Design

Minimum and performance asphaltic concrete pavement designs are outlined in the tables below.

The following **basic pavement design** will last for 8 to 10 years before significant maintenance is required, depending on the traffic volume.

Basic **Pavement Structure**	**Compaction Requirement**	**Car Parking Minimum Component Thickness**	**Bus/Truck Traffic Minimum Component Thickness**
Asphalt Top Lift HL-3 (OPSS.MUNI 1150), and PG 58-28 (OPSS.MUNI 1101)	OPSS.MUNI 310	65 mm	40 mm
Asphalt Base Course HL-8 (OPSS.MUNI 1150), and PG 58-28 (OPSS.MUNI 1101)	OPSS.MUNI 310	N/A	50 mm
Granular Base Course 19 mm diameter crusher run limestone or Granular A (OPSS.MUNI 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Granular Subbase Course 50 mm diameter crusher run limestone or Granular B Type II (OPSS.MUNI 1010)	98% Standard Proctor Maximum Dry Density (ASTM-D698)	300 mm	400 mm
Total Thickness		**515 mm**	**640 mm**

The following **performance pavement design** will last approximately twice as long before significant maintenance is required. The performance pavement design considers that the top

layer of asphalt will be damaged over time, and therefore, will contribute less to the structural strength of the asphalt.

Performance **Pavement Structure**	**Compaction Requirement**	**Car Parking Minimum Component Thickness**	**Bus/Truck Traffic Minimum Component Thickness**
Asphalt Top Lift HL-3 (OPSS.MUNI 1150), and PG 58-28 (OPSS.MUNI 1101)	OPSS.MUNI 310	40 mm	40 mm
Asphalt Base Course HL-8 (OPSS.MUNI 1150), and PG 58-28 (OPSS.MUNI 1101)	OPSS.MUNI 310	50 mm	80 mm
Granular Base Course 19 mm diameter crusher run limestone or Granular A (OPSS.MUNI 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Granular Subbase Course 50 mm diameter crusher run limestone or Granular B Type II (OPSS.MUNI 1010)	98% Standard Proctor Maximum Dry Density (ASTM-D698)	400 mm	500 mm
Total Thickness		**640 mm**	**770 mm**

The existing native soils have a low to moderate susceptibility to frost heave, and pavement on these materials must be designed accordingly.

5.1.3 Pavement Drainage

Adequate drainage of the pavement subgrade is required. Prior to paving, the subgrade should be free of any depressions and sloped at a minimum grade of 2% to provide positive drainage. Perforated plastic subdrains (100 mm diameter) should be designed to collect subgrade water and positively outlet it at the catch basins. Typical pavement drainage details are appended.

Controlling surface water is important in keeping pavements in good maintenance. Grading adjacent pavement areas must be designed so that water is not allowed to pond adjacent to the outside edges of the pavement or curb.

6 Considerations for Construction

6.1 Excavations

Excavations must be carried out in accordance with the *Occupational Health and Safety Act – Regulation 213/91 – Construction Projects (Part III - Excavations, Section 222 through 242).* These regulations designate four (4) broad classifications of soils to stipulate appropriate measures for excavation safety. For practical purposes:

- The earth fill and glacial till units are Type 3 soils
- The silts and clays unit is a Type 2 soil
- Weathered bedrock is a Type 2 soil where highly weathered and soil-like

In accordance with the regulation's requirements, the soil must be suitably sloped and/or braced where workers must enter a trench or excavation deeper than 1.2 m. Safe excavation slopes (of no more than 3 m in height) by soil type are stipulated as follows:

Soil Type	Base of Slope	Steepest Slope Inclination
1	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
2	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
3	from bottom of trench	1 horizontal to 1 vertical
4	from bottom of trench	3 horizontal to 1 vertical

Minimum support system requirements for steeper excavations are stipulated in Sections 235 through 238 and 241 of the Act and Regulations and include provisions for timbering, shoring and moveable trench boxes. Any excavation slopes greater than 3 m in height should be checked by Grounded for global stability issues.

Larger obstructions (e.g., buried concrete debris, other obstructions) not directly observed in the boreholes are likely present in the earth fill. Similarly, larger inclusions (e.g., cobbles and boulders) may be encountered in the native soils. The size and distribution of these obstructions cannot be predicted with boreholes, as the split spoon sampler is not large enough to capture particles of this size. Provision must be made in excavation contracts to allocate risks associated with the time spent and equipment utilized to remove or penetrate such obstructions when encountered.

6.2 Short-Term Groundwater Control

Considerations pertaining to groundwater discharge quantities and quality are discussed in Grounded's hydrogeological report for the site, under separate cover.

The groundwater table for engineering design purposes is at Elev. 163.8 m. The groundwater table is present within all soil and rock units. The upper till and silts and clays units have a very low permeability and will yield only minor seepage in the long-term. However, the lower till unit will yield free-flowing water when penetrated. Excavations will generally be made below the groundwater table, but above the lower till unit, in relatively low permeability soils that preclude the free flow of water into excavations.

Cohesionless wet zones were encountered in several of the boreholes. If these cohesionless zones are penetrated, some seepage from these wet zones should be anticipated. However, these zones are likely of limited extent and are not horizontally continuous layers.

On this basis, seepage into excavations may be allowed to drain into the excavation and then controlled by a conventional sump pump arrangement. Nevertheless, delays in excavation will

occur as the seepage is controlled and these delays should be anticipated in the construction schedule.

Dewatering prior to excavation may be required for foundations advanced to bear within the lower till.

A professional dewatering contractor should be consulted to review the subsurface conditions and to design a site-specific dewatering system. It is the dewatering contractor's responsibility to assess the factual data and to provide recommendations on dewatering system requirements.

6.3 Earth-Retention Shoring Systems

No excavation shall extend below the foundations of existing adjacent structures without adequate alternative support being provided. Excavation zone of influence guidelines are appended.

6.3.1 Lateral Earth Pressure Distribution

If the shoring is supported with a single level of earth anchor or bracing, a triangular earth pressure distribution like that used for the basement wall design is appropriate.

Where multiple rows of lateral supports are used to support the shoring walls, research has shown that a distributed pressure diagram more realistically approximates the earth pressure on a shoring system of this type, when restrained by pre-tensioned anchors. A multi-level supported shoring system can be designed based on an earth pressure distribution with a maximum pressure defined by:

$\boldsymbol{P = 0.8\,K[\gamma H + q] + \gamma_w h_w}$ … in cohesive soils
$\boldsymbol{P = 0.65\,K[\gamma H + q] + \gamma_w h_w}$ … in cohesionless soils

P = maximum horizontal pressure (kPa)
K = earth pressure coefficient (see Section 3.3)
H = total depth of the excavation (m)
h_w = height of groundwater (m) above the base of excavation
γ = soil bulk unit weight (kN/m3)
q = total surcharge loading (kPa)

Where shoring walls are drained to effectively eliminate hydrostatic pressure on the shoring system (e.g., pile and lagging walls), $\boldsymbol{h_w}$ is equal to zero. For the design of impermeable shoring, a design groundwater table at Elev. 163.8 m must be accounted for.

In cohesive soils, the lateral earth pressure distribution is trapezoidal, uniformly increasing from zero to the maximum pressure defined in the equation above over the top and bottom quarter (H/4) of the shoring. In cohesionless soils, the lateral earth pressure distribution is rectangular.

6.3.2 Soldier Pile Toe Embedment

Soldier pile toes will be made in the dense to dense to very dense lower till unit at approx. Elev. 152± m. Soldier pile toes resist horizontal movement due to the passive earth pressure acting on the toe below the base of excavation.

There are zones of soil in the subgrade that are wet, cohesionless, and permeable. Augered holes for piles made into these soils will be prone to caving and blowback. Temporarily cased holes are required to prevent borehole caving during installations in drilled holes. To prevent groundwater issues (groundwater inflow, caving and blowback into the drill holes, disturbance to placed concrete, etc.) during drilling and installation, construction methods such as utilizing temporary liners, pre-advancing liners deeper than the augured holes, mud/slurry/polymer drilling techniques, or other methods as deemed necessary by the shoring contractor are required. Tremie placement of concrete may be required if there is more than 75 mm of standing water in the bottom of any caisson hole prior to concreting.

6.3.3 Lateral Bracing Elements

The shoring system at this site will require lateral bracing. If feasible, the shoring system should be supported by pre-stressed soil anchors (tiebacks) extending into the subgrade of the adjacent properties. To limit the movement of the shoring system as much as is practically possible, tiebacks are installed and stressed as excavation proceeds. The use of tiebacks through adjacent properties requires the consent (through encroachment agreements) of the adjacent property owners.

Anchors made in the plastic till tend to creep over time and therefore, if possible, it is better to anchor in the lower till unit. In the dense to very dense till below Elev. 152± m, it is expected that post-grouted anchors can be made such that an anchor will safely carry up to 60 kN/m of adhered anchor length (at a nominal borehole diameter of 150 mm).

At least one prototype anchor per tieback level must be performance-tested to 200% of the design load to demonstrate the anchor capacity and validate design assumptions. Given the potential variability in soil conditions or installation quality, all production anchors must also be proof-tested to 133% of the design load.

The dense to very dense till below Elev. 152± m is suitable for the placement of raker foundations Raker footings established on dense to very dense soils at an inclination of 45 degrees can be designed for a maximum factored geotechnical resistance at ULS of 500 kPa. Raker placement is not recommended in the firm clay between approximate Elev. 156 and 152± m.

6.4 Site Work

To better protect wet undisturbed subgrade, excavations exposing wet soils must be cut neat, inspected, and then immediately protected with a skim coat of concrete (i.e., a mud mat). Wet

sands are susceptible to degradation and disturbance due to even mild site work, frost, weather, or a combination thereof.

The effects of work on site can greatly impact soil integrity. Care must be taken to prevent this damage. Site work carried out during periods of inclement weather may result in the subgrade becoming disturbed, unless a granular working mat is placed to preserve the subgrade soils in their undisturbed condition. Subgrade preparation activities should not be conducted in wet weather and the project must be scheduled accordingly.

If site work causes disturbance to the subgrade, removal of the disturbed soils and the use of granular fill material for site restoration or underfloor fill will be required at additional cost to the project.

It is construction activity itself that often imparts the most severe loading conditions on the subgrade. Special provisions such as end dumping and forward spreading of earth and aggregate fills, restricted construction lanes, and half-loads during placement of the granular base and other work may be required, especially if construction is carried out during unfavourable weather.

Adequate temporary frost protection for the founding subgrade must be provided if construction proceeds in freezing weather conditions. The subgrade at this site is susceptible to frost damage. The slab on grade should not be placed on frozen subgrade, to prevent settlement of the slab as the subgrade thaws. Areas of frozen subgrade should be removed during subgrade preparation. Depending on the project context, consideration should be given to frost effects (heaving, softening, etc.) on exposed subgrade surfaces.

6.5 Engineering Review

By issuing this report, Grounded Engineering has assumed the role of Geotechnical Engineer of Record for this site. Grounded should be retained to review the structural engineering drawings prior to issue or construction to ensure that the recommendations in this report have been appropriately implemented.

All foundation installations must be reviewed in the field by Grounded, the Geotechnical Engineer of Record, as they are constructed. The on-site review of the condition of the founding subgrade as the foundations are constructed is as much a part of the geotechnical engineering design function as the design itself; it is also required by Section 4.2.2.2 of the Ontario Building Code. If Grounded is not retained to carry out foundation engineering field review during construction, then Grounded accepts no responsibility for the performance or non-performance of the foundations, even if they are constructed in general conformance with the engineering design advice contained in this report.

The long-term performance of a slab on grade is highly dependent upon the subgrade support and drainage conditions. Strict procedures must be maintained during construction to maintain the integrity of the subgrade to the extent possible. The design advice in this report is based on an assessment of the subgrade support capabilities as indicated by the boreholes. These

conditions may vary across the site depending on the final design grades and therefore, the preparation of the subgrade and the compaction of all fill should be monitored by Grounded at the time of construction to confirm material quality, thickness, and to ensure adequate compaction.

A visual pre-construction survey of adjacent lands and buildings is recommended to be completed prior to the start of any construction. This documents the baseline condition and can prevent unwarranted damage claims. Any shoring system, regardless of the execution and design, has the potential for movement. Small changes in stress or soil volume can cause cracking in adjacent buildings.

7 Limitations and Restrictions

Grounded should be retained to review the structural engineering drawings prior to issue or construction to ensure that the recommendations in this report have been appropriately implemented.

To protect the slope, site development and construction activities should be designed in a manner that does not erode the surface slope. Of particular importance, site drainage and grading must not produce concentrated overland flow directed towards the slope crest or face. Although concentrated overland flow must not be allowed to flow over the slope, a minor sheet flow may be acceptable. A healthy vegetative cover should be created and maintained on the slope.

This report provides specifications which are to be used as technical specifications only. These technical specifications do not cover contract issues (quantities, insurance, other tender specifications, etc.) and as such must not be regarded as final tender specifications. The technical specifications provided in this report may form part of a complete set of tender documents prepared by others.

7.1 Investigation Procedures

The geotechnical engineering analysis and advice provided are based on the factual borehole information observed and recorded by Grounded. The investigation methodology and engineering analysis methods used to carry out this scope of work are consistent with conventional standard practice by Grounded as well as other geotechnical consultants, working under similar conditions and constraints (time, financial and physical).

Borehole drilling services were provided to Grounded by a specialist professional contractor. The drilling was observed and recorded by Grounded's field supervisor on a full-time basis. Drilling was conducted using conventional drilling rigs equipped with hollow stem augers. Shear vane field tests were attempted within the silts and clays units, however the resultant data appeared to be skewed by trace amounts of coarse sand and gravel adding additional resistance to turning the vane. As drilling proceeded, groundwater observations were made in the boreholes. Based on

examination of recovered borehole samples, our field supervisor made a record of borehole and drilling observations. The field samples were secured in air-tight clean jars and bags and taken to the Grounded soil laboratory where they were each logged and reviewed by the geotechnical engineering team and the senior reviewer.

The Split-Barrel Method technique (ASTM D1586) was used to obtain the soils samples. The sampling was conducted at conventional intervals and not continuously. As such, stratigraphic interpolation between samples is required and stratigraphic boundary lines do not represent exact depths of geological change. They should be taken as gradual transition zones between soil or rock types.

A carefully conducted, fully comprehensive investigation and sampling scope of work carried out under the most stringent level of oversight may still fail to detect certain ground conditions. As such, users of this report must be aware of the risks inherent in using engineered field investigations to observe and record subsurface conditions. As a necessary requirement of working with discrete test locations, Grounded has assumed that the conditions between test locations are the same as the test locations themselves, for the purposes of providing geotechnical engineering advice.

It is not possible to design a field investigation with enough test locations that would provide complete subsurface information, nor is it possible to provide geotechnical engineering advice that completely identifies or quantifies every element that could affect construction, scheduling, or tendering. Contractors undertaking work based on this report (in whole or in part) must make their own determination of how they may be affected by the subsurface conditions, based on their own analysis of the factual information provided and based on their own means and methods. Contractors using this report must be aware of the risks implicit in using factual information at discrete test locations to infer subsurface conditions across the site and are directed to conduct their own investigations as needed.

7.2 Site and Scope Changes

Natural occurrences, the passage of time, local construction, and other human activity all have the potential to directly or indirectly alter the subsurface conditions at or near the project site. Contractual obligations related to groundwater or stormwater control, disturbed soils, frost protection, etc. must be considered with attention and care as they relate this potential site alteration.

The geotechnical engineering advice provided in this report is based on the factual observations made from the site investigations as reported. It is intended for use by the owner and their retained design team. If there are changes to the features of the development or to the scope, the interpreted subsurface information, geotechnical engineering design parameters, advice, and discussion on construction considerations may not be relevant or complete for the project. Grounded should be retained to review the implications of such changes with respect to the contents of this report.

7.3 Report Use

The authorized users of this report are 7085 Goreway Developments Limited and their design team, for whom this report has been prepared. Grounded Engineering Inc. maintains the copyright and ownership of this document. Reproduction of this report in any format or medium requires explicit prior authorization from Grounded Engineering Inc.

The local municipal/regional governing bodies may also make use of and rely upon this report, subject to the limitations as stated.

8 Closure

If the design team has any questions regarding the discussion and advice provided, please do not hesitate to have them contact our office. We trust that this report meets your requirements at present.

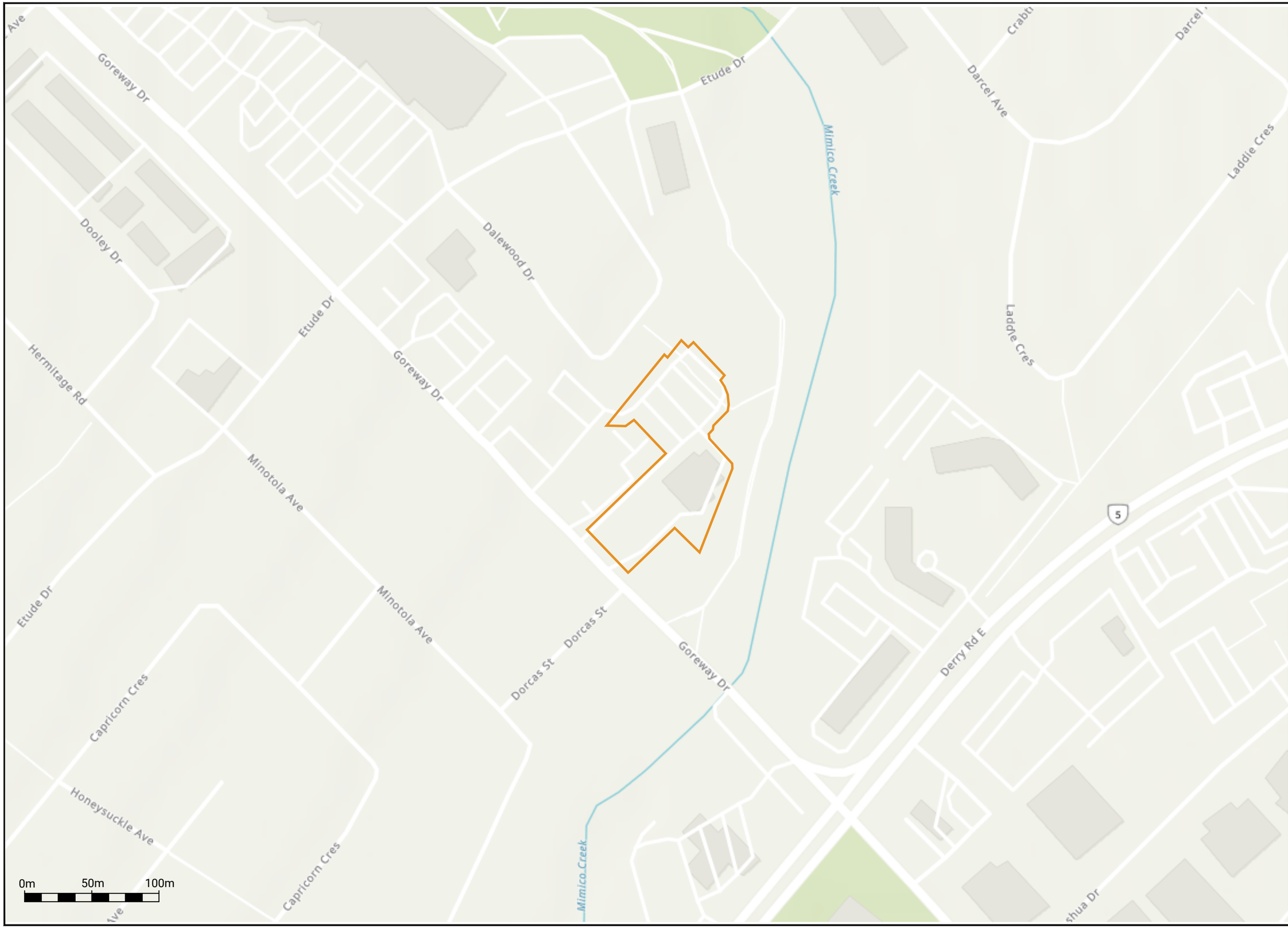
For and on behalf of our team,

GROUNDED ENGINEERING

Tarak Ali, EIT
Project Manager

Jason Crowder, Ph.D., P.Eng.
Principal, Geotechnical Engineering Services

FIGURES



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LEGEND

APPROXIMATE PROPERTY BOUNDARY

Note

Reference
ArcGIS, 2020

Project
7085 GOREWAY DRIVE
MISSISSAUGA, ONTARIO

Figure Title
SITE LOCATION PLAN

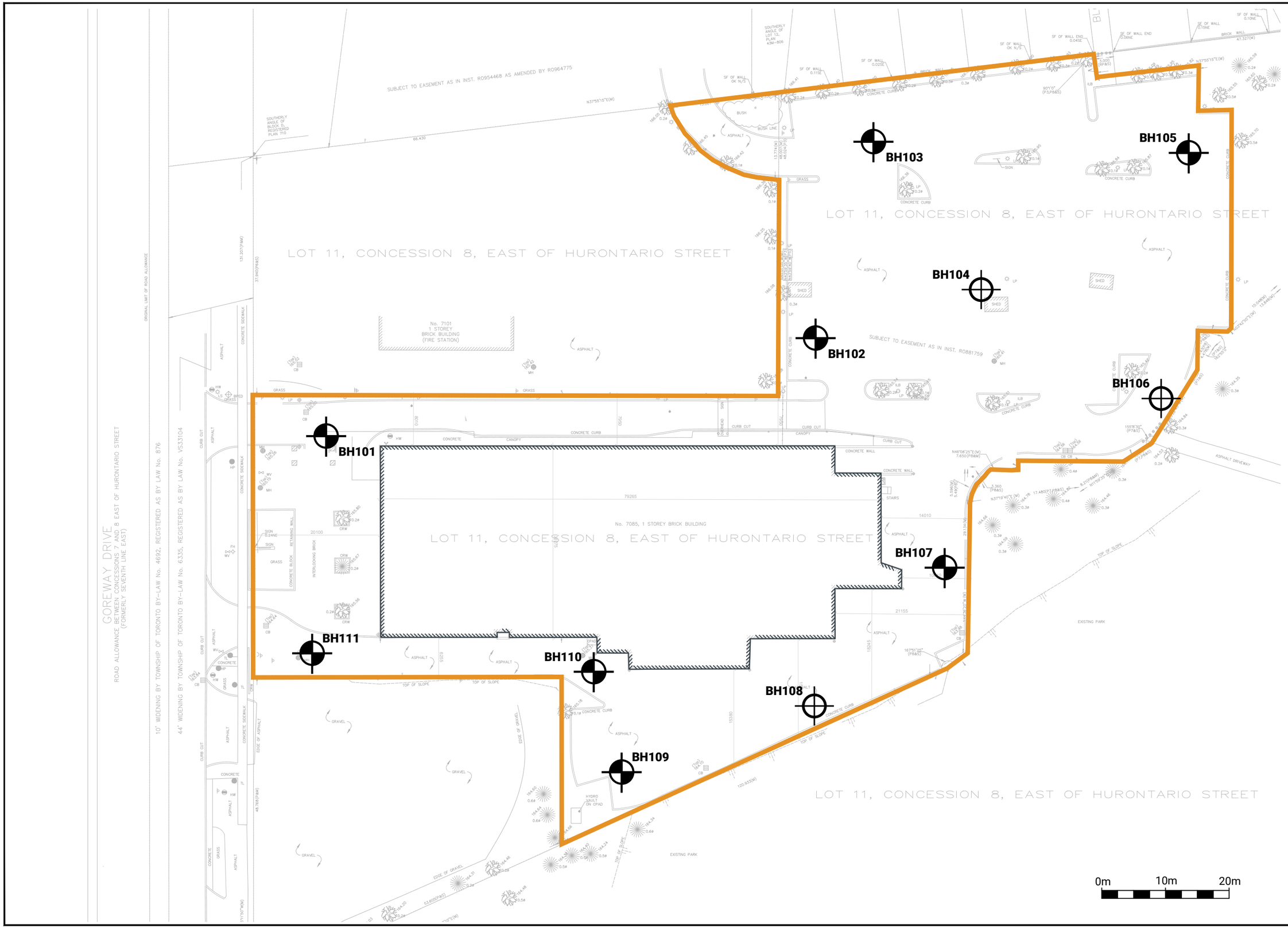
North
TRUE
PROJECT

Date
JUNE 2022

Scale
AS INDICATED

Job No
19-040

Figure No
FIGURE 1



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www.groundedeng.ca

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- EXISTING BUILDING STRUCTURE
- MONITORING WELL/BOREHOLE BY GROUNDED

Note

Reference

Survey Drawing Reference no.
17-103BT01.
Date: JUNE 20, 2017.
Prepared by KRCMAR Surveyors Ltd.
Received on November 26, 2019.

Project

7085 GOREWAY DRIVE

MISSISSAUGA, ONTARIO

Figure Title

BOREHOLE LOCATION PLAN

North

TRUE
PROJECT

Date

JUNE 2022

Scale

AS INDICATED

Job No

19-040

Figure No

FIGURE 2

Approximate Ground Surface:
Elev. 165.2 m

Design Groundwater Table
Elev. 163.8 m

BH 111 | BH 109 | BH 110 | BH 101 | BH 108 | BH 107 | BH 102 | BH 106 | BH 104 | BH 103 | BH 105

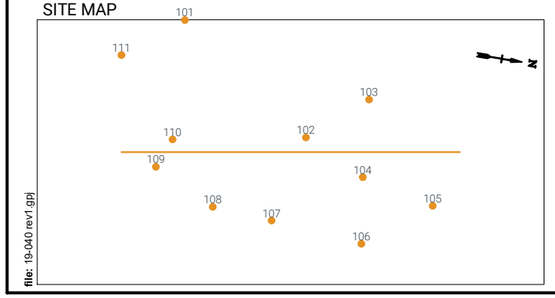
Elevation (m)

168 166 164 162 160 158 156 154 152 150 148 146

P3 FFE Elev. 155.8± m

Boreholes Equally Spaced

SITE MAP



file: 19-040 rev1.gpj

LITHOLOGY GRAPHIC LEGEND

- Asphalt
- Fill
- Clayey Silt Till
- Silt and Clay
- Sandy Silt Till
- Aggregate
- Bedrock (inferred)
- Silty Sand
- Sand and Silt Till

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LEGEND

- FILL
- GRAVELS (gravel to gravelly sand)
- SILT TO SAND (not till)
- COHESIONLESS TILLS
- COHESIVE SOILS (clayey silt to clay, incl. tills)
- DISTURBED/REWORKED/ORGANIC

- water level, unstabilized
- water level, stabilized (latest)
- water level, stabilized (highest)

Project
7085 GOREWAY DRIVE MISSISSAUGA, ON

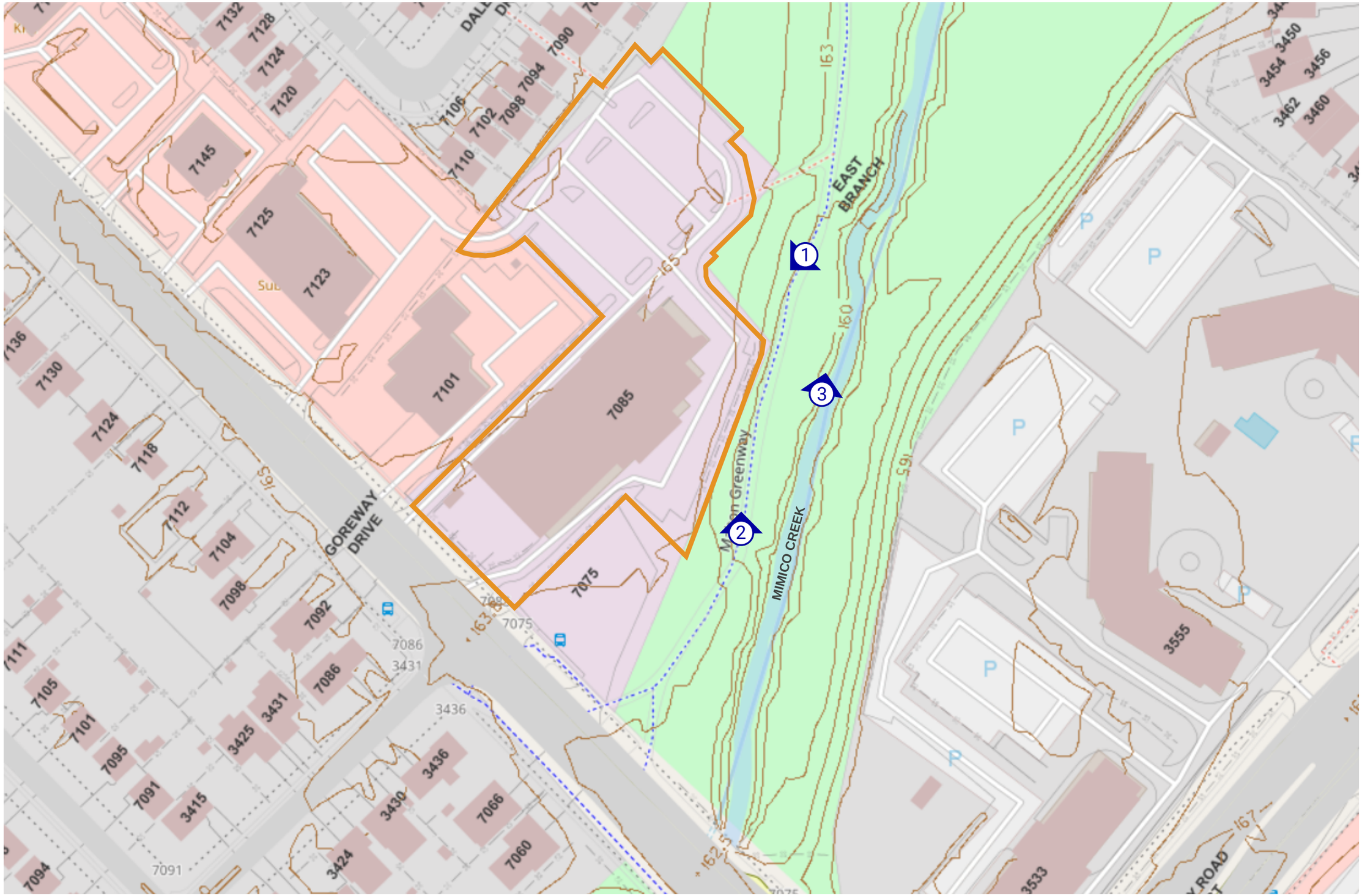
Figure Title
SUBSURFACE PROFILE

Date
JUNE 2022

Scale
AS INDICATED

Job No
19-040

Figure No
FIGURE 3



GROUNDED ENGINEERING

12 Banigan Drive, Toronto, Ont., M4H 1E9
www.groundedeng.ca

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- ① SITE PHOTOGRAPH LOCATION

Note

Reference
Mississauga Maps, 2020
KRCMAR, DWG Name 17-103BT01, Job No 17-103, Date June 2017

Project
7085 GOREWAY DRIVE
MISSISSAUGA, ONTARIO

Figure Title
PHOTOGRAPH AND SITE FEATURES PLAN

North
TRUE
PROJECT

Date
JUNE 2022

Scale
N.T.S.

Job No
19-040

Figure No
FIGURE 4

APPENDIX A

BOREHOLE LOG TERMINOLOGY

GROUNDED ENGINEERING

SAMPLING/TESTING METHODS

SS: split spoon sample

AS: auger sample

GS: grab sample

FV: shear vane

DP: direct push

PMT: pressuremeter test

ST: shelby tube

CORE: soil coring

RUN: rock coring

SYMBOLS & ABBREVIATIONS

MC: moisture content

LL: liquid limit

PL: plastic limit

NP: non-plastic

γ: soil unit weight (bulk)

G_s: specific gravity

S_u: undrained shear strength

▽ unstabilized water level

▼ 1st water level measurement

▼ 2nd water level measurement most recent

▼ water level measurement

ENVIRONMENTAL SAMPLES

M&I: metals and inorganic parameters

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

VOC: volatile organic compound

PHC: petroleum hydrocarbon

BTEX: benzene, toluene, ethylbenzene and xylene

PPM: parts per million

FIELD MOISTURE (based on tactile inspection)

DRY: no observable pore water

MOIST: inferred pore water, not observable (i.e. grey, cool, etc.)

WET: visible pore water

COHESIONLESS

Relative Density	N-Value
Very Loose	<4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	>50

COHESIVE

Consistency	N-Value	Su (kPa)
Very Soft	<2	<12
Soft	2 - 4	12 - 25
Firm	4 - 8	25 - 50
Stiff	8 - 15	50 - 100
Very Stiff	15 - 30	100 - 200
Hard	>30	>200

COMPOSITION

Term	% by weight
trace silt	<10
some silt	10 - 20
silt***y***	20 - 35
sand ***and*** silt	>35

ASTM STANDARDS

ASTM D1586 Standard Penetration Test (SPT)
Driving a 51 mm O.D. split-barrel sampler ("split spoon") into soil with a 63.5 kg weight free falling 760 mm. The blows required to drive the split spoon 300 mm ("bpf") after an initial penetration of 150 mm is referred to as the N-Value.

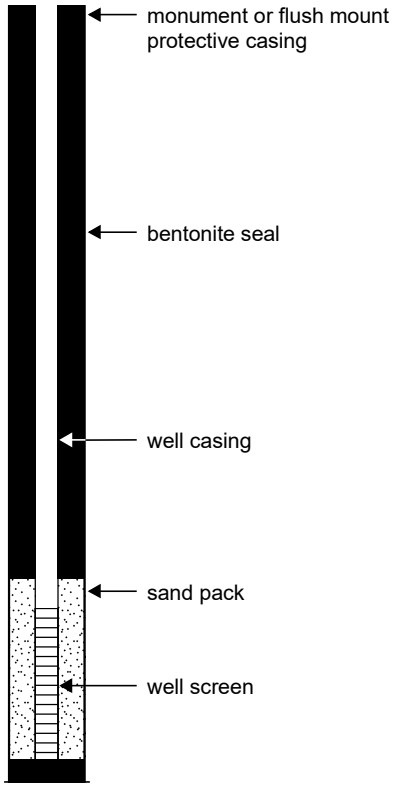
ASTM D3441 Cone Penetration Test (CPT)
Pushing an internal still rod with a outer hollow rod ("sleeve") tipped with a cone with an apex angle of 60° and a cross-sectional area of 1000 mm^2 into soil. The resistance is measured in the sleeve and at the tip to determine the skin friction and the tip resistance.

ASTM D2573 Field Vane Test (FVT)
Pushing a four blade vane into soil and rotating it from the surface to determine the torque required to shear a cylindrical surface with the vane. The torque is converted to the shear strength of the soil using a limit equilibrium analysis.

ASTM D1587 Shelby Tubes (ST)
Pushing a thin-walled metal tube into the in-situ soil at the bottom of a borehole, removing the tube and sealing the ends to prevent soil movement or changes in moisture content for the purposes of extracting a relatively undisturbed sample.

ASTM D4719 Pressuremeter Test (PMT)
Place an inflatable cylindrical probe into a pre-drilled hole and expanding it while measuring the change in volume and pressure in the probe. It is inflated under either equal pressure increments or equal volume increments. This provides the stress-strain response of the soil.

WELL LEGEND



GROUNDED ENGINEERING

Date Started : Jun 1, 2020
Position : E: 610053, N: 4841182 (UTM 17T)
Elev. Datum : Geodetic

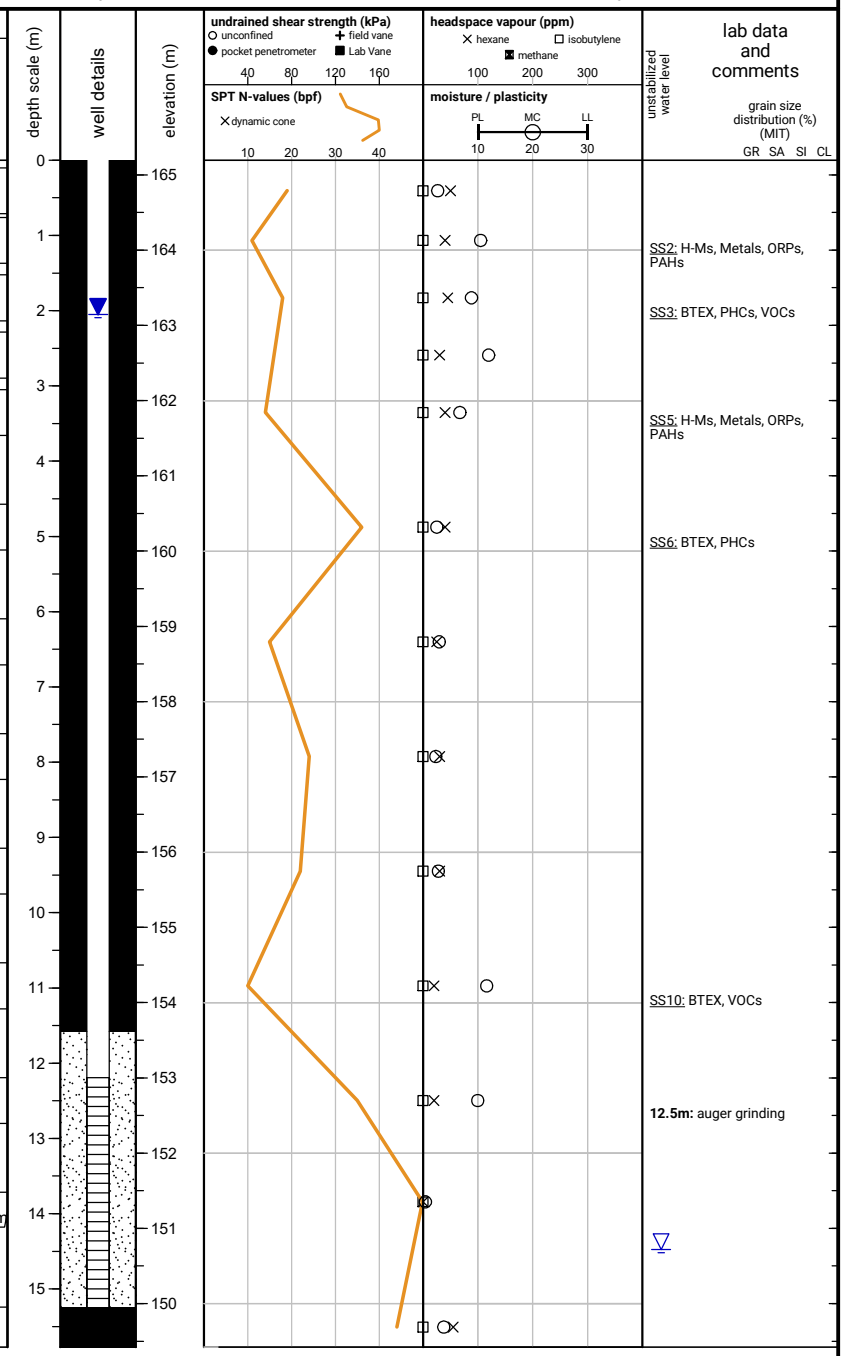
BOREHOLE LOG 101

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : *CME 75*

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	sample number	sample type	SPT N-value
165.2	**GROUND SURFACE**				
	100mm **ASPHALT**		1	SS	19
164.4	**FILL**, sand and gravel, trace asphalt, trace aggregate, compact, dark brown, moist				
0.8	**SILTY CLAY**, trace to some sand, trace gravel, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		2	SS	11
			3	SS	18
			4	SS	16
	...at 3.0 m, grey		5	SS	14
	...at 4.6 m, hard to 6.1 m		6	SS	36
			7	SS	15
	...at 7.6 m, sand seams		8	SS	24
	...at 9.1 m, sand seams		9	SS	22
154.5					
10.7	**SILT AND CLAY**, some sand, trace gravel, clay nodules, stiff, grey, moist		10	SS	10
	...at 12.2 m, hard		11	SS	35
151.5					
13.7	**SANDY SILT**, some gravel, trace shale and limestone fragments, very dense, grey, dry (GLACIAL TILL)		12	SS	50 / 100mm
	...at 15.2 m, clayey silt seams, dense, moist		13	SS	44
149.4					
15.8	**END OF BOREHOLE**				



Unstabilized water level measured at 14.5 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	1.8	163.4
Jul 8, 2020	1.8	163.4
Aug 7, 2020	1.8	163.4
Sep 11, 2020	1.5	163.7
Oct 8, 2020	1.6	163.6
Nov 6, 2020	2.1	163.1
May 11, 2022	2.1	163.1

file: 19-040 rev1.gpj

Tech : JN | **PM** : TA | **Rev** : JC

BOREHOLE LOG 102

Date Started : Jun 3, 2020
Position : E: 610098, N: 4841248 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

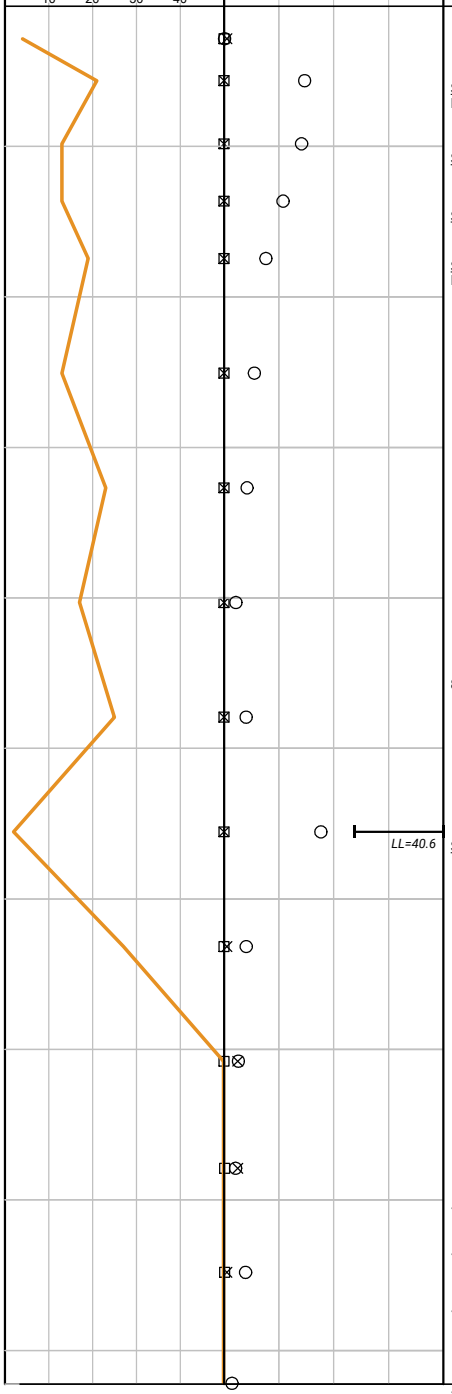
drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
165.9	**GROUND SURFACE**				
	75mm **ASPHALT**		1	SS	4
165.1	50mm **AGGREGATE**				
0.8	**FILL**, sand and gravel, trace aggregate, loose, light brown, wet		2	SS	21
	SILTY CLAY, some sand, trace gravel, silt nodules, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	13
	...at 2.3 m, sand seam		4	SS	13
	...at 3.0 m, orangey brown to grey		5	SS	19
	...at 4.6 m, grey		6	SS	13
	...at 7.6 m, sand seams		7	SS	23
	...at 9.1 m, sand seams		8	SS	17
155.2			9	SS	25
10.7	**SILT AND CLAY**, some sand, trace gravel, clay nodules, soft, grey, moist		10	SS	2
153.7				FV	
12.2	**SANDY SILT**, some gravel, some clay, trace shale and limestone fragments, compact, grey, moist (GLACIAL TILL)		11	SS	27
	...at 13.7 m, very dense		12	SS	63
149.1			13	SS	87 / 250mm
16.8	**INFERRED BEDROCK**, shale and limestone fragments, grey, moist		14	SS	50 / 125mm
147.6			15	SS	50 / 25mm
18.3	**END OF BOREHOLE**				

depth scale (m) | well details | elevation (m)

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40, 80, 120, 160
SPT N-values (bpf): dynamic cone; 10, 20, 30, 40
headspace vapour (ppm): hexane, isobutylene, methane; 100, 200, 300
moisture / plasticity: PL, MC, LL; 10, 20, 30



unstabilized water level

lab data and comments

grain size distribution (%) (MIT) GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs
SS3: BTEX, PHCs, VOCs
SS4: H-Ms, Metals, ORPs
SS5: BTEX, ORPs, PAHs, PHCs
8.8m: auger grinding
1 12 46 41
SS10: BTEX, VOCs
15.8m: auger grinding
16.5m: auger grinding
17.2m: auger grinding
18.3m: spoon bouncing

Unstabilized water level measured at 15.3 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	4.8	161.1
Jul 8, 2020	2.5	163.4
Aug 7, 2020	2.4	163.5
Sep 11, 2020	2.4	163.5
Oct 8, 2020	2.5	163.4
Nov 6, 2020	2.7	163.2
May 11, 2022	2.7	163.2

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 2, 2020
Position : E: 610076, N: 4841274 (UTM 17T)
Elev. Datum : Geodetic

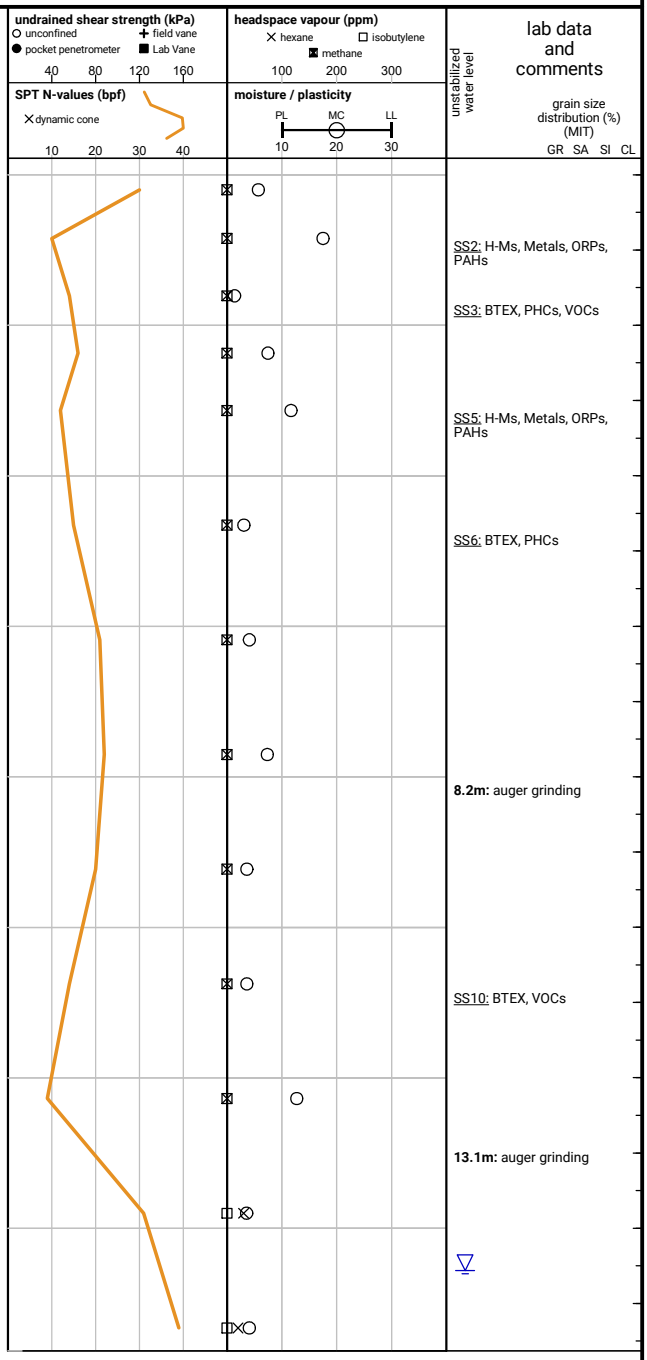
BOREHOLE LOG 103

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev / depth (m)	description	number	type	SPT N-value
166.2	**GROUND SURFACE**			
	90mm **ASPHALT**	1	SS	30
165.4	25mm **AGGREGATE**			
0.8	**FILL**, sand and gravel to sandy silt, trace asphalt, trace aggregate, compact, brown, moist	2	SS	10
	SILTY CLAY, some sand, trace gravel, silt nodules, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)	3	SS	14
	...at 1.5 m, sandy, trace rock fragments	4	SS	16
	...at 2.3 m, sand seam	5	SS	12
	...at 4.6 m, grey	6	SS	15
	...at 6.1 m, trace rock fragments	7	SS	21
	...at 7.6 m, sand seams	8	SS	22
	...at 9.1 m, trace rock fragments, sand seams	9	SS	20
		10	SS	14
154.0				
12.2	**SILT AND CLAY**, some sand, trace gravel, clay nodules, stiff, grey, moist	11	SS	9
			FV	
152.5				
13.7	**SANDY SILT**, trace gravel, sand seams, dense, grey, moist (GLACIAL TILL)	12	SS	31
		13	SS	39
150.4				
15.8				



END OF BOREHOLE

Unstabilized water level measured at 14.8 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	2.8	163.4
Jul 8, 2020	2.8	163.4
Aug 7, 2020	2.9	163.3
Sep 11, 2020	3.0	163.2
Oct 8, 2020	2.9	163.3
Nov 6, 2020	2.9	163.3
May 11, 2022	2.6	163.6

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 4, 2020
Position : E: 610112, N: 4841277 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 104

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
165.8	**GROUND SURFACE**				
	50mm **ASPHALT**		1	SS	5
165.0	90mm **AGGREGATE**				
0.8	**FILL**, clayey silt, trace sand, trace gravel, firm, grey, moist		2	SS	12
	SILTY CLAY, some sand, trace gravel, silt nodules, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	17
	...at 2.3 m, sand seam		4	SS	21
	...at 3.0 m, grey		5	SS	15
	...at 3.6 m, sand seam				
			6	SS	16
	...at 6.1 m, sandy		7	SS	12
158.2					
7.6	**SILT AND CLAY**, some sand, trace gravel, clay nodules, very stiff, grey, moist		8	SS	19
			9	SS	29
	...at 10.7 m, firm		10	SS	4
				FV	
153.6					
12.2	**SANDY SILT**, some gravel, some clay, dense to very dense, grey, moist (GLACIAL TILL)		11	SS	35
	...at 13.7 m, trace shale fragments		12	SS	44
			13	SS	50 / 125mm
149.0					
16.8	**INFERRED BEDROCK**, shale and limestone fragments, grey, moist		14	SS	50 / 100mm
148.8					
17.0	**END OF BOREHOLE**				

depth scale (m): 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

well details

elevation (m): 165 164 163 162 161 160 159 158 157 156 155 154 153 152 151 150 149

undrained shear strength (kPa)
○ unconfined + field vane
● pocket penetrometer ■ Lab Vane
40 80 120 160

SPT N-values (bpf)
× dynamic cone
10 20 30 40

headspace vapour (ppm)
× hexane □ isobutylene
⊠ methane
100 200 300

moisture / plasticity
PL MC LL
10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)
GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs
SS3: BTEX, PHCs, VOCs
7 17 34 42
SS4: H-Ms, Metals, ORPs, PAHs
SS5: ORPs
SS6: BTEX, PHCs
SS11: BTEX, VOCs

Unstabilized water level measured at 13.7 m below ground surface upon completion of drilling.

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

BOREHOLE LOG 105

Date Started : Jun 10, 2020
Position : E: 610120, N: 4841312 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

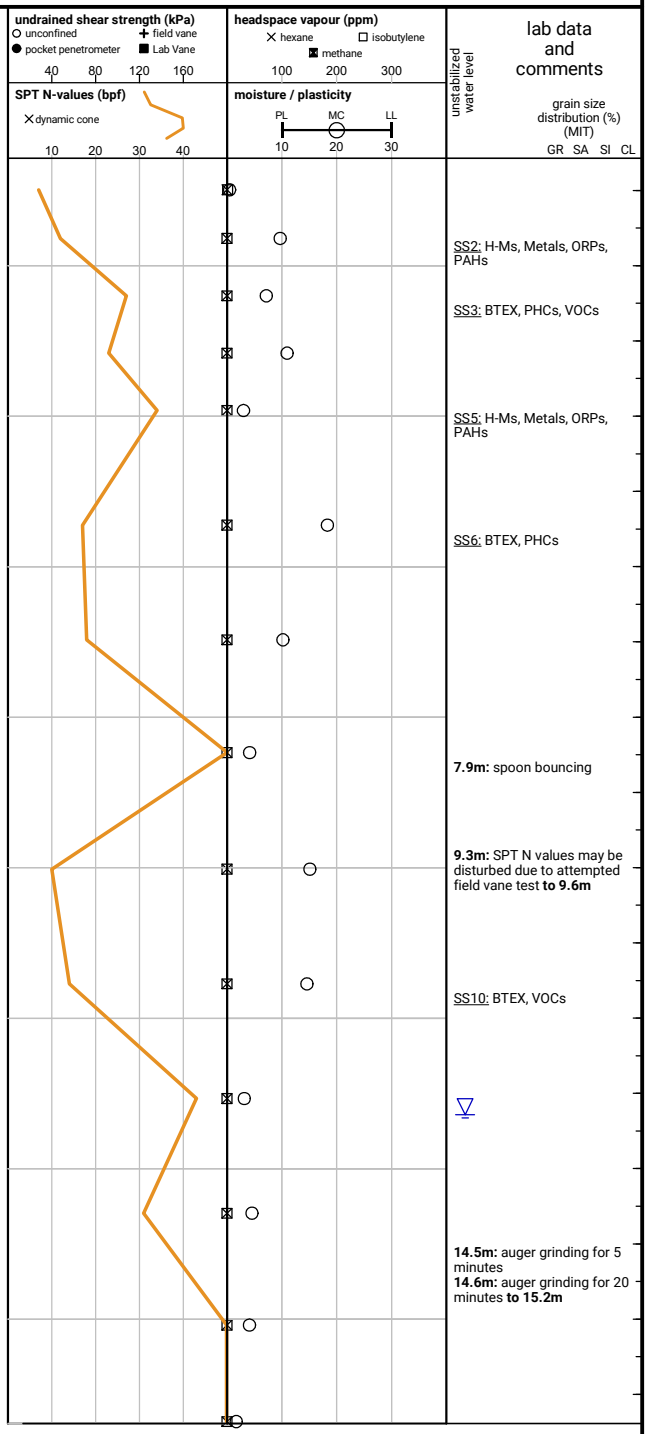
hollow stem augers (skinny) OD= 110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
165.4	**GROUND SURFACE**				
	50mm **ASPHALT**		1	SS	7
164.6	65mm **AGGREGATE**				
0.8	**FILL**, sand and gravel, trace aggregate, loose, light brown, dry		2	SS	12
	SILTY CLAY, some sand, trace gravel, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	27
			4	SS	23
	...at 3.0 m, hard, grey with some brown		5	SS	34
160.8					
4.6	**SILTY SAND**, compact, grey, wet		6	SS	17
159.3					
6.1	**SILTY CLAY**, some sand, trace gravel, very stiff to hard, grey, moist (GLACIAL TILL)		7	SS	18
	...at 7.6 m, trace shale fragments, very dense		8	SS	50
156.3					
9.1	**SILT AND CLAY**, some sand, trace gravel, clay nodules, stiff, grey, moist		9	SS	10
			10	SS	14
153.2					
12.2	**SANDY SILT**, some gravel, some clay, dense, grey, moist (GLACIAL TILL)		11	SS	43
			12	SS	31
150.2					
15.2	**INFERRED BEDROCK**, shale and limestone fragments, grey, dry		13	SS	85
148.6					
16.8			14	SS	50 / 50mm

END OF BOREHOLE

Unstabilized water level measured at 12.7 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen



GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	1.8	163.6
Jul 8, 2020	1.8	163.6
Aug 7, 2020	2.0	163.4
Sep 11, 2020	2.4	163.0
Oct 8, 2020	2.6	162.8
Nov 6, 2020	2.3	163.1
May 11, 2022	1.6	163.8

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 5, 2020
Position : E: 610144, N: 4841282 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 106

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

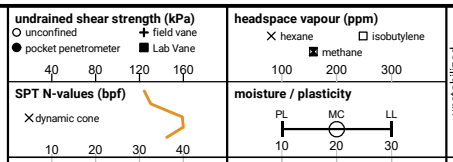
drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev / depth (m)	description	graphic log	number	type	SPT N-value
164.8	**GROUND SURFACE**				
	100mm **ASPHALT**		1	SS	3
163.8 / 1.0	**FILL**, sand and gravel to clayey silt, trace aggregate, loose / stiff, brown to dark grey, moist		2	SS	9
	SILTY CLAY, some sand, trace gravel, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	16
			4	SS	13
161.4 / 3.4			5A / 5B	SS	33
	SANDY SILT, some gravel, some clay, compact to dense, grey, moist (GLACIAL TILL)		6	SS	22
			7	SS	19
157.2 / 7.6			8	SS	10
	SILT AND CLAY, some sand, trace gravel, clay nodules, stiff, grey, moist				
	...at 9.1 m, trace rock fragments		9	SS	11
				FV	
154.1 / 10.7			10	SS	13
	SANDY SILT, gravelly, some clay, compact, grey, moist (GLACIAL TILL)				
			11	SS	15
	...at 13.7 m, very dense, wet		12	SS	50 / 125mm
149.3 / 15.5	...at 15.2 m, sand seam		13A / 13B	SS	88
	INFERRED BEDROCK, shale and limestone fragments, grey, moist				
147.7 / 17.1			14	SS	80 / 200mm

END OF BOREHOLE

Water level and cave not measured upon completion of drilling.



depth scale (m): 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

well details

elevation (m): 164 163 162 161 160 159 158 157 156 155 154 153 152 151 150 149 148

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)
GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs

SS3: BTEX, PHCs, VOCs

SS4: H-Ms, Metals, ORPs, PAHs

5B: ORPs

SS8: BTEX, PHCs

21 22 44 13

SS10: BTEX, VOCs

13.6m: auger grinding for 1.5 minutes **to 13.7m**

14.0m: auger grinding for 1 minute

14.6m: auger grinding for 2 minutes

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

BOREHOLE LOG 107

Date Started : Jun 8, 2020
Position : E: 610140, N: 4841238 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

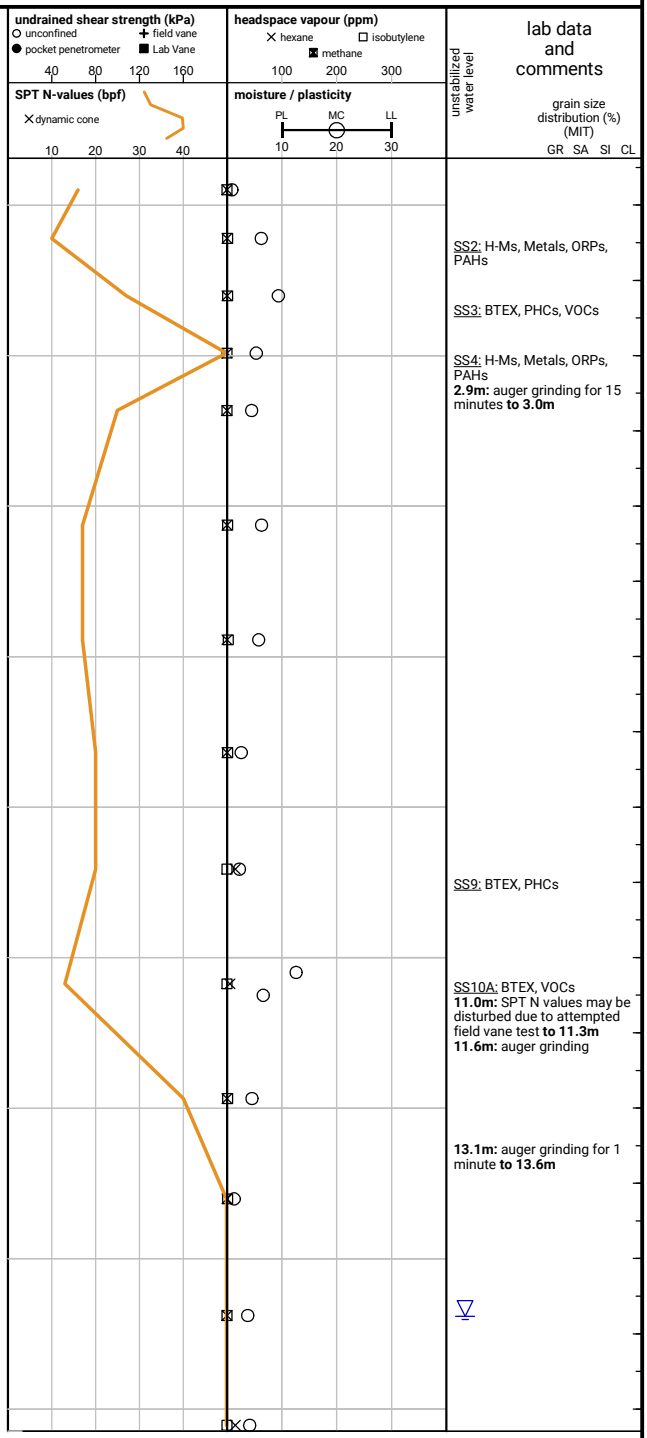
hollow stem augers (skimmy) OD=110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
164.6	**GROUND SURFACE**				
	100mm **ASPHALT**		1	SS	16
	FILL, sand and gravel to sand and silt, trace clay, compact, brown to dark grey, dry to moist		2	SS	10
163.1 / 1.5	...at 1.5 m, trace rock fragments		3	SS	27
	SANDY SILT, some gravel, some clay, compact, grey, moist (GLACIAL TILL)		4	SS	55
	...at 2.3 m, very dense to 3.0 m				
	...at 3.0 m, brownish grey		5	SS	25
	...at 4.6 m, grey		6	SS	17
			7	SS	17
			8	SS	20
153.9			9	SS	20
10.7 / 153.6	**SILT AND CLAY**, some sand, trace gravel, stiff, grey, moist		10A	SS	13
11.0			10B	SS	
	SANDY SILT, some gravel, some clay, compact to dense, grey, moist (GLACIAL TILL)		11	SS	40
	...at 13.7 m, very dense		12	SS	50 / 75mm
149.4 / 15.2	**INFERRED BEDROCK**, shale and limestone fragments, grey, dry		13	SS	83 / 150mm
147.7 / 16.9	...at 16.8 m, moist		14	SS	50 / 150mm

END OF BOREHOLE

Unstabilized water level measured at 15.4 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen



GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	2.8	161.8
Jul 8, 2020	1.2	163.4
Aug 7, 2020	1.2	163.4
Sep 11, 2020	1.2	163.4
Oct 8, 2020	1.3	163.3
Nov 6, 2020	1.5	163.1
May 11, 2022	1.3	163.3

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 9, 2020
Position : E: 610138, N: 4841210 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 108

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	sample number	sample type	SPT N-value
164.3	**GROUND SURFACE**				
	100mm **ASPHALT**		1	SS	46
	FILL, sand and gravel to sandy silt, trace rootlets, trace aggregate, dense, light brown to dark grey, moist ...at 0.8 m, compact		2	SS	18
			3	SS	10
162.0					
2.3	**SANDY SILT**, some gravel, some clay, loose, brown, moist (WEATHERED)		4	SS	5
161.3					
3.0	**SANDY SILT**, some gravel, some clay, compact, brown, moist (GLACIAL TILL)		5	SS	22
	...at 4.6 m, grey		6	SS	22
			7	SS	22
			8	SS	13
155.2					
9.1	**SILT AND CLAY**, some sand, trace gravel, stiff, grey, moist		9	SS	14
153.6					
10.7	**SANDY SILT**, some gravel, trace shale and limestone fragments, very dense, grey, moist (GLACIAL TILL)		10	SS	93 / 200mm
			11	SS	50 / 100mm
150.6					
13.7	**INFERRED BEDROCK**, shale and limestone fragments, grey, dry		12	SS	85 / 250mm
148.9					
15.4			13	SS	50 / 50mm

depth scale (m): 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

well details

elevation (m): 164 163 162 161 160 159 158 157 156 155 154 153 152 151 150 149

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40 80 120 160

SPT N-values (bpf): dynamic cone; 10 20 30 40

headspace vapour (ppm): hexane, isobutylene, methane; 100 200 300

moisture / plasticity: PL MC LL; 10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT): GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs
1.4m: auger grinding for 2 minutes **to 1.5m**

SS3: BTEX, PHCs, VOCs

SS5: BTEX, H-Ms, Metals, ORPs, PHCs

SS6: PAHs

7.3m: auger grinding for 5 minutes

SS10: BTEX, VOCs
10.8m: auger grinding for 15 minutes **to 10.9m**
11.0m: auger grinding for 10 minutes **to 11.6m**

15.4m: spoon bouncing

END OF BOREHOLE

Borehole was dry upon completion of drilling.

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 11, 2020
Position : E: 610123, N: 4841180 (UTM 17T)
Elev. Datum : Geodetic

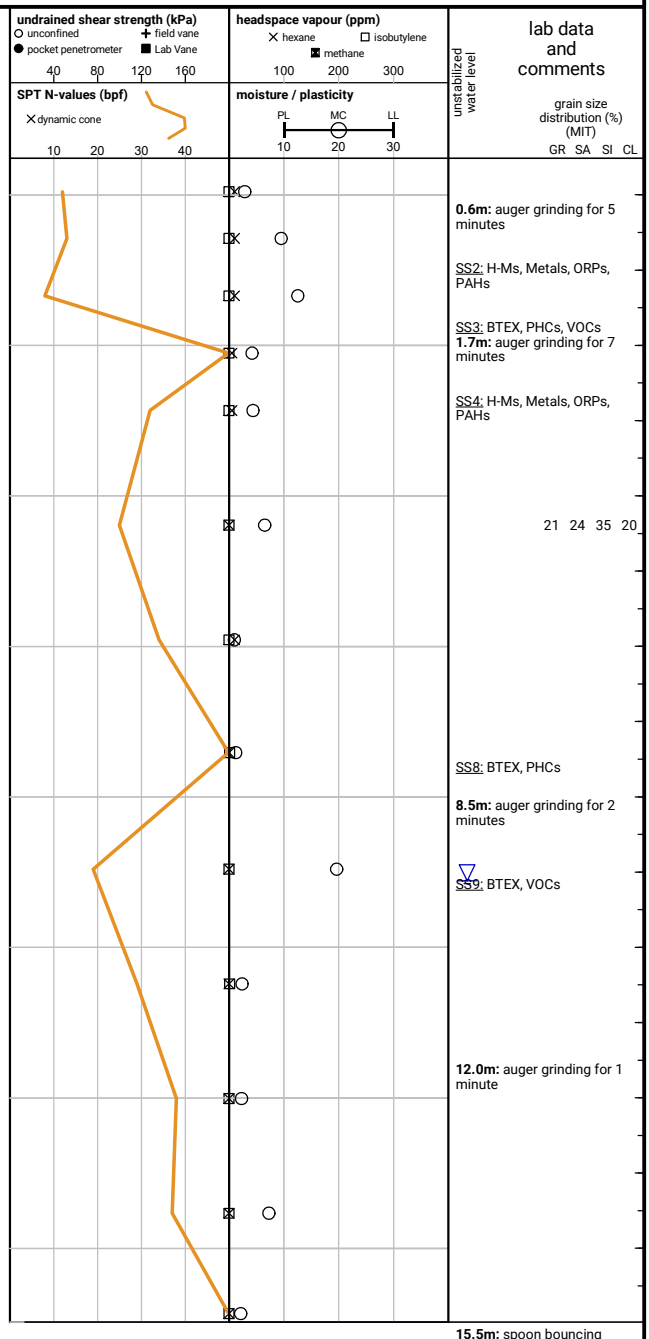
BOREHOLE LOG 109

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	sample number	sample type	SPT N-value
164.5	**GROUND SURFACE**				
	100mm **ASPHALT**		1	SS	12
	50mm **AGGREGATE**				
	FILL, sand and gravel to sandy silt, trace organics, trace asphalt, compact, light brown to dark grey, dry to moist		2	SS	13
163.0 / 1.5	**SANDY SILT**, some gravel, some clay, loose, brown with some orange, moist (GLACIAL TILL)		3	SS	8
	...at 2.3 m, very dense, light brown		4	SS	54
	...at 3.0 m, trace rock fragments, dense, greyish brown with some orange to 4.6 m		5	SS	32
	...at 4.6 m, gravelly, grey		6	SS	25
			7	SS	34
	...at 7.6 m, very dense		8	SS	77
155.4 / 9.1	**SILT AND CLAY**, some sand, trace gravel, very stiff, grey, moist		9	SS	19
	...at 9.6 m, sand seam, wet to 9.7 m				
153.8 / 10.7	**SAND AND SILT**, some gravel, trace shale and limestone fragments, compact to dense, grey, moist (GLACIAL TILL)		10	SS	29
			11	SS	38
	...at 13.7 m, sand seams		12	SS	37
149.0 / 15.5	...at 15.2 m, sand seams, very dense		13	SS	50 / 75mm



END OF BOREHOLE

Unstabilized water level measured at 9.6 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	1.8	162.7
Jul 8, 2020	1.9	162.6
Aug 7, 2020	1.9	162.6
Sep 11, 2020	2.0	162.5
Oct 8, 2020	2.1	162.4
Nov 6, 2020	2.5	162.0
May 11, 2022	2.0	162.5

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

BOREHOLE LOG 110

Date Started : Jun 12, 2020
Position : E: 610109, N: 4841186 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	sample number	sample type	SPT N-value
165.2	**GROUND SURFACE**				
	75mm **ASPHALT**		1	SS	4
	75mm **AGGREGATE**				
	FILL, sandy silt, trace gravel, trace asphalt, trace rootlets, loose, brown, moist		2	SS	10
			3	SS	6
162.9 / 2.3	**SANDY SILT**, some gravel, some clay, compact to dense, brown with some orange, moist (GLACIAL TILL)		4	SS	17
	...at 3.0 m, light brown		5	SS	37
	...at 4.6 m, trace shale fragmnets		6	SS	40
	...at 6.1 m, very dense to 7.6 m		7	SS	66
			8	SS	28
156.1 / 9.1	**SILT AND CLAY**, some sand, trace gravel, stiff, grey, moist		9	SS	8
				FV	
			10	SS	14
153.0 / 12.2	**SAND AND SILT**, some gravel, trace shale and limestone fragments, dense to very dense, grey, moist (GLACIAL TILL)		11	SS	41
			12	SS	78
150.0 / 15.2	**INFERRED BEDROCK**, shale and limestone fragments, grey, moist		13	SS	88 / 175mm
149.6 / 15.6	**END OF BOREHOLE**				

depth scale (m) 0–15; elevation (m) 165–150

well details: 50 mm dia. monitoring well installed. No. 10 screen

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40 80 120 160
SPT N-values (bpf): dynamic cone; 10 20 30 40
headspace vapour (ppm): hexane, isobutylene, methane; 100 200 300
moisture / plasticity: PL MC LL; 10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT) GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs

SS3: BTEX, PHCs, VOCs

SS5: H-Ms, Metals, ORPs, PAHs

SS7: BTEX, PHCs

7.3m: auger grinding for 3 minutes

SS10: BTEX, VOCs

12.8m: auger grinding for 10 minutes **to 13.1m**

13.4m: auger grinding for 20 minutes **to 13.7m**

15.6m: spoon bouncing

Unstabilized water level measured at 10.1 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	7.4	157.8
Jul 8, 2020	6.4	158.8
Aug 7, 2020	5.6	159.6
Sep 11, 2020	4.5	160.7
Oct 8, 2020	3.6	161.6
Nov 6, 2020	2.5	162.7
May 11, 2022	2.2	163.0

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

BOREHOLE LOG 111

Date Started : Jun 15, 2020
Position : E: 610074, N: 4841155 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD= 110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
164.9	**GROUND SURFACE**				
	75mm **ASPHALT**		1	SS	15
164.1	50mm **AGGREGATE**				
0.8	**FILL**, sand and gravel, trace aggregate, compact, light brown, dry		2	SS	16
	SANDY SILT, some gravel, some clay, compact, light brown, moist (GLACIAL TILL)		3	SS	24
			4	SS	17
	...at 3.0 m, sand seam, grey		5	SS	10
	...at 4.6 m, clayey, hard		6	SS	32
			7	SS	38
			8	SS	87
155.8					
9.1	**SILT AND CLAY**, some sand, trace gravel, stiff, grey, moist		9	SS	14
			10	SS	14
152.7					
12.2	**SAND AND SILT**, some gravel, trace shale and limestone fragments, dense to very dense, grey, wet (GLACIAL TILL)		11	SS	39
			12	SS	49
148.8					
16.1			13	SS	50 / 75mm

depth scale (m) 0–16

well details

elevation (m) 164–149

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40 80 120 160

SPT N-values (bpf): dynamic cone; 10 20 30 40

headspace vapour (ppm): hexane, isobutylene, methane; 100 200 300

moisture / plasticity: PL MC LL; 10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT) GR SA SI CL

SS1: H-Ms, Metals, ORPs, PAHs

SS2: BTEX, PHCs, VOCs

SS3: H-Ms, Metals, ORPs, PAHs

SS4: BTEX, PHCs

SS9: BTEX, VOCs

12.7m: spoon bouncing
12.8m: auger grinding for 6 minutes

END OF BOREHOLE

Unstabilized water level measured at 7.0 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

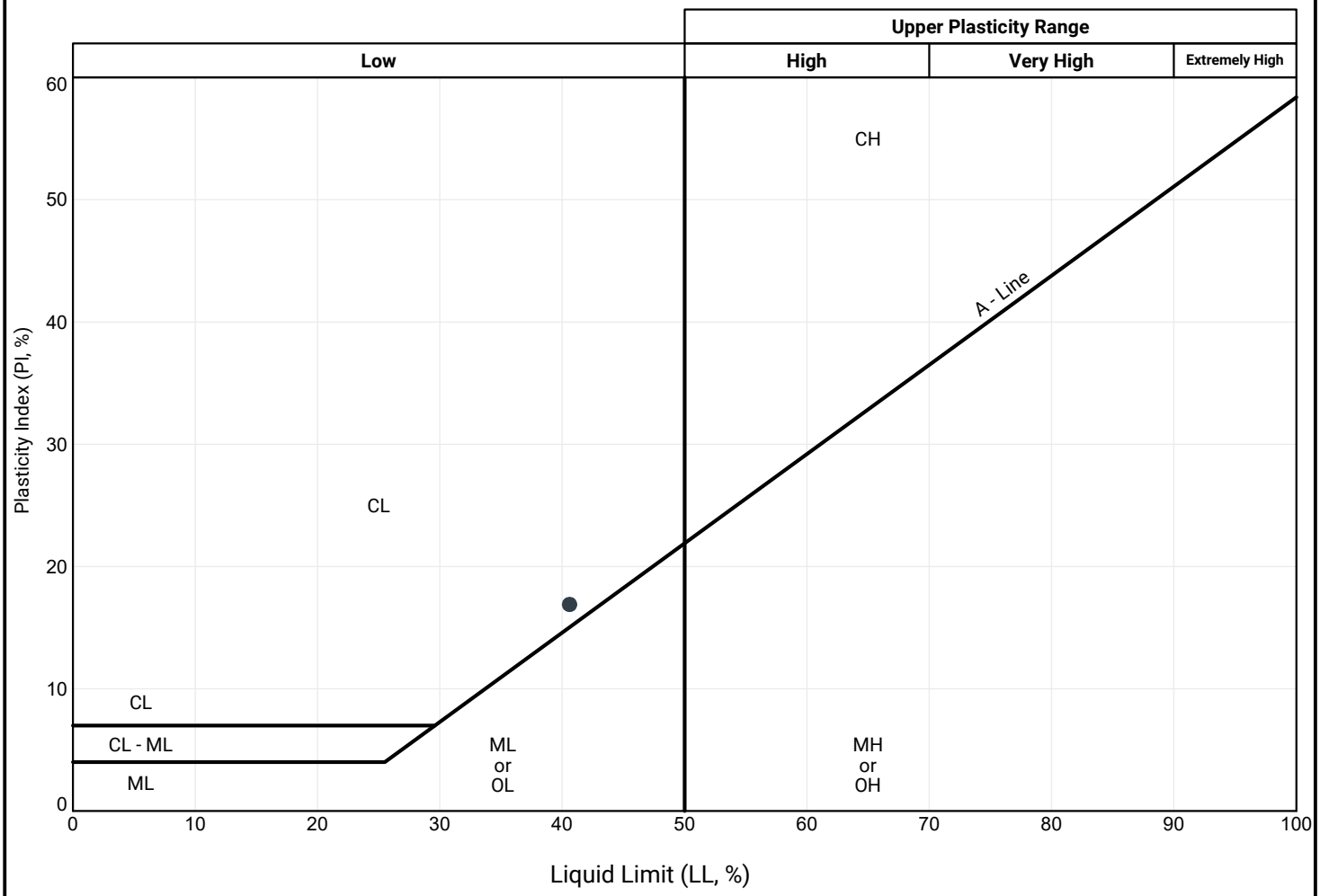
GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	1.4	163.5
Jul 8, 2020	1.6	163.3
Aug 7, 2020	1.6	163.3
Sep 11, 2020	1.8	163.1
Oct 8, 2020	1.8	163.1
Nov 6, 2020	1.6	163.3
May 11, 2022	1.5	163.4

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

APPENDIX B



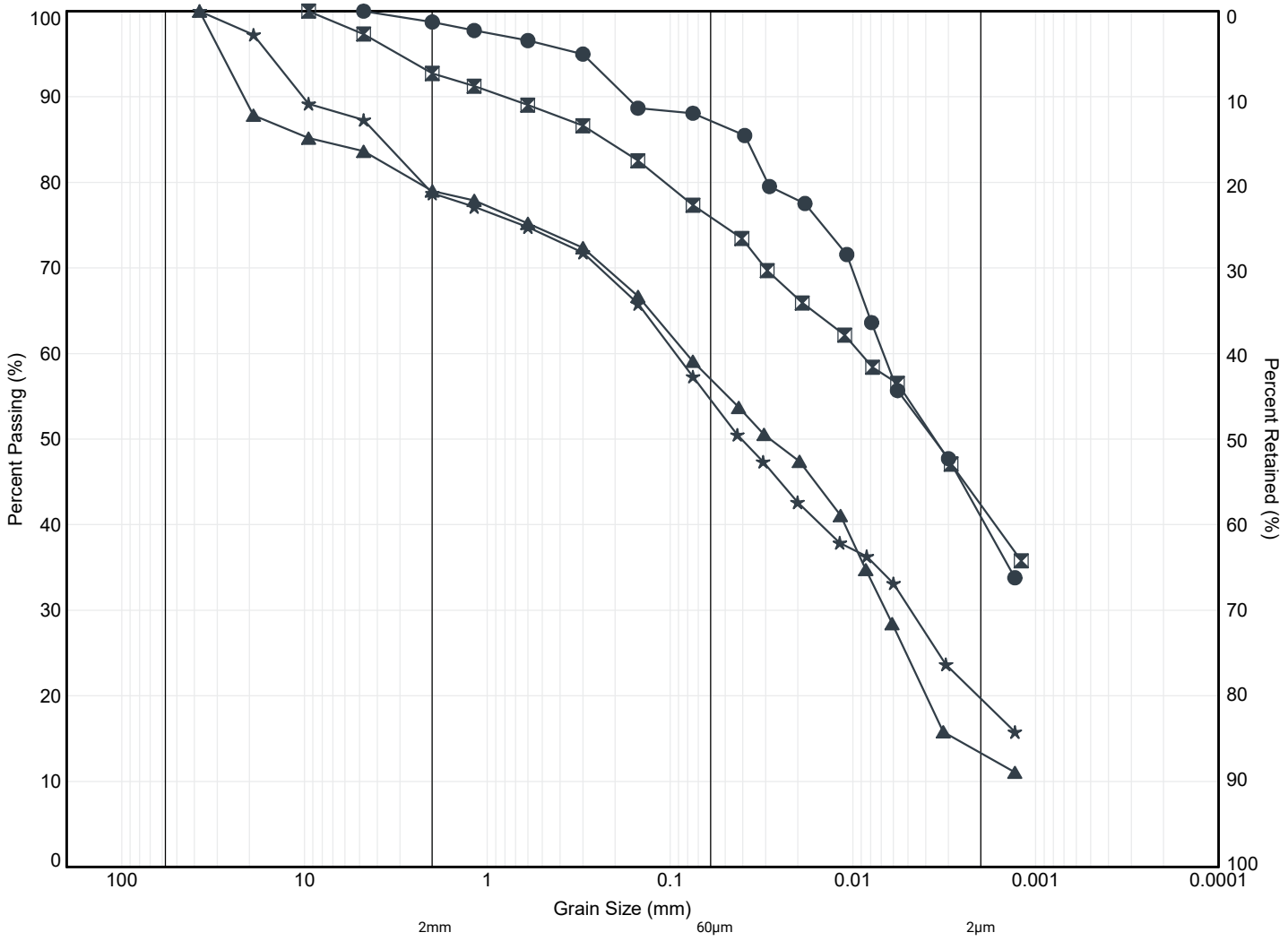
	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)
●	**102**	SS10	11.0	154.9	41	24	17

GROUNDED ENGINEERING

Title: **ATTERBERG LIMITS CHART**

File No.: **19-040**

file: 19-040 rev1.gpj



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	**102**	SS10	11.0	154.9	1	12	46	41
⊠	**104**	SS4	2.6	163.2	7	17	34	42
▲	**106**	SS10	11.0	153.8	21	22	44	13
★	**109**	SS6	4.9	159.6	21	24	35	20

GROUNDED ENGINEERING

Title: **GRAIN SIZE DISTRIBUTION**

File No.: **19-040**

file: 19-040 rev1.gpj

APPENDIX C

CORROSIVITY (SGS)

Report No. CA15946-JUN20
Customer Grounded Engineering Inc.
Attention Tarak Ali
Reference 19-040-101, Tarak Ali
Works#
Title Final Report

Sample ID		Analysis Start Date	Analysis Start Time	Analysis Completed Date	Analysis Completed Time	BH102-SS9	BH104-SS8	BH107-SS6	BH108-SS4
Sample Date/Time						24-Jun-20 17:30	24-Jun-20 17:30	24-Jun-20 17:30	24-Jun-20 17:30
Analysis	**Units**								
Corrosivity Index	none	06-Jul-20	15:16	06-Jul-20	15:16	8	8	8	6
Soil Redox Potential	mV	29-Jun-20	17:20	30-Jun-20	9:58	134	138	165	160
Sulphide	%	06-Jul-20	8:23	06-Jul-20	11:11	0.16	0.15	0.17	< 0.04
Moisture Content	%	29-Jun-20	14:11	30-Jun-20	12:28	9.0	10.6	12.2	18.5
pH	pH Units	29-Jun-20	8:51	30-Jun-20	8:22	8.75	8.96	8.65	8.05
Chloride	µg/g	29-Jun-20	23:39	30-Jun-20	12:55	15	37	54	190
Sulphate	µg/g	29-Jun-20	23:39	30-Jun-20	12:55	190	140	140	220
Conductivity	uS/cm	29-Jun-20	8:51	30-Jun-20	8:21	254	246	254	542
Resistivity (calculated)	ohms.cm	29-Jun-20	8:51	30-Jun-20	8:22	3940	4070	3940	1850

INTERPRETATION

AWWA C-105 Standard	Units	Points	Points	Points	Points
% Moisture	%	2	2	2	2
pH	pH Units	3	3	3	0
Redox Potential	mV	0	0	0	0
Resistivity	ohms.cm	0	0	0	1
Acid Volatile Sulphides	%	3.5	3.5	3.5	2
TOTAL SCORE (AWWA C-105)		**8.5**	**8.5**	**8.5**	**5**
Sample		**BH102-SS9**	**BH104-SS8**	**BH107-SS6**	**BH108-SS4**
Corrosion Protection Recommended?		**No**	**No**	**No**	**No**
Resistivity less than 2000 ohm.cm?		**No**	**No**	**No**	**YES**
Anions and Nutrients (Soil)					
Sulphate	%	0.019	0.014	0.014	0.022
CLASS OF EXPOSURE		**Negligible**	**Negligible**	**Negligible**	**Negligible**

FINAL REPORT

CA15946-JUN20 R1

19-040-101, 7085 Goreway Dr. Mississauga

Prepared for

Grounded Engineering Inc.

FINAL REPORT

First Page

CLIENT DETAILS

Client	Grounded Engineering Inc.
Address	12 Banigan Drive Toronto, Ontario M4H1E9. Canada
Contact	Tarak Ali
Telephone	647-264-7909
Facsimile	
Email	tali@groundedeng.ca
Project	19-040-101, 7085 Goreway Dr. Mississauga
Order Number	
Samples	Soil (4)

LABORATORY DETAILS

Project Specialist	Brad Moore Hon. B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2143
Facsimile	705-652-6365
Email	brad.moore@sgs.com
SGS Reference	CA15946-JUN20
Received	06/26/2020
Approved	07/06/2020
Report Number	CA15946-JUN20 R1
Date Reported	07/06/2020

COMMENTS

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present:Yes
Custody Seal Present:Yes

Chain of Custody Number:013605

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

Client: Grounded Engineering Inc.

Project: 19-040-101, 7085 Goreway Dr. Mississauga

Project Manager: Tarak Ali

Samplers: Tarak Ali

PACKAGE: **- Corrosivity Index** (SOIL)

			Sample Number	5	6	7	8
			Sample Name	BH102-SS9	BH104-SS8	BH107-SS6	BH108-SS4
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	24/06/2020	24/06/2020	24/06/2020	24/06/2020
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**
Corrosivity Index							
Corrosivity Index	none	1		8	8	8	6
Soil Redox Potential	mV	-		134	138	165	160
Sulphide	%	0.04		0.16	0.15	0.17	< 0.04
pH	pH Units	0.05		8.75	8.96	8.65	8.05
Resistivity (calculated)	ohms.cm	-9999		3940	4070	3940	1850

PACKAGE: **- General Chemistry** (SOIL)

			Sample Number	5	6	7	8
			Sample Name	BH102-SS9	BH104-SS8	BH107-SS6	BH108-SS4
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	24/06/2020	24/06/2020	24/06/2020	24/06/2020
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**
General Chemistry							
Conductivity	uS/cm	2		254	246	254	542

PACKAGE: **- Metals and Inorganics** (SOIL)

			Sample Number	5	6	7	8
			Sample Name	BH102-SS9	BH104-SS8	BH107-SS6	BH108-SS4
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	24/06/2020	24/06/2020	24/06/2020	24/06/2020
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**
Metals and Inorganics							
Moisture Content	%	0.1		9.0	10.6	12.2	18.5
Sulphate	µg/g	0.4		190	140	140	220

FINAL REPORT

CA15946-JUN20 R1

Client: Grounded Engineering Inc.

Project: 19-040-101, 7085 Goreway Dr. Mississauga

Project Manager: Tarak Ali

Samplers: Tarak Ali

PACKAGE: **- Other (ORP)** (SOIL)

Sample Number	5	6	7	8
Sample Name	BH102-SS9	BH104-SS8	BH107-SS6	BH108-SS4
Sample Matrix	Soil	Soil	Soil	Soil
Sample Date	24/06/2020	24/06/2020	24/06/2020	24/06/2020

Parameter	Units	RL		Result	Result	Result	Result
Other (ORP)							
Chloride	µg/g	0.4		15	37	54	190

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0632-JUN20	µg/g	0.4	<0.4	10	20	96	80	120	102	75	125
Sulphate	DIO0632-JUN20	µg/g	0.4	<0.4	4	20	96	80	120	103	75	125

Carbon/Sulphur

Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide	ECS0006-JUL20	%	0.04	< 0.04	ND	20	112	80	120			

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0485-JUN20	uS/cm	2	< 0.002	0	20	99	90	110	NA		

QC SUMMARY

pH

Method: SM 4500 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0485-JUN20	pH Units	0.05	NA	0		100			NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.
RL Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
NA The sample was not analysed for this analyte
ND Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

SGS Environment, Health & Safety - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 013605 Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Sarah Fu
Received By (signature):
Received Date: 06/26/2020 (mm/dd/yy)
Received Time: 15:40 (hr : min)
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Ice
Temperature Upon Receipt (°C): 1°C, 5°C, 9°C
LAB LIMS #: CA-15946-Jun20

REPORT INFORMATION

Company: Grounded Eng
Contact: Tarak Ali
Address: 12 Ranigan Dr.
Phone:
Fax:
Email: tali@groundedeng.ca

INVOICE INFORMATION

☒ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

Quotation #:
P.O. #:
Project #: 19-040-101
Site Location/ID: 7085 Goreway Dr. Mississauga

TURNAROUND TIME (TAT) REQUIRED

☒ Regular TAT (5-7days)
TAT's are quoted in business days (exclude statutory holidays & weekends).
Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

Regulation 153/04:
☐ Table 1 ☐ Res/Park Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium
☐ Table ____ ☐ Fine

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M&I: Metals & Inorganics (incl CrVI, CN,Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water)	M&I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M&I: ICP Metals only (Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni, Se,Ag,Tl,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs (all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides (Organochlorine or specify other	Other: Corrosivity	Other	Other	Other	Other	Other: Sewer Use: Specify pkg:	Other: Water Characterization Pkg General ☐ Extended ☐	TCLP: Specify TCLP tests ☐M&I ☐VOC ☐PCB ☐B(a)P ☐ABN ☐Ignit.	COMMENTS:
1	BH102-S59	06/24/20	17:30	1	Soil													X							
2	BH104-S58	↓	↓	↓	↓													X							
3	BH107-S56																	X							
4	BH108-S54																	X							
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

Observations/Comments/Special Instructions

Sampled By (NAME): Tarak Ali
Signature: TA
Date: 06/24/20 (mm/dd/yy)

Relinquished by (NAME): Tarak Ali
Signature: TA
Date: 06/24/20 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.2
Date of Issue: 09 Sept, 2019

APPENDIX D

Photograph 1

Position:	Valleyland
Direction/Object:	Up slope, towards property
Description:	The slope is present approximately at the edge of the property line. The existing building structure is visible in the tableland. The slope has an approximate height of 2 ±m and is vegetated with grass and young trees. No erosion was observed.

Photograph 2

Position:	Valleyland
Direction/Object:	Along pathway at slope toe
Description:	There is a metal fence along the slope crest, in a good state of maintenance. A public pathway known as “Malton Greenway” is present along the entire length of the toe of slope.

Photograph 3

Position:	Mimico Creek
Direction/Object:	Upstream
Description:	Mimico Creek is present approximately 15-25 ±m from the toe of slope. The bank of the creek is bare, with some erosion and undercutting. The creek flows from the north to the south in a meandering fashion.

SLOPE RATING CHART

GROUNDED ENGINEERING

Site Location: **7085 Goreway Dr, Mississauga**

File No. **19-040**

Property Owner:

Inspection Date: **April 9, 2020**

Inspected By: **T. Ali**

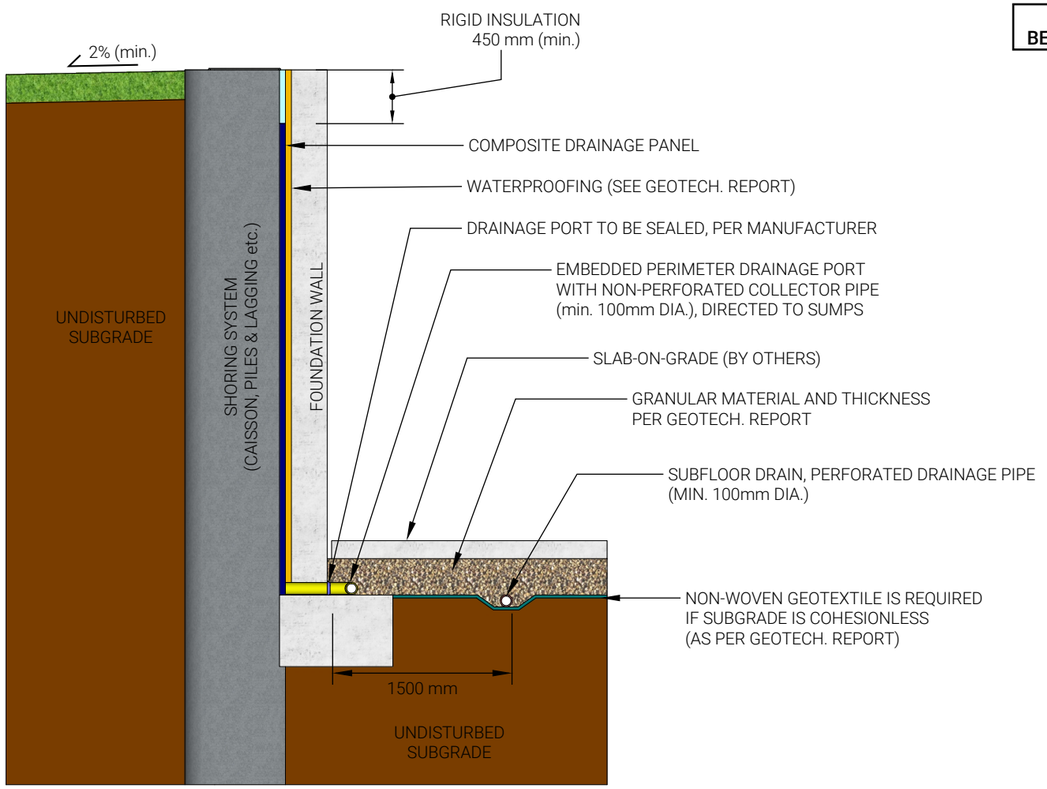
Weather: **sunny, 2 deg C**

				Rating Value
1.	**SLOPE INCLINATION**			
		degrees	**horiz. : vert.**	
	a)	18 or less	3 : 1 or flatter	(0)
	b)	18 - 26	2 : 1 to 3 : 1	6
	c)	more than 26	steeper than 2 : 1	16
2.	**SOIL STRATIGRAPHY**			
	a)	Shale, Limestone, Granite (Bedrock)		0
	b)	Sand, Gravel		6
	c)	Glacial Till		(9)
	d)	Clay, Silt		12
	e)	Fill		16
	f)	Leda Clay		24
3.	**SEEPAGE FROM SLOPE FACE**			
	a)	None or Near bottom only		(0)
	b)	Near mid-slope only		6
	c)	Near crest only or, From several levels		12
4.	**SLOPE HEIGHT**			
	a)	2 m or less		(0)
	b)	2.1 to 5 m		2
	c)	5.1 to 10 m		4
	d)	more than 10 m		8
5.	**VEGETATION COVER ON SLOPE FACE**			
	a)	Well vegetated; heavy shrubs or forested with mature trees		0
	b)	Light vegetation; Mostly grass, weeds, occasional trees, shrubs		(4)
	c)	No vegetation, bare		8
6.	**TABLE LAND DRAINAGE**			
	a)	Table land flat, no apparent drainage over slope		(0)
	b)	Minor drainage over slope, no active erosion		2
	c)	Drainage over slope, active erosion, gullies		4
7.	**PROXIMITY OF WATERCOURSE TO SLOPE TOE**			
	a)	15 metres or more from slope toe		(0)
	b)	Less than 15 metres from slope toe		6
8.	**PREVIOUS LANDSLIDE ACTIVITY**			
	a)	No		(0)
	b)	Yes		6
				TOTAL
				13

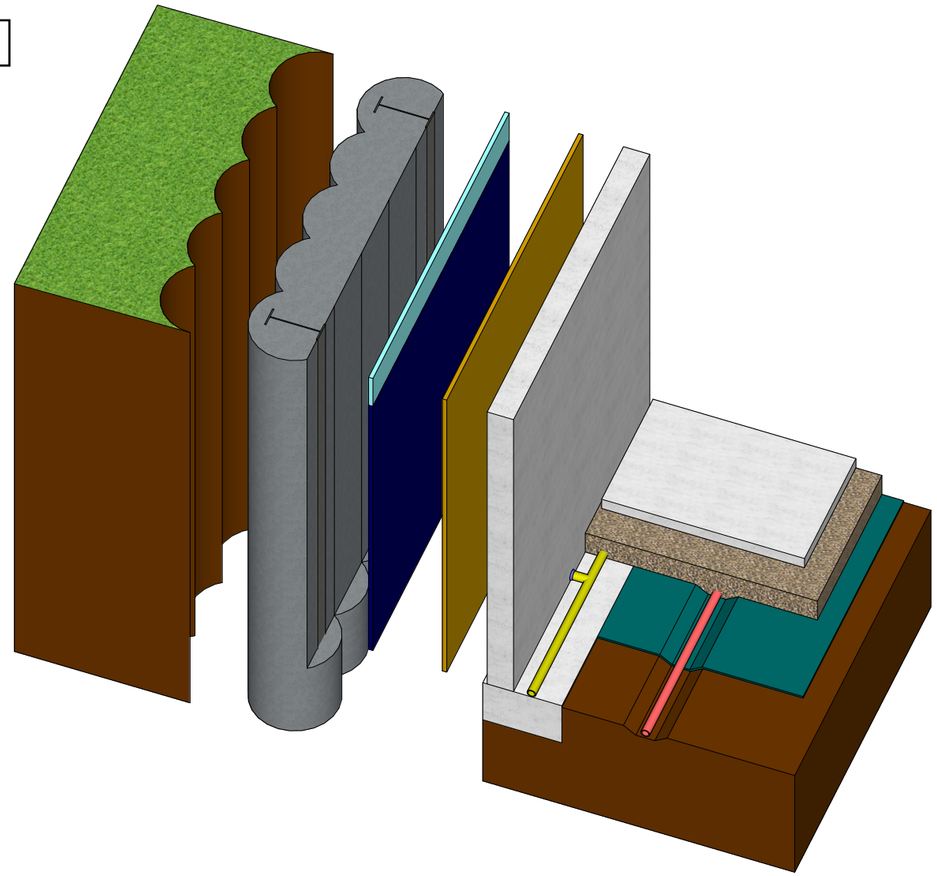
	SLOPE INSTABILITY RATING	**RATING VALUES TOTAL**	**INVESTIGATION REQUIREMENTS**
(1.)	Low potential	< 24	Site inspection only, confirmation, report letter.
2.	Slight potential	25-35	Site inspection and surveying, preliminary study, detailed report.
3.	Moderate potential	> 35	Boreholes, piezometers, lab tests, surveying, detailed report.

NOTES:
a) Choose only one from each category; compare total rating value with above requirements.
b) If there is a water body (stream, creek, river, pond, bay, lake) at the slope toe; the potential for toe erosion and undercutting should be evaluated in detail and, protection provided if required.

APPENDIX E



OBJECTS ARE COLOR-CODED BETWEEN TWO VIEWS FOR CLARITY



SECTIONAL VIEW

ISOMETRIC VIEW

SUBFLOOR DRAINAGE SYSTEM

1. THE SUBFLOOR DRAINS SHOULD BE SET IN PARALLEL ROWS, IN ONE DIRECTION, AND SPACED AS PER THE GEOTECHNICAL REPORT.
2. THE INVERT OF THE PIPES SHOULD BE A MINIMUM OF 300mm BELOW THE UNDERSIDE OF THE SLAB-ON-GRADE.
3. A CAPILLARY MOISTURE BARRIER (I.E. DRAINAGE LAYER) CONSISTING OF A MINIMUM 200 mm LAYER OF CLEAR STONE (OPSS MUNI 1004) COMPACTED TO A DENSE STATE (OR AS PER THE GEOTECHNICAL REPORT). WHERE VEHICULAR TRAFFIC IS REQUIRED, THE UPPER 50 mm OF THE CAPILLARY MOISTURE BARRIER MAY BE REPLACED WITH GRANULAR A (OPSS MUNI 1010) COMPACTED TO A MINIMUM 98% SPMDD.
4. A NON-WOVEN GEOTEXTILE MUST SEPARATE THE SUBGRADE FROM THE SUBFLOOR DRAINAGE LAYER IF THE SUBGRADE IS COHESIONLESS. THE NON-WOVEN GEOTEXTILE MAY CONSIST OF TERRAFIX 360R OR AN APPROVED EQUIVALENT.

PERIMETER DRAINAGE SYSTEM

1. FOR A DISTANCE OF 1.2m FROM THE BUILDING, THE GROUND SURFACE SHOULD HAVE A MINIMUM 2% GRADE.
2. PREFABRICATED COMPOSITE DRAINAGE PANEL (CONTINUOUS COVER, AS PER MANUFACTURER'S REQUIREMENTS) IS RECOMMENDED BETWEEN THE BASEMENT WALL AND RIGID SHORING WALL. THE DRAINAGE PANEL MAY CONSIST OF MIRADRAIN 6000 OR AN APPROVED EQUIVALENT.
3. PERIMETER DRAINAGE IS TO BE COLLECTED IN NON-PERFORATED PIPES AND CONVEYED DIRECTLY TO THE BUILDING SUMPS.
4. PERIMETER DRAINAGE PORTS SHOULD BE SPACED A MAXIMUM 3m ON-CENTRE. EACH PORT SHOULD HAVE A MINIMUM CROSS-SECTIONAL AREA OF 1500 mm2.

GENERAL NOTES

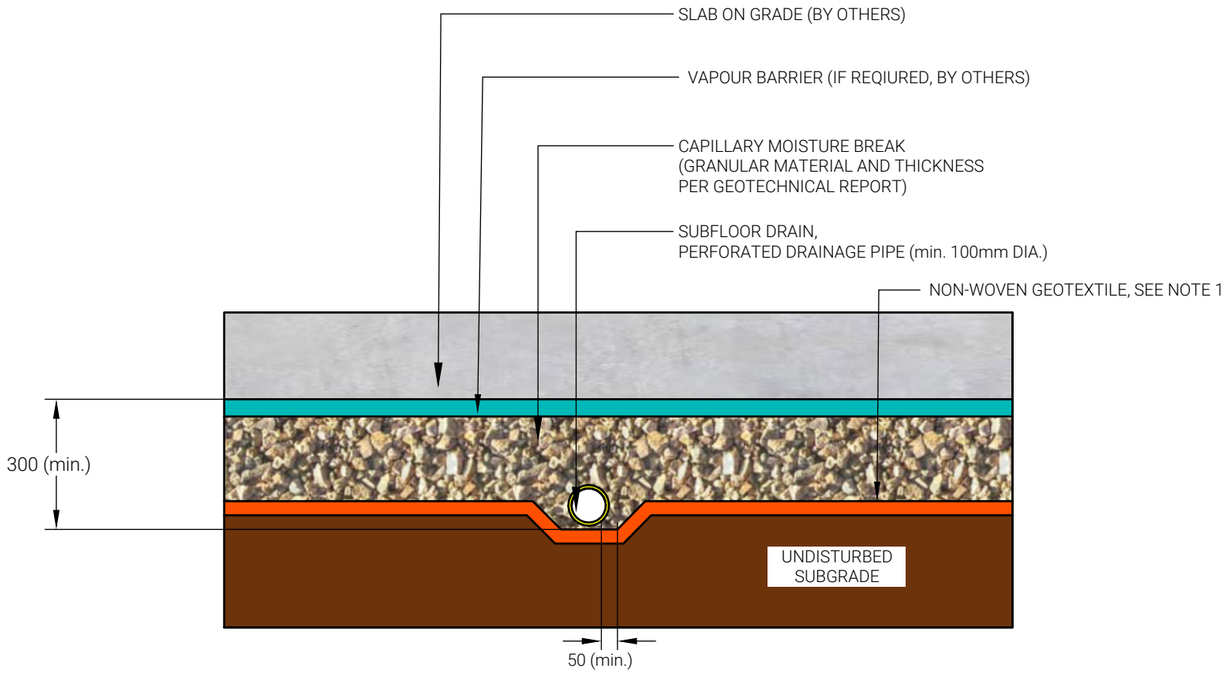
1. THERE SHOULD BE NO STRUCTURAL CONNECTION BETWEEN THE SLAB-ON-GRADE AND THE FOUNDATION WALL OR FOOTING.
2. THERE SHOULD BE NO CONNECTION BETWEEN THE SUBFLOOR AND PERIMETER DRAINAGE SYSTEMS.
3. THIS IS ONLY A TYPICAL BASEMENT DRAINAGE DETAIL. THE GEOTECHNICAL REPORT SHOULD BE CONSULTED FOR SITE SPECIFIC RECOMMENDATIONS.
4. THE FINAL BASEMENT DRAINAGE DESIGN SHOULD BE REVIEWED BY THE GEOTECHNICAL ENGINEER TO CONFIRM THE DESIGN IS ACCEPTABLE.

GROUNDED ENGINEERING

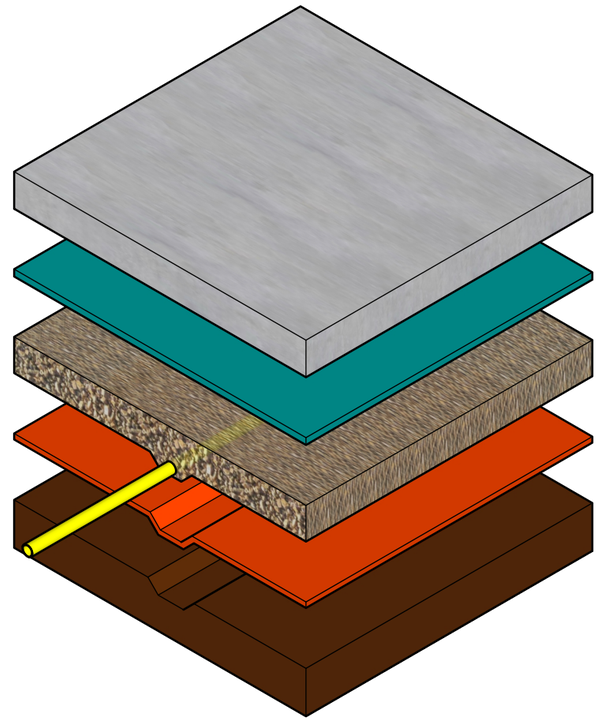
Title

BASEMENT DRAINAGE SHORING SYSTEM TYPICAL DETAILS

OBJECTS ARE COLOR-CODED BETWEEN TWO VIEWS FOR CLARITY



SECTIONAL VIEW



ISOMETRIC VIEW

NOTES

1. WHEN THE SUBGRADE CONSISTS OF COHESIONLESS SOIL, IT MUST BE SEPARATED FROM THE SUBFLOOR DRAINAGE LAYER USING A NON-WOVEN GEOTEXTILE (WITH AN APPARENT OPENING SIZE OF < 0.250mm AND A TEAR RESISTANCE OF > 200 N).

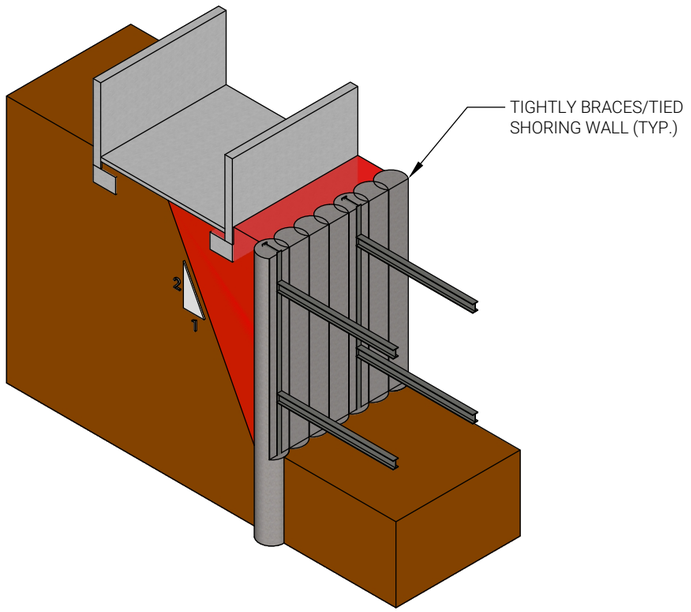
2. TYPICAL SCHEMATIC ONLY. MUST BE READ IN CONJUNCTION WITH GEOTECHNICAL REPORT.

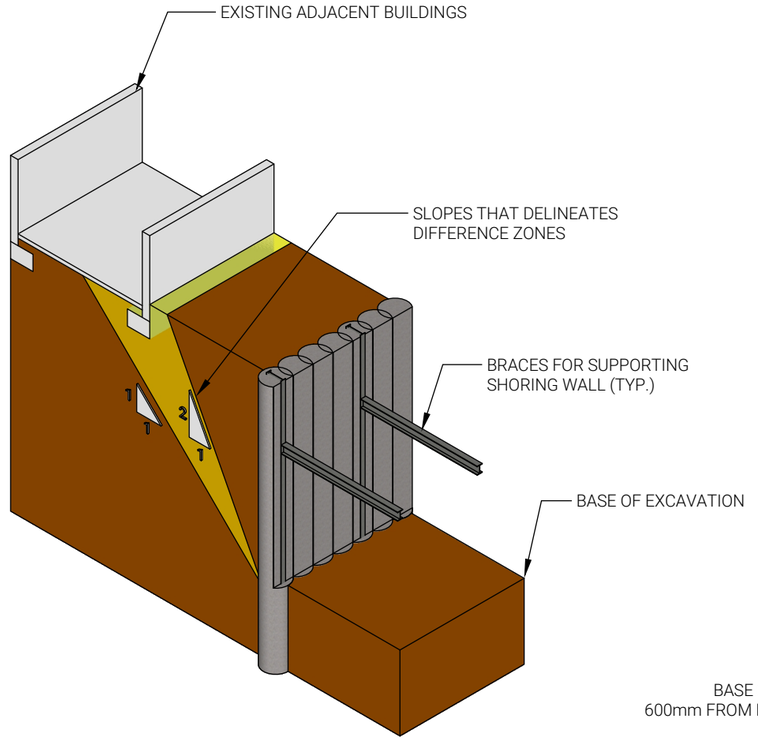
GROUNDED ENGINEERING

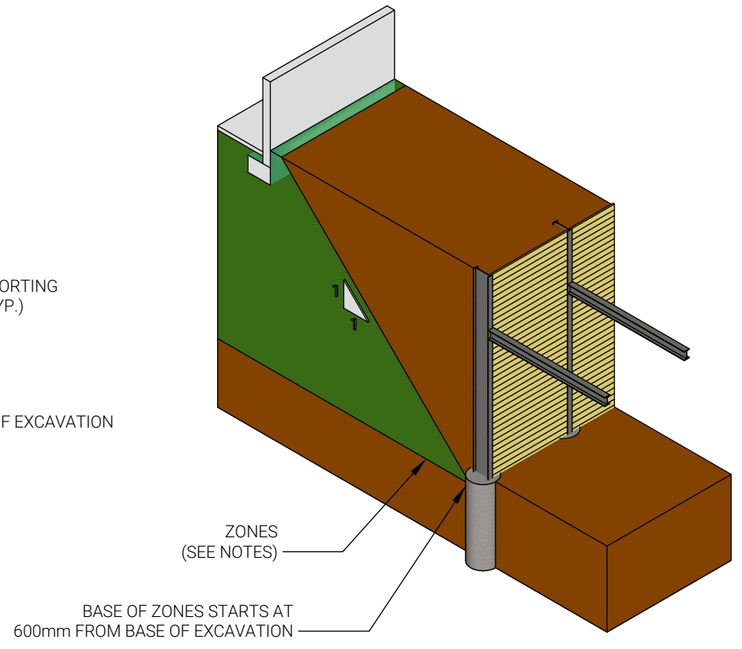
Title

BASEMENT SUBDRAIN TYPICAL DETAIL

APPENDIX F







ZONE A (RED)

FOUNDATIONS WITHIN THIS ZONE OFTEN REQUIRE UNDERPINNING OR SHORING SYSTEM. HORIZONTAL AND VERTICAL PRESSURES ON EXCAVATION WALL OF NON-UNDERPINNED FOUNDATION MUST BE CONSIDERED

ZONE B (YELLOW)

FOUNDATIONS WITHIN THIS ZONE OFTEN DO NOT REQUIRE UNDERPINNING BUT MAY REQUIRE SHORING SYSTEM. HORIZONTAL AND VERTICAL PRESSURES ON EXCAVATION WALL OF NON-UNDERPINNED FOUNDATION MUST BE CONSIDERED

ZONE C (GREEN)

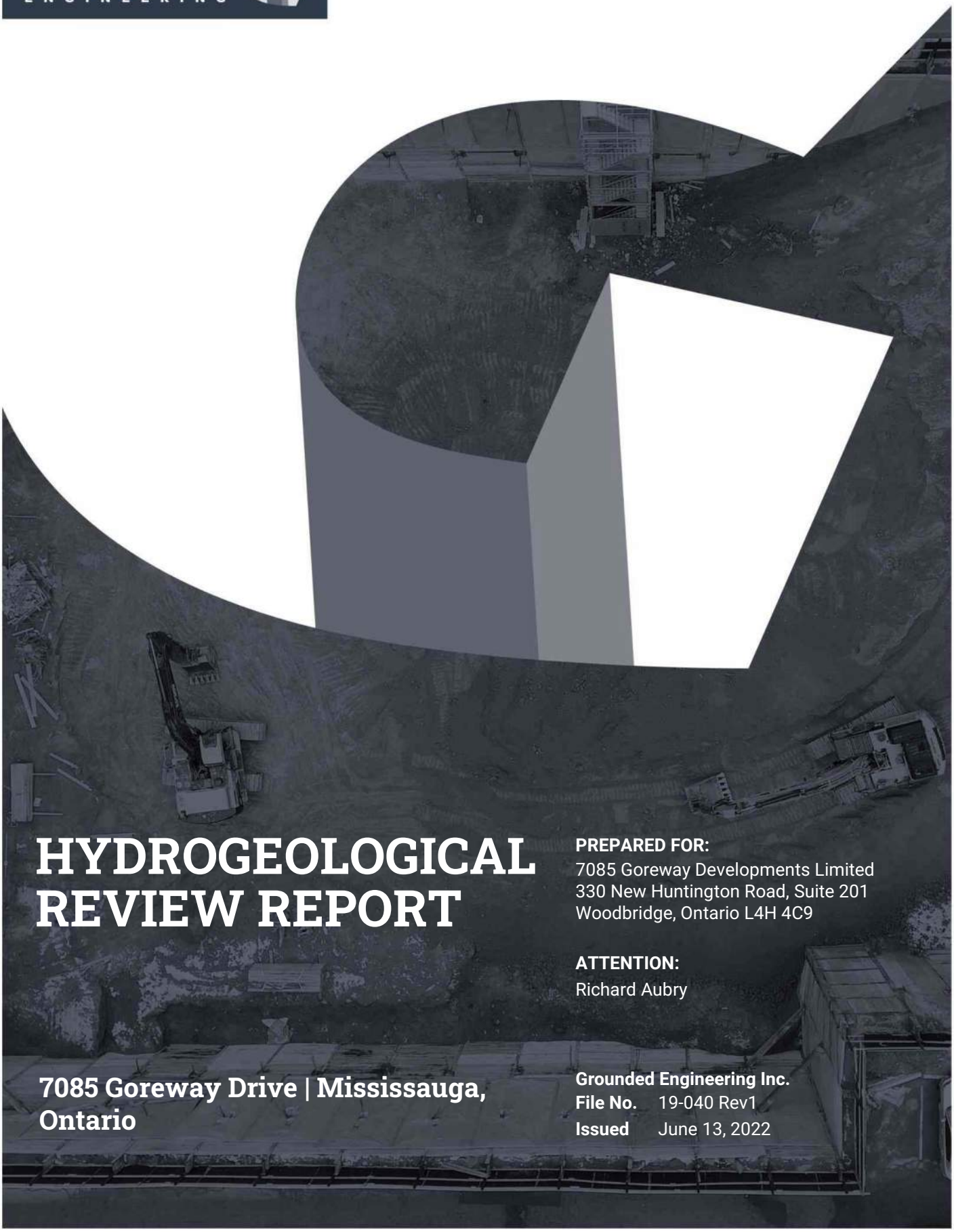
FOUNDATIONS WITHIN THIS ZONE USUALLY DO NOT REQUIRE UNDERPINNING OR SHORING SYSTEM

NOTES:
1. USER'S GUIDE - NBC 2005 STRUCTURAL COMMENTARIES (PART 4 OF DIVISION B) - COMMENTARY K.

GROUNDED ENGINEERING

Title

EXCAVATION ZONE OF INFLUENCE GUIDELINES



HYDROGEOLOGICAL REVIEW REPORT

PREPARED FOR:
7085 Goreway Developments Limited
330 New Huntington Road, Suite 201
Woodbridge, Ontario L4H 4C9

ATTENTION:
Richard Aubry

7085 Goreway Drive | Mississauga, Ontario

Grounded Engineering Inc.
File No. 19-040 Rev1
Issued June 13, 2022

Executive Summary

Grounded Engineering Inc. (Grounded) was retained by 7085 Goreway Developments Limited to conduct a Hydrogeological Review for the proposed redevelopment of 7085 Goreway Drive in Mississauga, Ontario (site). The conclusions of the investigation are summarized as follows:

Site Information

Existing Development

Site	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Foundations (masl)
			Depth (m)	Elevation (masl)	
7085 Goreway Drive	1.5	0	N/A	N/A	N/A

Proposed Development

Site	Above Grade Levels	Below Grade Levels			
		Level #	Lowest Finished Floor		Approximate Base of Foundations (masl)
			Depth (m)	Elevation (masl)	
Residential Tower	14	3	9.4±	155.8±	154.9±
Stacked Townhouses	4	3	9.4±	155.8±	154.9±

Site Conditions

Site Stratigraphy

Stratum/Formation	Aquifer or Aquitard	Bottom Depth Range (mbgs)	Bottom Elevation Range (masl)	Hydraulic Conductivity (m/s)	Method
Earth Fill	Aquifer	0.8 to 3.0	165.4 to 161.3	1×10^{-4}	Literature
Upper Till	Aquitard	7.6 to 12.2	158.2 to 153.9	3.58×10^{-8}	Slug Test
Silts and Clays	Aquitard	10.7 to 13.7	154.1 to 151.5	1×10^{-9}	Grain Size
Lower Till	Aquifer	13.7 to 16.8	150.6 to 148.8	1.27×10^{-7}	Slug Test
Georgian Bay Bedrock (weathered)	Aquifer	Below 18.3	Below 147.6	2.44×10^{-6}	Slug Test

Groundwater Elevation

Design Groundwater Elevation (masl)	163.8

Groundwater Quality

Sample ID	Sample Date	City of Mississauga Storm Sewer Limits	Region of Peel Sanitary and Combined Sewer Limits	Provincial Water Quality Objectives
SW-BH105	May 11, 2022	Exceeds	Meets	Exceeds

Groundwater Control

Stored Groundwater (pre-excavation/dewatering)					
Volume of Excavation (m^3)	Volume of Excavation Below Water Table (m^3)	Estimated Volume of Stored Groundwater		Estimated Volume of Available Groundwater	
		m^3	L	m^3	L
58,743	46,665	17,700	17,700,000	5,600	5,600,000

Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used						
	Estimated Groundwater Seepage		Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
	L/day	L/min	L/day	L/min	L/day	L/min
Permeable Shoring	15,000	10.4	138,000	95.8	153,000	106.3
Caisson Wall	5,000	3.5	138,000	95.8	143,000	99.3

Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used						
	Estimated Groundwater Seepage		Estimated Infiltrated Stormwater – Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
	L/day	L/min	L/day	L/min	L/day	L/min
Permeable Shoring	15,000	10.4	30,000	20.8	45,000	31.3
Caisson Wall	20,000	13.9	30,000	20.8	50,000	34.7

Land Stability		
	Short Term (Construction)	Long Term (Permanent)
Maximum Zone of Influence (m)	5	5
Maximum Potential Settlement (mm)	19	17

Regulatory Requirements	
Environmental Activity and Sector Registry (EASR) Posting	Required
Short Term Permit to Take Water (PTTW)	Not Required
Long Term Permit to Take Water (PTTW)	Not Required

TABLE OF CONTENTS

FIGURES

APPENDICES

1 Introduction

7085 Goreway Developments Limited has retained Grounded Engineering Inc. (“Grounded”) to provide hydrogeological engineering design advice for their proposed development at 7085 Goreway Drive, in Mississauga, Ontario.

Property Information	
Location of Site	7085 Goreway Drive, Mississauga, Ontario, L4T 3X6
Ownership of Site	7085 Goreway Developments Limited
Site Dimensions (m)	117 x 100 (approx.)
Site Area (m^2)	11, 704

Existing Development	
Number of Building Structures	One (1)
Number of Above Grade Levels	One and a half (1.5)
Number of Underground Levels	None
Sub-Grade Depth of Development (m)	N/A
Sub-Grade Area (m^2)	N/A
Land Use Classification	Commercial

Proposed Development	
Number of Building Structures	One (1) residential tower and a block of stacked townhouses
Number of Above Grade Levels	Tower: Fourteen (14) Townhouses: Four (4)
Number of Underground Levels	Three (3)
Sub-Grade Depth of Development (m)	9.4±
Sub-Grade Area (m^2)	5,462
Land Use Classification	Residential

Qualified Person and Hydrogeological Review Information	
Qualified Person	Matt Bielaski, P.Eng., QP_{RA-ESA}
Consulting Firm	Grounded Engineering Inc.
Date of Hydrogeological Review	June 13, 2022
Scope of Work	▪ Review of MECP Water Well Records for the area ▪ Review of geological information for the area ▪ Review of topographic information for the area ▪ Advancement of eleven (11) boreholes to a maximum depth of 18.3 m, which were instrumented with eight (8) monitoring wells ▪ Completion of slug tests in select available monitoring wells. Only monitoring wells that had sufficient water to perform the tests in June 2020 were tested ▪ Groundwater elevation monitoring for six (6) months on a monthly basis ▪ Groundwater sampling and analysis to the following criteria: o City of Mississauga Storm Sewer Limits o Region of Peel Sanitary and Combined Sewer Limits o Provincial Water Quality Objectives ▪ Assessment of groundwater controls and potential impacts ▪ Report preparation in accordance with Ontario Water Resources Act and Ontario Regulation 387/04

General Hydrogeological Characterization	
Site Topography	The site has an approximate ground surface elevation of 165.2 masl.
Local Physiographic Features	The site is located in the Bevelled Till Plains Physiographic Landform. The site is composed mostly of sandy silt till and silty clay till deposits.
Regional Physiographic Features	Eastern Portion of Property: modern alluvium comprised of clay, silt, sand, and gravel that may contain organic remains. Central and Western Portions of Property: Halton Till comprised of clayey silt to silt till derived from glaciolacustrine deposits or shale. Northwestern Portion of Property: glaciolacustrine deposits comprised of clay, silt, minor sand and gravel, massive to laminated silt and clay, may contain poorly sorted diamicton layers.
Watershed	The site is located within the Mimico Creek Watershed. Locally, groundwater is anticipated to flow east/southeast towards Mimico Creek.
Surface Drainage	Surface water is expected to flow towards municipal catch basins located on site.

2 Study Area Map

A map of the Study Area (250 m radius around the site) has been enclosed which shows the following information:

- All monitoring wells identified on site
- All monitoring wells identified off site within the study area
- All boreholes identified on site
- All buildings identified on site and within the study area
- The Site boundaries
- Any watercourses and drainage features within the study area.

3 Geology and Physical Hydrogeology

The site stratigraphy, including soil materials, composition and texture are presented in detail on the borehole logs in Appendix A. A summary of stratigraphic units that were encountered at the site are as follows:

Site Stratigraphy					
Stratum/Formation	**Aquifer or Aquitard**	**Bottom Depth Range (mbgs)**	**Bottom Elevation Range (masl)**	**Hydraulic Conductivity (m/s)**	**Method of Determination**
Earth Fill	Aquifer	0.8 to 3.0	165.4 to 161.3	1×10^{-4}	Literature[1]
Upper Till	Aquitard	7.6 to 12.2	158.2 to 153.9	3.58×10^{-8}	Slug Test
Silts and Clays	Aquitard	10.7 to 13.7	154.1 to 151.5	1×10^{-9}	Grain Size
Lower Till	Aquifer	13.7 to 16.8	150.6 to 148.8	1.27×10^{-7}	Slug Test
Georgian Bay Bedrock (weathered)	Aquifer	Below 18.3	Below 147.6	2.44×10^{-6}	Slug Test

Surface Water			
Surface Water Body	**Distance from site (m)**	**Direction from site**	**Hydraulically Connected to Site (yes/no)**
Mimico Creek	35 to 40	East to Southeast	yes

[1] Freeze and Cherry (1979)

4 Monitoring Well Information

Well ID	Well Diameter (mm)	Ground Surface (masl)	Top of Screen (masl)	Bottom of Screen (masl)	Screened Geological Unit
BH101	50	165.2	153.0	150.0	Clays and Silts/Lower Till
BH102	50	165.9	150.6	147.6	Lower Till/Bedrock
BH103	50	166.2	153.8	150.8	Clays and Silts/Lower Till
BH105	50	165.4	161.7	158.6	Upper Till
BH107	50	164.6	150.9	147.9	Lower Till/Bedrock
BH109	50	164.5	156.9	153.8	Upper Till/Clays and Silts
BH110	50	165.2	160.6	157.6	Upper Till
BH111	50	164.9	163.4	160.4	Upper Till

5 Groundwater Elevations

Well ID	Groundwater Elevation (masl)							
	Jun 22, 2020	Jul 8, 2020	Aug 7, 2020	Sep 11, 2020	Oct 8, 2020	Nov 6, 2020	May 11, 2022	Maximum
BH101	163.4	163.4	163.4	163.7	163.6	163.1	163.1	**163.7**
BH102	161.1	163.4	163.5	163.5	163.4	163.2	163.2	**163.5**
BH103	163.4	163.4	163.3	163.2	163.3	163.3	163.6	**163.6**
BH105	163.6	163.6	163.4	163.0	162.8	163.1	163.8	**163.8**
BH107	161.8	163.4	163.4	163.4	163.3	163.1	163.3	**163.4**
BH109	162.7	162.6	162.6	162.5	162.4	162.0	162.5	**162.7**
BH110	157.8	158.8	159.6	160.7	161.6	162.7	163.0	**163.0**
BH111	163.5	163.3	163.3	163.1	163.1	163.3	163.4	**163.5**

The groundwater table for engineering design purposes is at Elev. 163.8 m. The groundwater table is present within all soil and rock units. The upper till and silts and clays units have a very low permeability and will yield only minor seepage in the long-term. However, the lower till unit will yield free-flowing water when penetrated.

Groundwater levels fluctuate with time depending on the amount of precipitation and surface runoff and may be influenced by known or unknown dewatering activities at nearby sites.

6 Aquifer Testing

6.1 Single Well Response Test (Slug Test)

The hydraulic conductivities from the monitoring wells were determined based on slug tests (single-well response tests). These tests involve rapid removal of water or addition of a "slug" which displaces a known volume of water from a single well, and then monitoring the water level in the well until it recovers. The results of the slug tests were analyzed using the Bouwer and Rice method (1976).

The hydraulic properties of the strata applicable to the site are as follows:

Well ID	Well Screen Elevation (masl)	Screened Geological Unit	Hydraulic Conductivity (m/s)
BH101	153.0 - 150.0	Clays and Silts/Lower Till	5.83×10^{-8}
BH102	150.6 - 147.6	Lower Till/Bedrock	1.28×10^{-6}
BH103	153.8 - 150.8	Clays and Silts/Lower Till	2.78×10^{-7}
BH105	161.7 - 158.6	Upper Till	1.27×10^{-7}
BH107	150.9 - 147.9	Lower Till/Bedrock	4.65×10^{-6}
BH109	156.9 - 153.8	Upper Till/Clays and Silts	1.70×18^{-8}
BH111	163.4 - 160.3	Upper Till	$2.13x\ 10^{-8}$

6.2 Soil Grain Size Distribution

The hydraulic conductivities of various soil types can also be estimated from grain size analyses. An assessment of the grain sizes was conducted using the excel-based tool, HydrogeoSieve XL (*HydrogeoSieve XL ver.2.2, J.F. Devlin, University of Kansas, 2015*). HydrogeoSieve XL compares the results of the grain size analyses against fifteen (15) different analytical methods.

Given our experience in the area as well as published literature, some of the geometric means provided for the soil were biased low by one or more methods. In these instances, the values determined by these methods were excluded from the mean. The table below illustrates the hydraulic conductivity values estimated from the mean of the analytical methods where the soil met the applicable analysis criteria.

Sample ID	Soil Description	Applicable Analysis Methods	Hydraulic Conductivity (m/s)
BH102 SS10	Silt and clay	Alyamani and Sen, Sauerbrei	1×10^{-9}
BH104 SS4	Silty clay till	Alyamani and Sen, Sauerbrei	1×10^{-9}
BH106 SS10	Sandy, gravelly silt till	Alyamani and Sen, Sauerbrei	7×10^{-8}
BH109 SS6	Sandy, gravelly silt till	Alyamani and Sen, Sauerbrei	5×10^{-8}

The results of the analyses are presented in Appendix D.

6.3 Literature

According to Freeze and Cherry (1979), the typical hydraulic conductivity of the strata investigated at the site are:

Stratum/Formation	Hydraulic Conductivity (m/s)
Earth Fill	10^{-2} to 10^{-6}
Silts	10^{-5} to 10^{-9}
Glacial Tills	10^{-6} to 10^{-12}
Clays	10^{-9} to 10^{-12}
Bedrock (Shale)	10^{-6} to 10^{-13}

7 Water Quality

One (1) unfiltered groundwater sample and one (1) filtered groundwater were collected and analyzed by a Canadian laboratory accredited and licensed by Standards Council of Canada and or Canadian Association for Laboratory Accreditation.

The samples were collected directly from monitoring well (BH105) on (May 11, 2022). For the filtered sample, a 0.2 µm field filter was used for the Total Metals parameters and a 0.45 µm field filter was used for the dissolved Mercury parameter. The samples were analyzed for the following parameters:

- City of Mississauga Storm Sewer By-Law 259-05 – Limits for Storm Sewer Discharge
- Region of Peel By-Law 53-2010 Table 1 – Limits for Sanitary Sewer Discharge
- Provincial Water Quality Objectives – Table 2 - General - July 1999 PIBS 3303E

A true copy of the analysis report, Certificate of Analysis and a chain of custody record for the sample are enclosed.

7.1 Results of Unfiltered Sample

The unfiltered groundwater sample **exceeded** the **Limits for Storm Sewer Discharge** for the following parameters:

- Total Suspended Solids (Limit 15 mg/L, Result 211 mg/L)
- Total Aluminum (Limit 1 mg/L, Result 2.69 mg/L)
- Total Arsenic (Limit 0.02 mg/L, Result 0.0243 mg/L)
- Total Manganese (Limit 0.05 mg/L, Result 0.110 mg/L)
- Total Zinc (Limit 0.163 mg/L, Result 0.04 mg/L)

The unfiltered groundwater sample **met** the **Limits for Sanitary and Combined Sewer Discharge** for all parameters analyzed.

The unfiltered groundwater sample **exceeded** the **Provincial Water Quality Objectives** for the following parameters:

- Anthracene (Limit 0.0000008 mg/L, Result < 0.0001 mg/L)
- Benz(a)anthracene (Limit 0.0000004 mg/L, Result < 0.0001 mg/L)
- Benzo(g,h,i)perylene (Limit 0.00000002 mg/L, Result < 0.0002 mg/L)
- Benzo(k)fluoranthene (Limit 0.0000002 mg/L, Result < 0.0001 mg/L)
- Chrysene (Limit 0.0000001 mg/L, Result < 0.0001 mg/L)
- Dibenz(a,h)anthracene (Limit 0.000002 mg/L, Result < 0.0001 mg/L)
- Fluoranthene (Limit 0.0000008 mg/L, Result < 0.0001 mg/L)
- Perylene (Limit 0.00000007 mg/L, Result < 0.0005 mg/L)
- Phenanthrene (Limit 0.00003 mg/L, Result < 0.0001 mg/L)
- Chromium VI (Limit 0.001 mg/L, Result 0.0041 mg/L)
- Arsenic (Limit 0.005 mg/L, Result 0.0243 mg/L)
- Cobalt (Limit 0.0009 mg/L, Result 0.00169 mg/L)
- Copper (Limit 0.001 mg/L, Result 0.0165 mg/L)
- Lead (Limit 0.001 mg/L, Result 0.0154 mg/L)
- Phosphorus (Limit 0.01 mg/L, Result 0.34 mg/L)
- Silver (Limit 0.0001 mg/L, Result 0.00011 mg/L)
- Zinc (Limit 0.02 mg/L, Result 0.163 mg/L)
- Chlorine (Limit 0.002 mg/L, Result < 0.02 mg/L)
- pH (Limit 8.5 No unit, Result 8.54 No unit)
- 4AAP-Phenolics (Limit 0.001 mg/L, Result 0.003 mg/L)
- Copper (Limit 0.001 mg/L, Result 0.0037 mg/L)
- Phosphorus (Limit 0.01 mg/L, Result 0.024 mg/L)

7.2 Results of Filtered Sample

The filtered sample was compared to select parameters from the above listed comparison standards/objectives.

The filtered groundwater sample **met** the **Limits for Storm Sewer Discharge** and **met the Limits for Sanitary and Combined Sewer Discharge** for the select parameters analyzed.

The unfiltered groundwater sample **exceeded** the **Provincial Water Quality Objectives** for the following parameters:

- Copper (Limit 0.001 mg/L, Result 0.0037mg/L)
- Phosphorus (Limit 0.01 mg/L, Result 0.024 mg/L)

8 Proposed Construction Method

The proposed shoring methodology at the site is assumed to consist of conventional soldier piling and lagging. For the purposes of this report, numerical analyses were conducted employing conventional soldier piling and lagging in order to determine a “worst-case scenario” with respect to dewatering volumes and groundwater seepage at the site.

A scenario with a continuous interlocking caisson wall, extending into the bedrock, acting as a cut off layer was also analyzed. The groundwater seepage volumes are not anticipated to be large enough to warrant a caisson groundwater cut off, however this scenario was analyzed incase the City/Region/Conservation Authority requires a caisson wall due to the site’s proximity to Mimico Creek.

The groundwater table for engineering design purposes is at Elev. 163.8 m. The groundwater table is present within all soil and rock units. The upper till and silts and clays units have a very low permeability and will yield only minor seepage in the long-term. However, the lower till unit will yield free-flowing water when penetrated. Excavations will generally be made below the groundwater table, but above the lower till unit, in relatively low permeability soils that preclude the free flow of water into excavations.

Cohesionless wet zones were encountered in several of the boreholes. If these cohesionless zones are penetrated, some seepage from these wet zones should be anticipated. However, these zones are likely of limited extent and are not horizontally continuous layers.

On this basis, seepage into excavations may be allowed to drain into the excavation and then controlled by a conventional sump pump arrangement. Nevertheless, delays in excavation will occur as the seepage is controlled and these delays should be anticipated in the construction schedule. Stored water within the excavation will also need to be considered prior to excavation.

9 Private Water Drainage System (PWDS)

If the proposed development consists of drained foundations, then a private water drainage system will be required. The total sub floor drain area will be approximately 5,462 m^2 based on the drawings which have been provided.

If the development is designed with a private water drainage system, the drainage system is a critical structural element since it keeps water pressure from acting on the basement walls and floor slab. As such, the sump that ensures the performance of this system must have a duplexed pump arrangement for 100% pumping redundancy and these pumps must be on emergency power. The size of the sump should be adequate to accommodate the estimated groundwater seepage. It is anticipated that the groundwater seepage can be controlled with typical, widely available, commercial/residential sump pumps.

If the proposed development is designed as a watertight structure, then a private water drainage system will not be required. However, the structure must then be designed to resist hydrostatic pressure and uplift forces.

10 Groundwater Extraction and Discharge

Numerical analyses were conducted for both short term and long term dewatering scenarios. The modeling was conducted using computer software, which deploys the finite element modelling method. The Finite Element Model (FEM) for groundwater seepage indicates the short term (construction) and long term (permanent) dewatering requirements as provided below. The finite element model results are presented in Appendix E.

The groundwater seepage estimates, which have been provided, represent the steady state groundwater seepage. There will be an initial drawdown of the groundwater before a steady state condition is reached. The rate of the initial drawdown, and therefore discharge, is dependent on the dewatering contractor and how the groundwater is being dealt with at the site. An estimated initial volume of stored groundwater which will require removal before steady state is reached has been provided below.

Please note that if excavation is exposed to the elements, stormwater will have to be managed. The short term control of groundwater should consider stormwater management from rainfall events. A dewatering system should be designed to consider the removal of rainfall from excavation. A design storm of 25 mm has been used in the quantity estimates.

As required by Ontario Regulation 63/16, a plan for discharge must consider the conveyance of stormwater from a 100-year storm. The additional volume that will be generated in the occurrence of a 100-year storm event is approximately 517,000 L.

The following design considerations and values have been incorporated into the numerical modelling / dewatering estimates:

- Short term dewatering assumes a caisson wall hydraulic conductivity of 1.0 x 10^{-9} m/s and long term dewatering assumes a caisson wall hydraulic conductivity of 1.0 x 10^{-7} m/s due to decay of concrete quality over time.
- Mimico Creek is located approximately 35 m from the east Property boundary. The elevation of the water in Mimico Creek is 160.5 masl.
- Caissons filler assumed to be embedded 2 m into bedrock
- A Factor of Safety of 2.0 was used for all groundwater seepage volume calculations.
- The design hydraulic conductivities for the site are:

Design Hydraulic Conductivity	
Stratum/Formation	**K (m/s)**
Earth Fill	1 x 10^{-4}
Upper Till	3.58 x 10^{-8}
Silts and Clays	1 x 10^{-9}
Lower Till	1.27 x 10^{-7}
Georgian Bay Bedrock (weathered)	2.44 x 10^{-6}

Stored Groundwater (pre-excavation/dewatering)					
Volume of Excavation (m^3)	**Volume of Excavation Below Water Table (m^3)**	**Estimated Volume of Stored Groundwater**		**Estimated Volume of Available Groundwater**	
		m^3	**L**	**m^3**	**L**
58,743	46,665	17,700	17,700,000	5,600	5,600,000

Short Term (Construction) Steady State Groundwater Quantity – Safety Factor of 2.0 Used						
	Estimated Groundwater Seepage		**Design Rainfall Event (25mm)**		**Estimated Total Daily Water Takings**	
	L/day	**L/min**	**L/day**	**L/min**	**L/day**	**L/min**
Permeable Shoring	15,000	10.4	138,000	95.8	153,000	106.3
Caisson Wall	5,000	3.5	138,000	95.8	143,000	99.3

Long Term (Permanent) Steady State Groundwater Quantity – Safety Factor of 2.0 Used						
	Estimated Groundwater Seepage		Estimated Infiltrated Stormwater – Design Rainfall Event (25mm)		Estimated Total Daily Water Takings	
	L/day	L/min	L/day	L/min	L/day	L/min
Permeable Shoring	15,000	10.4	30,000	20.8	45,000	31.3
Caisson Wall	20,000	13.9	30,000	20.8	50,000	34.7

Regulatory Requirements	
Environmental Activity and Sector Registry (EASR) Posting	Required
Short Term Permit to Take Water (PTTW)	Not Required
Long Term Permit to Take Water (PTTW)	Not Required

Please note:

- Stored water within the excavation will need to be considered prior to excavation.
- The proposed pump schedule for short term construction dewatering has not been completed. As such, the actual peak short term discharge rate is not available at the time of writing this report. The pump schedule must be specified by either the dewatering contractor retained or the mechanical consultant.
- The proposed pump schedule for long term permanent drainage has not been completed. As such the actual peak long term discharge rate is not available at the time writing of this report. The pump schedule must be specified by the mechanical consultant.
- A watertight structure (structure that has not included a private water drainage system) has not been considered as part of the proposed development at this time.
- Due to the nature of the soils and the elevation of the groundwater table at the site, on-site containment (i.e., infiltration of groundwater) is not feasible.

11 Evaluation of Impact

11.1 Zone of Influence (ZOI)

The Zone of Influence (ZOI) with respect to groundwater was calculated based on the estimated groundwater taking rate and the hydraulic conductivity of the unit which water will be taken at the Site.

The ZOI was calculated using the Sichardt equation below.

Equation:

$$R_0 = 3000(\Delta H)\sqrt{K}$$

ΔH = dewatering thickness (m)
K = hydraulic conductivity (m/s)
R_0 = radius of influence (m)

The ZOI with respect to groundwater seepage at the site is summarized as follows.

Zone of Influence (ZOI)		
	Short Term (Construction)	**Long Term (Permanent)**
Maximum Zone of Influence (m)	5	5

11.2 Land Stability

The impacts to land stability on adjacent structures due to the proposed short and long term dewatering at the site are summarized as follows:

Land Stability		
	Short Term (Construction)	**Long Term (Permanent)**
Dewatering Thickness (m)	10.1	8.5
Increase in Effective Stress (kPa)	99	83
Maximum Theoretical Settlement due to Dewatering (mm)	18	16
Public Realm Theoretical Settlement due to Dewatering (mm)	2 or less	2 or less

The theoretical maximum induced settlement occurs directly adjacent to the proposed excavation and decreases in a nonlinear fashion with distance away from the excavation.

On this basis, the impact of the proposed dewatering on the existing adjacent structures is considered by Grounded to be within acceptable limits.

11.3 City/Region's Sewage Works

Negative impacts to City/Region's sewage works may occur in terms of the quantity or quality of the groundwater discharged. This report provided the estimated quantity of the water discharge. However, this report does not speak to the sewer capacities. The sewer capacity analysis is provided under a separate cover by the civil consultant.

The quality of the proposed groundwater discharge is provided in Section 7. As noted in that section, the unfiltered groundwater sample exceeded the Limits for Storm Sewer Discharge and met the Limits for Sanitary and Combined Sewer Discharge.

As such, additional treatment will be required before the water can be discharged to the Storm Sewer to avoid impacts to the City's sewage works caused by groundwater quality. Additional treatment will not be required before the water can be discharged to the Sanitary and Combined Sewer.

11.4 Natural Environment

The quality of the proposed groundwater discharge is provided in Section 7. As noted in that section, the unfiltered groundwater sample exceeded the Provincial Water Quality Objectives. As such, additional treatment will be required before the water can be discharged to Mimico Creek.

There are no natural waterbodies within the ZOI that will be affected by the proposed construction dewatering or permanent drainage. Any groundwater which will be taken from the site that is proposed to be discharged into any natural waterbody must be treated to meet the Provincial Water Quality Objectives, prior to discharge. If the groundwater is treated to meet the Provincial Water Quality Objectives, there will be no impact to the natural environment caused by the water takings at the site.

11.5 Local Drinking Water Wells

The site is located within the municipal boundaries of the City of Mississauga. The site and surrounding area are provided with municipal piped water and sewer supply. There is no use of the groundwater for water supply in this area of Mississauga. As such, there will be no impact to drinking water wells.

11.6 Contamination Source

The site and immediately surrounding area currently consist mostly of residential and commercial areas. These land uses are not anticipated to be a source of potential contamination and are not expected to provide an Area of Potential Environmental Concern for the site. As such, the pumping of groundwater at the site is not anticipated to facilitate the movement of potential contaminants onto the site. Evaluation of the environmental condition of the site has been completed under a separate cover.

12 Proposed Mitigation Measures and Monitoring Plan

The extent of the negative impact identified in previous sections will be limited to the ZOI caused by the groundwater taking at the site.

As a result of dewatering and draining the soil, changes in groundwater level have the potential to cause settlement based on the change in the effective stresses within the ZOI.

If adjacent buildings or municipal infrastructure are within the ZOI and will undergo settlement that may be considered unacceptable as identified the Land Stability Section, consideration should be given to implement a monitoring and mitigation program during dewatering activities.

Both the temporary construction dewatering system and the permanent building drainage system must be properly installed and screened to ensure sediments and fines will not be removed, which is typically a primary cause of dewatering related settlement.

13 Limitations

Natural occurrences, the passage of time, local construction, and other human activity all have the potential to directly or indirectly alter the subsurface conditions at or near the project site. Contractual obligations related to groundwater or stormwater control must be considered with attention and care as they relate this potential site alteration.

The hydrogeological engineering advice provided in this report is based on the factual observations made from the site investigations as reported. It is intended for use by the owner and their retained design team. If there are changes to the features of the development or to the scope, the interpreted subsurface information, geotechnical engineering design parameters, advice, and discussion on construction considerations may not be relevant or complete for the project. Grounded should be retained to review the implications of such changes with respect to the contents of this report.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Grounded accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report, including consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

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14 Closure

If there are any questions regarding the discussion and advice provided, please do not hesitate to contact our office. We trust that this report meets your requirements at present.

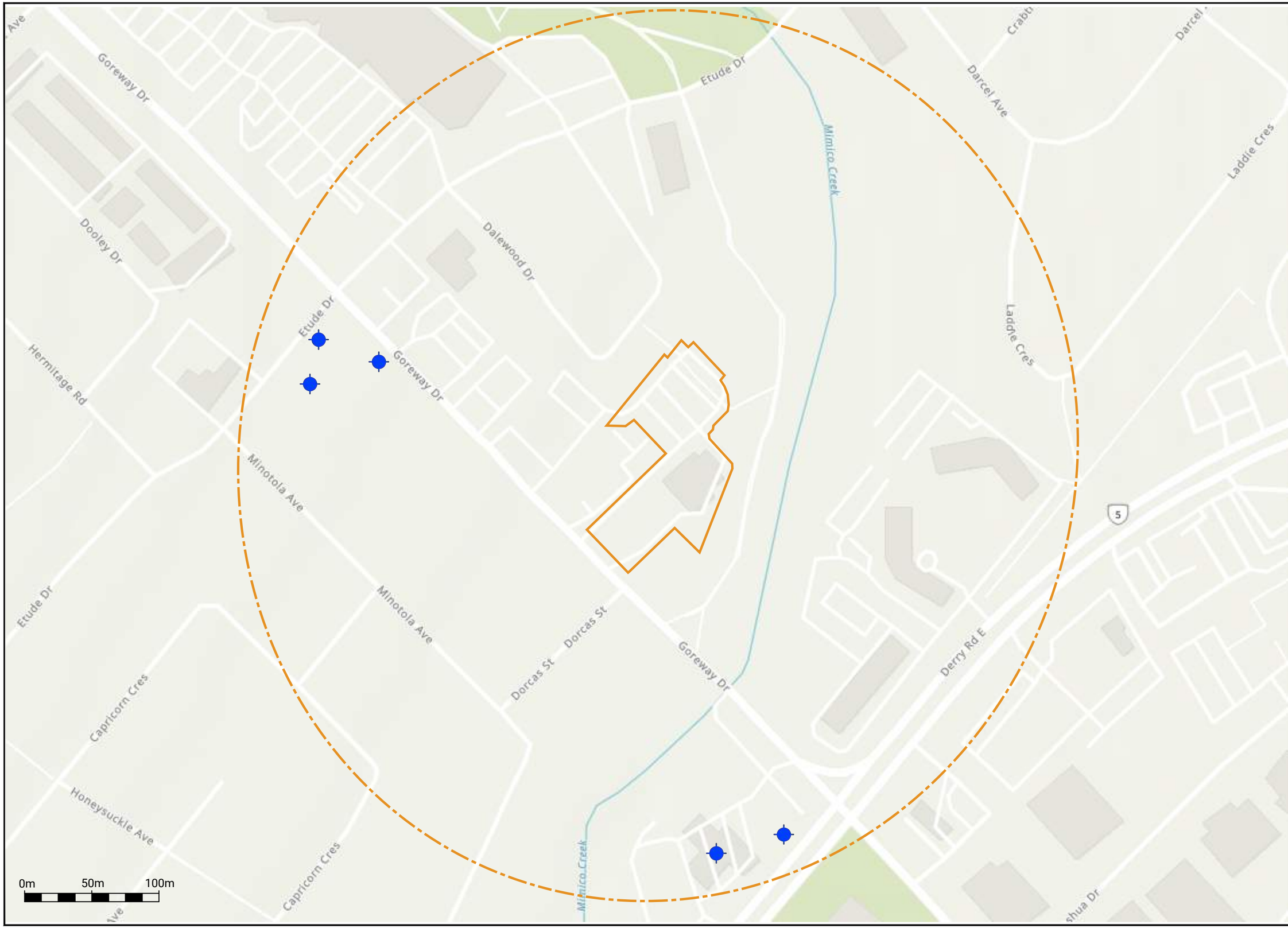
For and on behalf of our team,

GROUNDED ENGINEERING

Tarak Ali, EIT

Matt Bielaski, P.Eng., QP$_{RA-ESA}$
Principal

FIGURES



APPROXIMATE PROPERTY BOUNDARY

GROUNDED ENGINEERING

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www.groundedeng.ca

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- STUDY AREA (250 m RADIUS)
- MECP WELL LOCATION

Note

Reference
ArcGIS, 2020

Project
7085 GOREWAY DRIVE
MISSISSAUGA, ONTARIO

Figure Title
SITE LOCATION PLAN

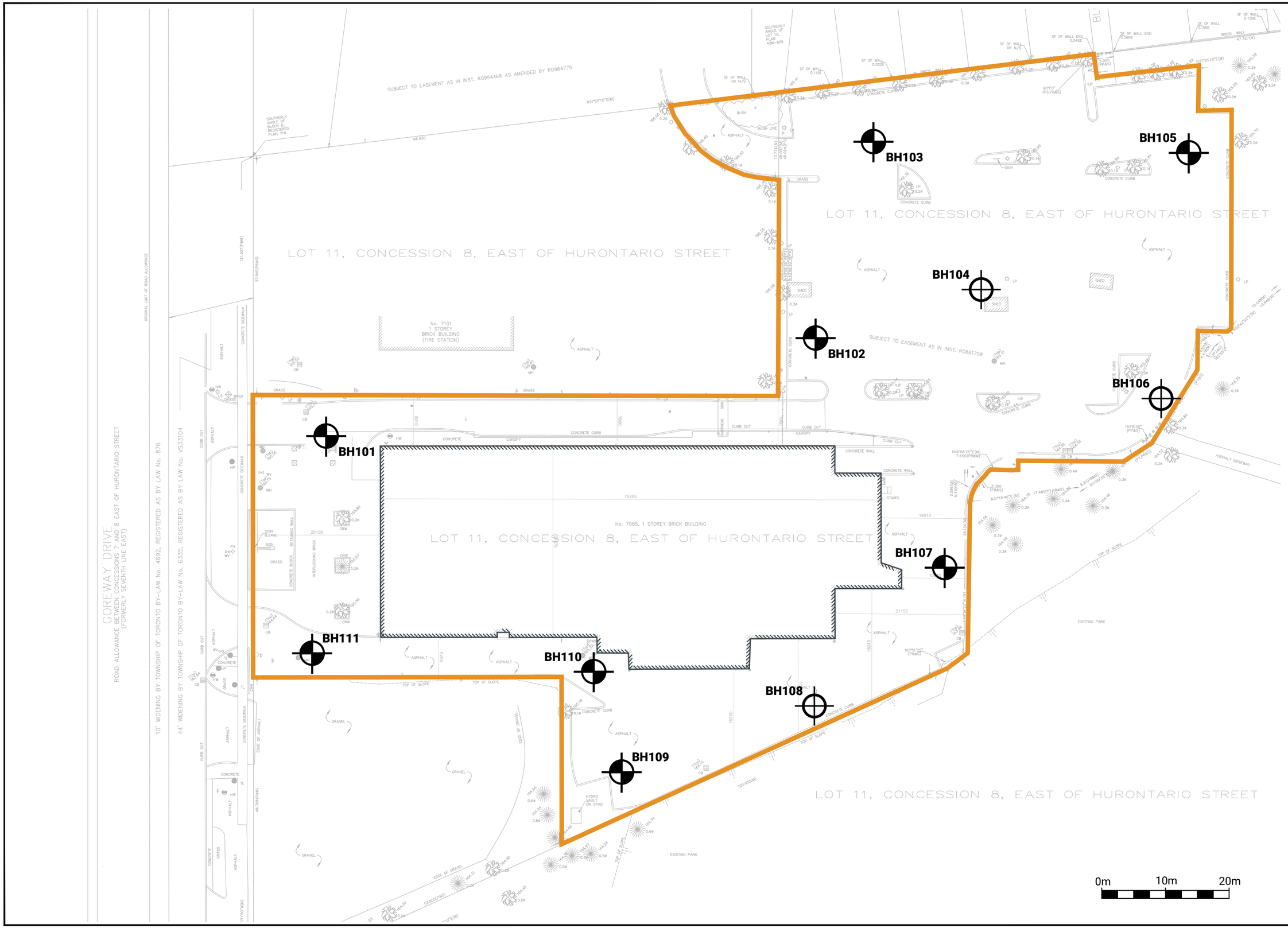
North
TRUE
PROJECT

Date
JUNE 2022

Scale
AS INDICATED

Job No
19-040

Figure No
FIGURE 1



GROUNDED ENGINEERING

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www.groundedeng.ca

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- EXISTING BUILDING STRUCTURE
- MONITORING WELL/BOREHOLE BY GROUNDED

Note

Reference

Survey Drawing Reference no.
17-103BT01.
Date: JUNE 20, 2017.
Prepared by KRCMAR Surveyors Ltd.
Received on November 26, 2019.

Project

7085 GOREWAY DRIVE

MISSISSAUGA, ONTARIO

Figure Title

BOREHOLE LOCATION PLAN

North

TRUE
PROJECT

Date

JUNE 2022

Scale

AS INDICATED

Job No

19-040

Figure No

FIGURE 2

Approximate Ground Surface:
Elev. 165.2 m

Design Groundwater Table
Elev. 163.8 m

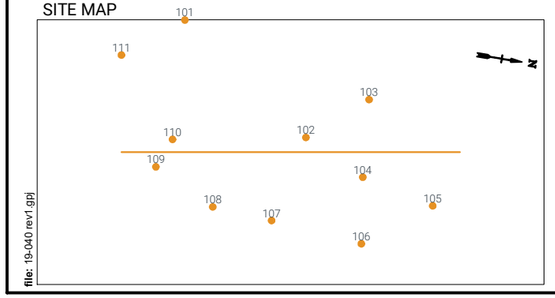
BH 111 | BH 109 | BH 110 | BH 101 | BH 108 | BH 107 | BH 102 | BH 106 | BH 104 | BH 103 | BH 105

Elevation (m)

P3 FFE Elev. 155.8± m

Boreholes Equally Spaced

SITE MAP



file: 19-040 rev1.gpj

LITHOLOGY GRAPHIC LEGEND

- Asphalt
- Fill
- Clayey Silt Till
- Silt and Clay
- Sandy Silt Till
- Aggregate
- Bedrock (inferred)
- Silty Sand
- Sand and Silt Till

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LEGEND

- FILL
- GRAVELS (gravel to gravelly sand)
- SILT TO SAND (not till)
- COHESIONLESS TILLS
- COHESIVE SOILS (clayey silt to clay, incl. tills)
- DISTURBED/REWORKED/ORGANIC

- water level, unstabilized
- water level, stabilized (latest)
- water level, stabilized (highest)

Project
7085 GOREWAY DRIVE MISSISSAUGA, ON

Figure Title
SUBSURFACE PROFILE

Date
JUNE 2022

Scale
AS INDICATED

Job No
19-040

Figure No
FIGURE 3

APPENDIX A

BOREHOLE LOG TERMINOLOGY

GROUNDED ENGINEERING

SAMPLING/TESTING METHODS

SS: split spoon sample

AS: auger sample

GS: grab sample

FV: shear vane

DP: direct push

PMT: pressuremeter test

ST: shelby tube

CORE: soil coring

RUN: rock coring

SYMBOLS & ABBREVIATIONS

MC: moisture content

LL: liquid limit

PL: plastic limit

NP: non-plastic

γ: soil unit weight (bulk)

G_s: specific gravity

S_u: undrained shear strength

▽ unstabilized water level

▼ 1st water level measurement

▼ 2nd water level measurement most recent

▼ water level measurement

ENVIRONMENTAL SAMPLES

M&I: metals and inorganic parameters

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

VOC: volatile organic compound

PHC: petroleum hydrocarbon

BTEX: benzene, toluene, ethylbenzene and xylene

PPM: parts per million

FIELD MOISTURE (based on tactile inspection)

DRY: no observable pore water

MOIST: inferred pore water, not observable (i.e. grey, cool, etc.)

WET: visible pore water

COHESIONLESS

Relative Density	N-Value
Very Loose	<4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	>50

COHESIVE

Consistency	N-Value	Su (kPa)
Very Soft	<2	<12
Soft	2 - 4	12 - 25
Firm	4 - 8	25 - 50
Stiff	8 - 15	50 - 100
Very Stiff	15 - 30	100 - 200
Hard	>30	>200

COMPOSITION

Term	% by weight
trace silt	<10
some silt	10 - 20
silt***y***	20 - 35
sand ***and*** silt	>35

ASTM STANDARDS

ASTM D1586 Standard Penetration Test (SPT)
Driving a 51 mm O.D. split-barrel sampler ("split spoon") into soil with a 63.5 kg weight free falling 760 mm. The blows required to drive the split spoon 300 mm ("bpf") after an initial penetration of 150 mm is referred to as the N-Value.

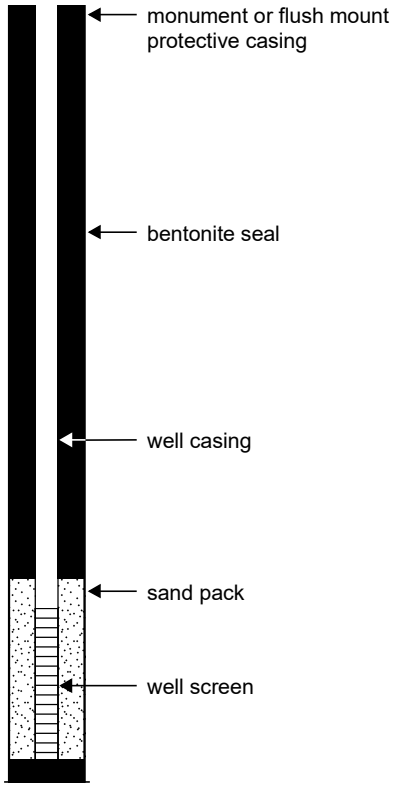
ASTM D3441 Cone Penetration Test (CPT)
Pushing an internal still rod with a outer hollow rod ("sleeve") tipped with a cone with an apex angle of 60° and a cross-sectional area of 1000 mm^2 into soil. The resistance is measured in the sleeve and at the tip to determine the skin friction and the tip resistance.

ASTM D2573 Field Vane Test (FVT)
Pushing a four blade vane into soil and rotating it from the surface to determine the torque required to shear a cylindrical surface with the vane. The torque is converted to the shear strength of the soil using a limit equilibrium analysis.

ASTM D1587 Shelby Tubes (ST)
Pushing a thin-walled metal tube into the in-situ soil at the bottom of a borehole, removing the tube and sealing the ends to prevent soil movement or changes in moisture content for the purposes of extracting a relatively undisturbed sample.

ASTM D4719 Pressuremeter Test (PMT)
Place an inflatable cylindrical probe into a pre-drilled hole and expanding it while measuring the change in volume and pressure in the probe. It is inflated under either equal pressure increments or equal volume increments. This provides the stress-strain response of the soil.

WELL LEGEND



Date Started : Jun 1, 2020
Position : E: 610053, N: 4841182 (UTM 17T)
Elev. Datum : Geodetic

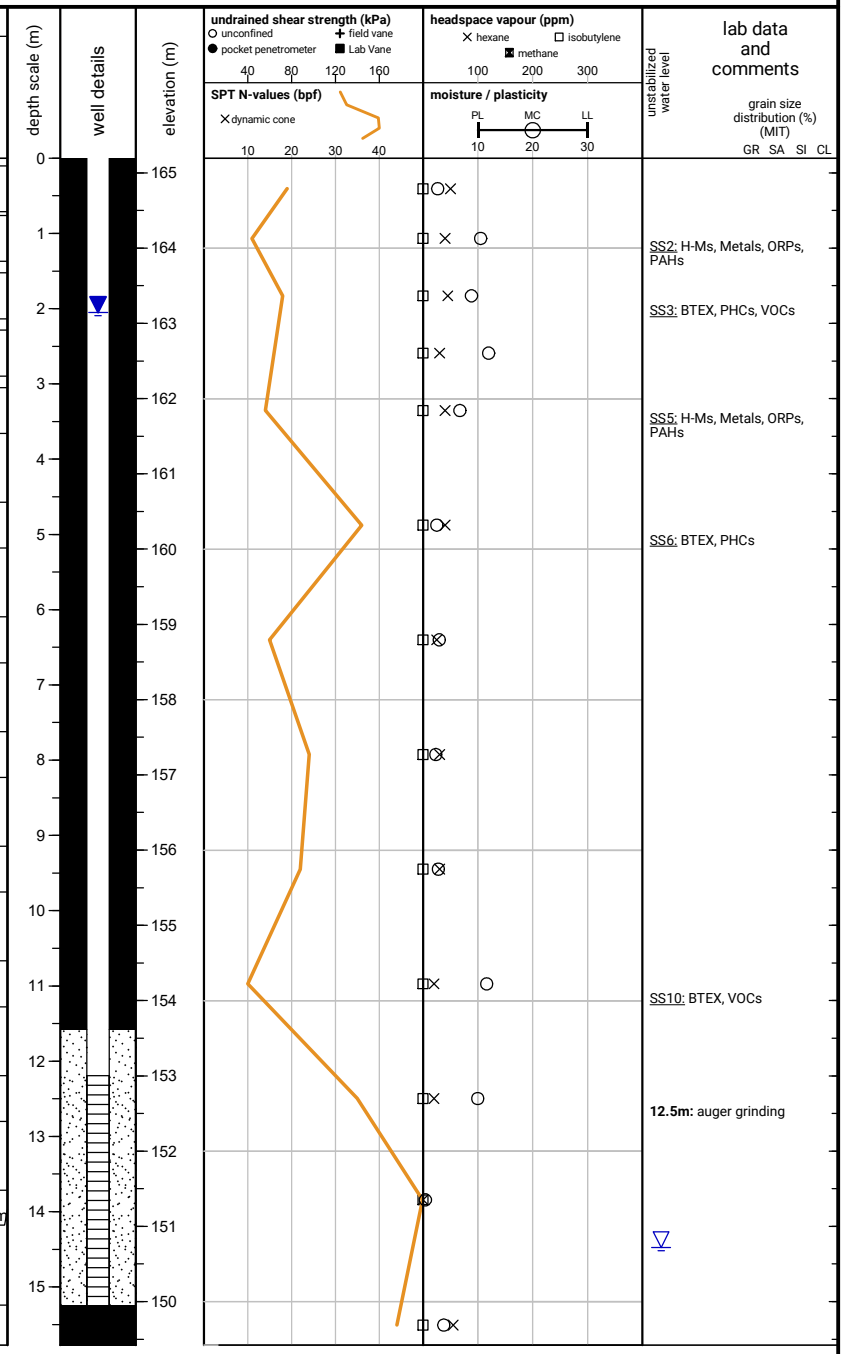
BOREHOLE LOG 101

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
165.2	**GROUND SURFACE**				
	100mm **ASPHALT**		1	SS	19
164.4	**FILL**, sand and gravel, trace asphalt, trace aggregate, compact, dark brown, moist				
0.8	**SILTY CLAY**, trace to some sand, trace gravel, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		2	SS	11
			3	SS	18
			4	SS	16
	...at 3.0 m, grey		5	SS	14
	...at 4.6 m, hard to 6.1 m		6	SS	36
			7	SS	15
	...at 7.6 m, sand seams		8	SS	24
	...at 9.1 m, sand seams		9	SS	22
154.5					
10.7	**SILT AND CLAY**, some sand, trace gravel, clay nodules, stiff, grey, moist		10	SS	10
	...at 12.2 m, hard		11	SS	35
151.5					
13.7	**SANDY SILT**, some gravel, trace shale and limestone fragments, very dense, grey, dry (GLACIAL TILL)		12	SS	50 / 100mm
	...at 15.2 m, clayey silt seams, dense, moist		13	SS	44
149.4					
15.8	**END OF BOREHOLE**				



Unstabilized water level measured at 14.5 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	1.8	163.4
Jul 8, 2020	1.8	163.4
Aug 7, 2020	1.8	163.4
Sep 11, 2020	1.5	163.7
Oct 8, 2020	1.6	163.6
Nov 6, 2020	2.1	163.1
May 11, 2022	2.1	163.1

file: 19-040 rev1.gpj

Tech : JN | **PM** : TA | **Rev** : JC

BOREHOLE LOG 102

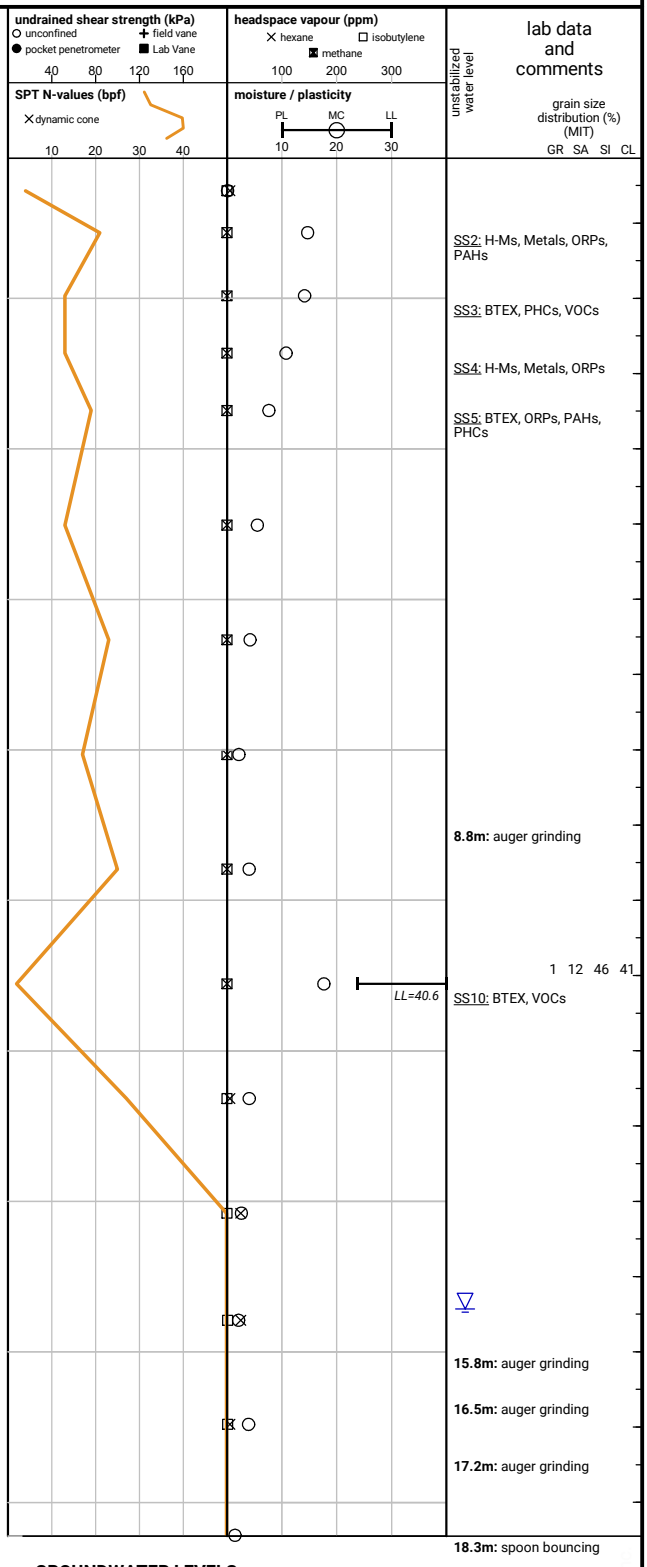
Date Started : Jun 3, 2020
Position : E: 610098, N: 4841248 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
165.9	**GROUND SURFACE**				
	75mm **ASPHALT**		1	SS	4
165.1	50mm **AGGREGATE**				
0.8	**FILL**, sand and gravel, trace aggregate, loose, light brown, wet		2	SS	21
	SILTY CLAY, some sand, trace gravel, silt nodules, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	13
	...at 2.3 m, sand seam		4	SS	13
	...at 3.0 m, orangey brown to grey		5	SS	19
	...at 4.6 m, grey		6	SS	13
	...at 7.6 m, sand seams		7	SS	23
	...at 9.1 m, sand seams		8	SS	17
155.2			9	SS	25
10.7	**SILT AND CLAY**, some sand, trace gravel, clay nodules, soft, grey, moist		10	SS	2
153.7				FV	
12.2	**SANDY SILT**, some gravel, some clay, trace shale and limestone fragments, compact, grey, moist (GLACIAL TILL)		11	SS	27
	...at 13.7 m, very dense		12	SS	63
149.1			13	SS	87 / 250mm
16.8	**INFERRED BEDROCK**, shale and limestone fragments, grey, moist		14	SS	50 / 125mm
147.6			15	SS	50 / 25mm
18.3	**END OF BOREHOLE**				



Unstabilized water level measured at 15.3 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	4.8	161.1
Jul 8, 2020	2.5	163.4
Aug 7, 2020	2.4	163.5
Sep 11, 2020	2.4	163.5
Oct 8, 2020	2.5	163.4
Nov 6, 2020	2.7	163.2
May 11, 2022	2.7	163.2

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 2, 2020
Position : E: 610076, N: 4841274 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 103

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	sample number	sample type	SPT N-value
166.2	**GROUND SURFACE**				
	90mm **ASPHALT**		1	SS	30
165.4	25mm **AGGREGATE**				
0.8	**FILL**, sand and gravel to sandy silt, trace asphalt, trace aggregate, compact, brown, moist		2	SS	10
	SILTY CLAY, some sand, trace gravel, silt nodules, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	14
	...at 1.5 m, sandy, trace rock fragments		4	SS	16
	...at 2.3 m, sand seam		5	SS	12
	...at 4.6 m, grey		6	SS	15
	...at 6.1 m, trace rock fragments		7	SS	21
	...at 7.6 m, sand seams		8	SS	22
	...at 9.1 m, trace rock fragments, sand seams		9	SS	20
			10	SS	14
154.0					
12.2	**SILT AND CLAY**, some sand, trace gravel, clay nodules, stiff, grey, moist		11	SS	9
				FV	
152.5					
13.7	**SANDY SILT**, trace gravel, sand seams, dense, grey, moist (GLACIAL TILL)		12	SS	31
			13	SS	39
150.4					
15.8					

depth scale (m) | well details | elevation (m)

undrained shear strength (kPa)
○ unconfined + field vane
● pocket penetrometer ■ Lab Vane
40 80 120 160

SPT N-values (bpf)
× dynamic cone
10 20 30 40

headspace vapour (ppm)
× hexane □ isobutylene
▣ methane
100 200 300

moisture / plasticity
PL MC LL
10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)
GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs

SS3: BTEX, PHCs, VOCs

SS5: H-Ms, Metals, ORPs, PAHs

SS6: BTEX, PHCs

8.2m: auger grinding

SS10: BTEX, VOCs

13.1m: auger grinding

END OF BOREHOLE

Unstabilized water level measured at 14.8 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	2.8	163.4
Jul 8, 2020	2.8	163.4
Aug 7, 2020	2.9	163.3
Sep 11, 2020	3.0	163.2
Oct 8, 2020	2.9	163.3
Nov 6, 2020	2.9	163.3
May 11, 2022	2.6	163.6

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 4, 2020
Position : E: 610112, N: 4841277 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 104

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
165.8	**GROUND SURFACE**				
	50mm **ASPHALT**		1	SS	5
165.0	90mm **AGGREGATE**				
0.8	**FILL**, clayey silt, trace sand, trace gravel, firm, grey, moist		2	SS	12
	SILTY CLAY, some sand, trace gravel, silt nodules, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	17
	...at 2.3 m, sand seam		4	SS	21
	...at 3.0 m, grey		5	SS	15
	...at 3.6 m, sand seam				
			6	SS	16
	...at 6.1 m, sandy		7	SS	12
158.2					
7.6	**SILT AND CLAY**, some sand, trace gravel, clay nodules, very stiff, grey, moist		8	SS	19
			9	SS	29
	...at 10.7 m, firm		10	SS	4
				FV	
153.6					
12.2	**SANDY SILT**, some gravel, some clay, dense to very dense, grey, moist (GLACIAL TILL)		11	SS	35
	...at 13.7 m, trace shale fragments		12	SS	44
			13	SS	50 / 125mm
149.0					
16.8	**INFERRED BEDROCK**, shale and limestone fragments, grey, moist		14	SS	50 / 100mm
148.8					
17.0	**END OF BOREHOLE**				

depth scale (m): 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

well details

elevation (m): 165 164 163 162 161 160 159 158 157 156 155 154 153 152 151 150 149

undrained shear strength (kPa)
○ unconfined + field vane
● pocket penetrometer ■ Lab Vane
40 80 120 160

SPT N-values (bpf)
× dynamic cone
10 20 30 40

headspace vapour (ppm)
× hexane □ isobutylene
▣ methane
100 200 300

moisture / plasticity
PL MC LL
10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)
GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs

SS3: BTEX, PHCs, VOCs
7 17 34 42

SS4: H-Ms, Metals, ORPs, PAHs

SS5: ORPs

SS6: BTEX, PHCs

SS11: BTEX, VOCs

▽

Unstabilized water level measured at 13.7 m below ground surface upon completion of drilling.

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

BOREHOLE LOG 105

Date Started : Jun 10, 2020
Position : E: 610120, N: 4841312 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

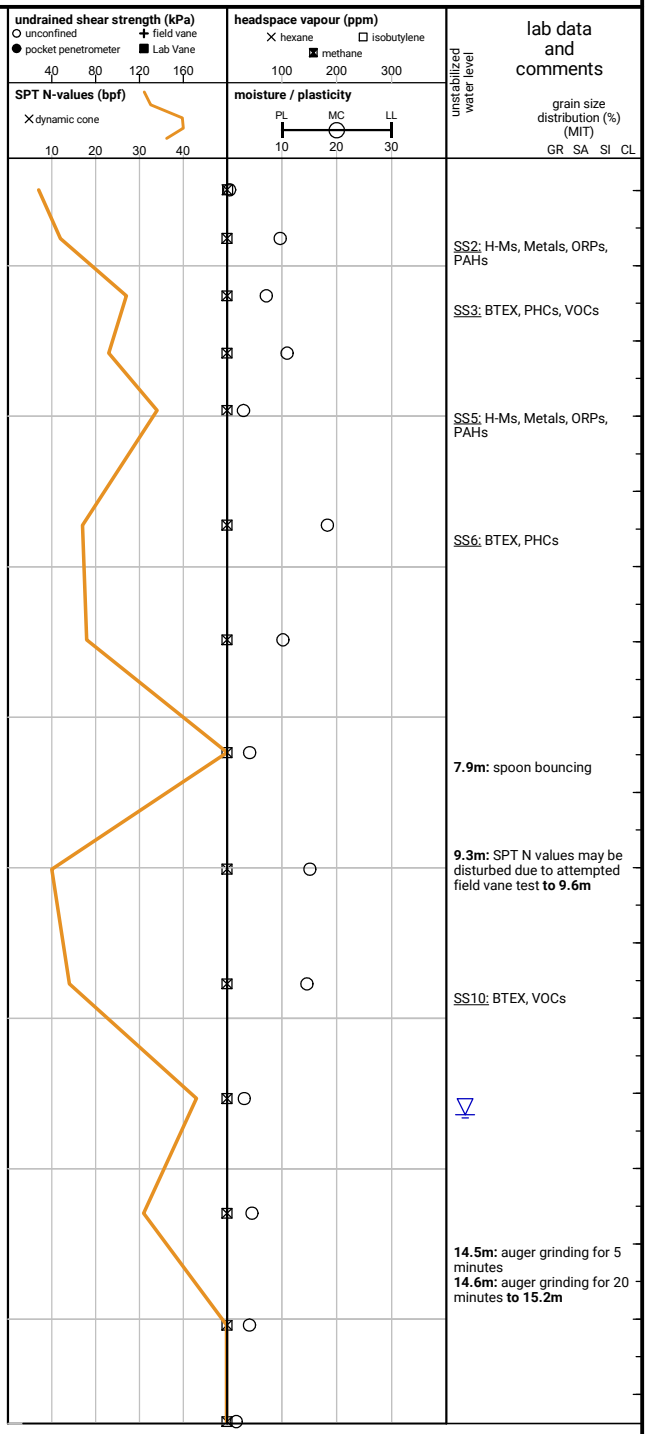
hollow stem augers (skinny) OD= 110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
165.4	**GROUND SURFACE**				
	50mm **ASPHALT**		1	SS	7
164.6	65mm **AGGREGATE**				
0.8	**FILL**, sand and gravel, trace aggregate, loose, light brown, dry		2	SS	12
	SILTY CLAY, some sand, trace gravel, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	27
			4	SS	23
	...at 3.0 m, hard, grey with some brown		5	SS	34
160.8					
4.6	**SILTY SAND**, compact, grey, wet		6	SS	17
159.3					
6.1	**SILTY CLAY**, some sand, trace gravel, very stiff to hard, grey, moist (GLACIAL TILL)		7	SS	18
	...at 7.6 m, trace shale fragments, very dense		8	SS	50
156.3					
9.1	**SILT AND CLAY**, some sand, trace gravel, clay nodules, stiff, grey, moist		9	SS	10
			10	SS	14
153.2					
12.2	**SANDY SILT**, some gravel, some clay, dense, grey, moist (GLACIAL TILL)		11	SS	43
			12	SS	31
150.2					
15.2	**INFERRED BEDROCK**, shale and limestone fragments, grey, dry		13	SS	85
148.6					
16.8			14	SS	50 / 50mm

END OF BOREHOLE

Unstabilized water level measured at 12.7 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen



GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	1.8	163.6
Jul 8, 2020	1.8	163.6
Aug 7, 2020	2.0	163.4
Sep 11, 2020	2.4	163.0
Oct 8, 2020	2.6	162.8
Nov 6, 2020	2.3	163.1
May 11, 2022	1.6	163.8

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 5, 2020
Position : E: 610144, N: 4841282 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 106

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

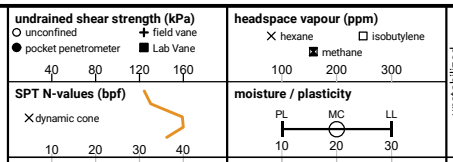
drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev / depth (m)	description	graphic log	number	type	SPT N-value
164.8	**GROUND SURFACE**				
	100mm **ASPHALT**		1	SS	3
163.8 / 1.0	**FILL**, sand and gravel to clayey silt, trace aggregate, loose / stiff, brown to dark grey, moist		2	SS	9
	SILTY CLAY, some sand, trace gravel, stiff to very stiff, mottled brown with grey, moist (GLACIAL TILL)		3	SS	16
			4	SS	13
161.4 / 3.4			5A / 5B	SS	33
	SANDY SILT, some gravel, some clay, compact to dense, grey, moist (GLACIAL TILL)		6	SS	22
			7	SS	19
157.2 / 7.6			8	SS	10
	SILT AND CLAY, some sand, trace gravel, clay nodules, stiff, grey, moist				
	...at 9.1 m, trace rock fragments		9	SS	11
				FV	
154.1 / 10.7			10	SS	13
	SANDY SILT, gravelly, some clay, compact, grey, moist (GLACIAL TILL)				
			11	SS	15
	...at 13.7 m, very dense, wet		12	SS	50 / 125mm
149.3 / 15.5	...at 15.2 m, sand seam		13A / 13B	SS	88
	INFERRED BEDROCK, shale and limestone fragments, grey, moist				
147.7 / 17.1			14	SS	80 / 200mm

END OF BOREHOLE

Water level and cave not measured upon completion of drilling.



depth scale (m): 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

well details

elevation (m): 164 163 162 161 160 159 158 157 156 155 154 153 152 151 150 149 148

unstabilized water level

lab data and comments

grain size distribution (%) (MIT)
GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs

SS3: BTEX, PHCs, VOCs

SS4: H-Ms, Metals, ORPs, PAHs

5B: ORPs

SS8: BTEX, PHCs

21 22 44 13

SS10: BTEX, VOCs

13.6m: auger grinding for 1.5 minutes **to 13.7m**

14.0m: auger grinding for 1 minute

14.6m: auger grinding for 2 minutes

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 8, 2020
Position : E: 610140, N: 4841238 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 107

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : *CME 75*

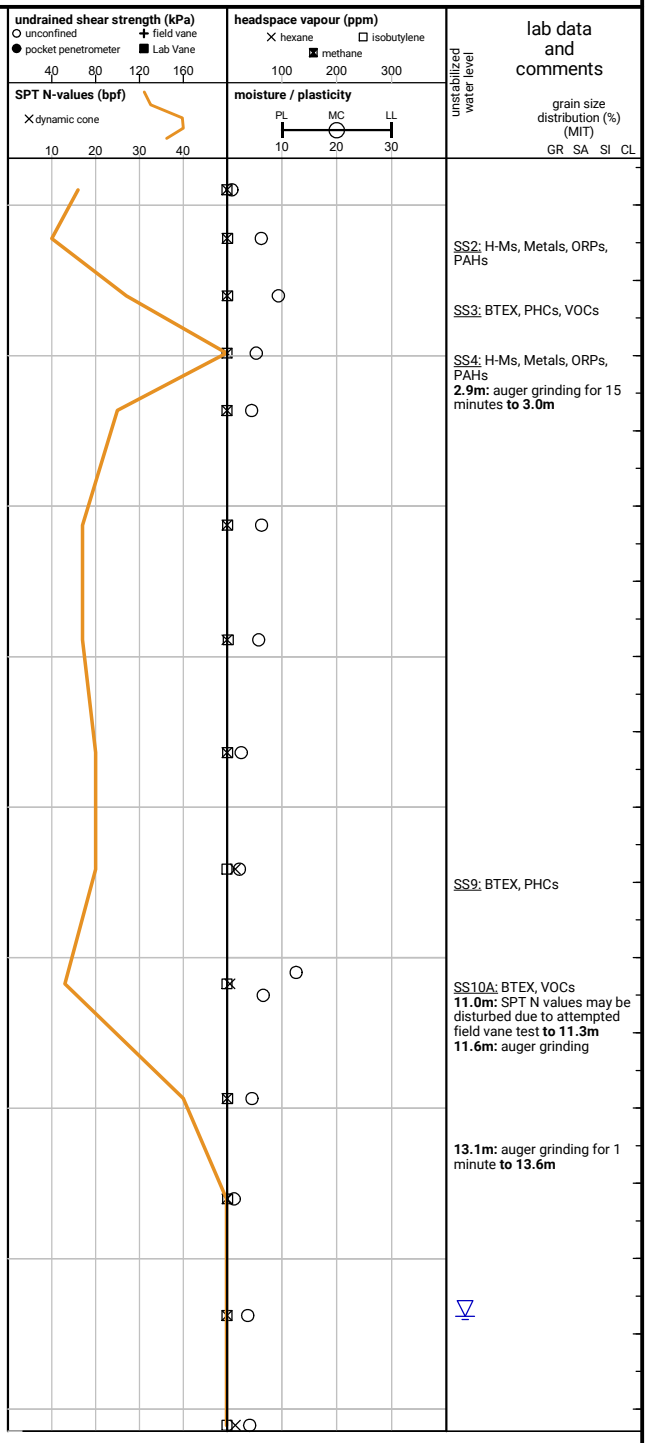
hollow stem augers (skimy) OD=110 mm

elev depth (m)	description	graphic log	sample number	sample type	SPT N-value	lab data and comments
164.6	**GROUND SURFACE**					
	100mm **ASPHALT**		1	SS	16	
	FILL, sand and gravel to sand and silt, trace clay, compact, brown to dark grey, dry to moist		2	SS	10	
163.1 / 1.5	...at 1.5 m, trace rock fragments		3	SS	27	SS2: H-Ms, Metals, ORPs, PAHs
	SANDY SILT, some gravel, some clay, compact, grey, moist (GLACIAL TILL)		4	SS	55	SS3: BTEX, PHCs, VOCs
	...at 2.3 m, very dense to 3.0 m					SS4: H-Ms, Metals, ORPs, PAHs
	...at 3.0 m, brownish grey		5	SS	25	**2.9m:** auger grinding for 15 minutes **to 3.0m**
	...at 4.6 m, grey		6	SS	17	
			7	SS	17	
			8	SS	20	
			9	SS	20	SS9: BTEX, PHCs
153.9 / 10.7						
153.6 / 11.0	**SILT AND CLAY**, some sand, trace gravel, stiff, grey, moist		10A	SS	13	SS10A: BTEX, VOCs **11.0m:** SPT N values may be disturbed due to attempted field vane test **to 11.3m** **11.6m:** auger grinding
			10B	SS		
	SANDY SILT, some gravel, some clay, compact to dense, grey, moist (GLACIAL TILL)		11	SS	40	**13.1m:** auger grinding for 1 minute **to 13.6m**
	...at 13.7 m, very dense		12	SS	50 / 75mm	
149.4 / 15.2	**INFERRED BEDROCK**, shale and limestone fragments, grey, dry		13	SS	83 / 150mm	
147.7 / 16.9	...at 16.8 m, moist		14	SS	50 / 150mm	

END OF BOREHOLE

Unstabilized water level measured at 15.4 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen



GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	2.8	161.8
Jul 8, 2020	1.2	163.4
Aug 7, 2020	1.2	163.4
Sep 11, 2020	1.2	163.4
Oct 8, 2020	1.3	163.3
Nov 6, 2020	1.5	163.1
May 11, 2022	1.3	163.3

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

GROUNDED ENGINEERING

Date Started : Jun 9, 2020
Position : E: 610138, N: 4841210 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 108

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value	lab data and comments
164.3	**GROUND SURFACE**					
	100mm **ASPHALT**		1	SS	46	
	FILL, sand and gravel to sandy silt, trace rootlets, trace aggregate, dense, light brown to dark grey, moist ...at 0.8 m, compact		2	SS	18	
			3	SS	10	
162.0						
2.3	**SANDY SILT**, some gravel, some clay, loose, brown, moist (WEATHERED)		4	SS	5	
161.3						
3.0	**SANDY SILT**, some gravel, some clay, compact, brown, moist (GLACIAL TILL)		5	SS	22	
	...at 4.6 m, grey		6	SS	22	
			7	SS	22	
			8	SS	13	
155.2						
9.1	**SILT AND CLAY**, some sand, trace gravel, stiff, grey, moist		9	SS	14	
153.6						
10.7	**SANDY SILT**, some gravel, trace shale and limestone fragments, very dense, grey, moist (GLACIAL TILL)		10	SS	93 / 200mm	
			11	SS	50 / 100mm	
150.6						
13.7	**INFERRED BEDROCK**, shale and limestone fragments, grey, dry		12	SS	85 / 250mm	
148.9						
15.4			13	SS	50 / 50mm	

depth scale (m): 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

well details

elevation (m): 164 163 162 161 160 159 158 157 156 155 154 153 152 151 150 149

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40 80 120 160

SPT N-values (bpf): dynamic cone; 10 20 30 40

headspace vapour (ppm): hexane, isobutylene, methane; 100 200 300

moisture / plasticity: PL MC LL; 10 20 30

unstabilized water level

grain size distribution (%) (MIT): GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs
1.4m: auger grinding for 2 minutes **to 1.5m**

SS3: BTEX, PHCs, VOCs

SS5: BTEX, H-Ms, Metals, ORPs, PHCs

SS6: PAHs

7.3m: auger grinding for 5 minutes

SS10: BTEX, VOCs
10.8m: auger grinding for 15 minutes **to 10.9m**
11.0m: auger grinding for 10 minutes **to 11.6m**

15.4m: spoon bouncing

END OF BOREHOLE

Borehole was dry upon completion of drilling.

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

BOREHOLE LOG 109

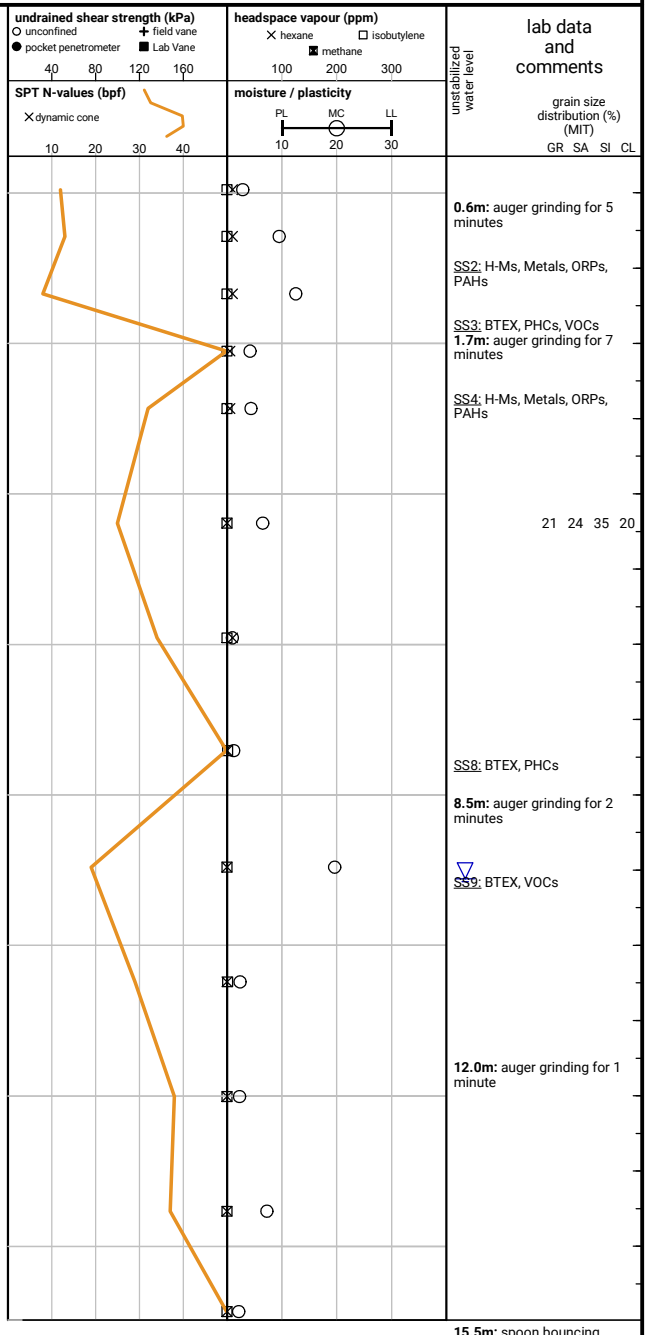
Date Started : Jun 11, 2020
Position : E: 610123, N: 4841180 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
164.5	**GROUND SURFACE**				
	100mm **ASPHALT**		1	SS	12
	50mm **AGGREGATE**				
	FILL, sand and gravel to sandy silt, trace organics, trace asphalt, compact, light brown to dark grey, dry to moist		2	SS	13
163.0 / 1.5	**SANDY SILT**, some gravel, some clay, loose, brown with some orange, moist (GLACIAL TILL)		3	SS	8
	...at 2.3 m, very dense, light brown		4	SS	54
	...at 3.0 m, trace rock fragments, dense, greyish brown with some orange to 4.6 m		5	SS	32
	...at 4.6 m, gravelly, grey		6	SS	25
			7	SS	34
	...at 7.6 m, very dense		8	SS	77
155.4 / 9.1	**SILT AND CLAY**, some sand, trace gravel, very stiff, grey, moist		9	SS	19
	...at 9.6 m, sand seam, wet to 9.7 m				
153.8 / 10.7	**SAND AND SILT**, some gravel, trace shale and limestone fragments, compact to dense, grey, moist (GLACIAL TILL)		10	SS	29
			11	SS	38
	...at 13.7 m, sand seams		12	SS	37
149.0 / 15.5	...at 15.2 m, sand seams, very dense		13	SS	50 / 75mm



END OF BOREHOLE

Unstabilized water level measured at 9.6 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	1.8	162.7
Jul 8, 2020	1.9	162.6
Aug 7, 2020	1.9	162.6
Sep 11, 2020	2.0	162.5
Oct 8, 2020	2.1	162.4
Nov 6, 2020	2.5	162.0
May 11, 2022	2.0	162.5

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

BOREHOLE LOG 110

Date Started : Jun 12, 2020
Position : E: 610109, N: 4841186 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD=110 mm

elev depth (m)	description	graphic log	sample number	sample type	SPT N-value
165.2	**GROUND SURFACE**				
	75mm **ASPHALT**		1	SS	4
	75mm **AGGREGATE**				
	FILL, sandy silt, trace gravel, trace asphalt, trace rootlets, loose, brown, moist		2	SS	10
			3	SS	6
162.9 / 2.3	**SANDY SILT**, some gravel, some clay, compact to dense, brown with some orange, moist (GLACIAL TILL)		4	SS	17
	...at 3.0 m, light brown		5	SS	37
	...at 4.6 m, trace shale fragmnets		6	SS	40
	...at 6.1 m, very dense to 7.6 m		7	SS	66
			8	SS	28
156.1 / 9.1	**SILT AND CLAY**, some sand, trace gravel, stiff, grey, moist		9	SS	8
				FV	
			10	SS	14
153.0 / 12.2	**SAND AND SILT**, some gravel, trace shale and limestone fragments, dense to very dense, grey, moist (GLACIAL TILL)		11	SS	41
			12	SS	78
150.0 / 15.2	**INFERRED BEDROCK**, shale and limestone fragments, grey, moist		13	SS	88 / 175mm
149.6 / 15.6	**END OF BOREHOLE**				

depth scale (m) 0–15 | well details | elevation (m) 165–150

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40 80 120 160
SPT N-values (bpf): dynamic cone; 10 20 30 40
headspace vapour (ppm): hexane, isobutylene, methane; 100 200 300
moisture / plasticity: PL MC LL; 10 20 30
unstabilized water level

lab data and comments
grain size distribution (%) (MIT) GR SA SI CL

SS2: H-Ms, Metals, ORPs, PAHs
SS3: BTEX, PHCs, VOCs
SS5: H-Ms, Metals, ORPs, PAHs
SS7: BTEX, PHCs
7.3m: auger grinding for 3 minutes
SS10: BTEX, VOCs
12.8m: auger grinding for 10 minutes **to 13.1m**
13.4m: auger grinding for 20 minutes **to 13.7m**
15.6m: spoon bouncing

Unstabilized water level measured at 10.1 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	7.4	157.8
Jul 8, 2020	6.4	158.8
Aug 7, 2020	5.6	159.6
Sep 11, 2020	4.5	160.7
Oct 8, 2020	3.6	161.6
Nov 6, 2020	2.5	162.7
May 11, 2022	2.2	163.0

file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

BOREHOLE LOG 111

Date Started : Jun 15, 2020
Position : E: 610074, N: 4841155 (UTM 17T)
Elev. Datum : Geodetic

File No. : 19-040 **Project** : 7085 Goreway Drive, Mississauga, ON **Client** : 7085 Goreway Developments Ltd.

drill method : CME 75

hollow stem augers (skinny) OD= 110 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
164.9	**GROUND SURFACE**				
	75mm **ASPHALT**		1	SS	15
164.1	50mm **AGGREGATE**				
0.8	**FILL**, sand and gravel, trace aggregate, compact, light brown, dry		2	SS	16
	SANDY SILT, some gravel, some clay, compact, light brown, moist (GLACIAL TILL)		3	SS	24
			4	SS	17
	...at 3.0 m, sand seam, grey		5	SS	10
	...at 4.6 m, clayey, hard		6	SS	32
			7	SS	38
			8	SS	87
155.8					
9.1	**SILT AND CLAY**, some sand, trace gravel, stiff, grey, moist		9	SS	14
			10	SS	14
152.7					
12.2	**SAND AND SILT**, some gravel, trace shale and limestone fragments, dense to very dense, grey, wet (GLACIAL TILL)		11	SS	39
			12	SS	49
148.8					
16.1	**END OF BOREHOLE**		13	SS	50 / 75mm

depth scale (m) | well details | elevation (m)

undrained shear strength (kPa): unconfined, field vane, pocket penetrometer, Lab Vane; 40 80 120 160
SPT N-values (bpf): dynamic cone; 10 20 30 40
headspace vapour (ppm): hexane, isobutylene, methane; 100 200 300
moisture / plasticity: PL MC LL; 10 20 30

unstabilized water level

lab data and comments

grain size distribution (%) (MIT) GR SA SI CL

SS1: H-Ms, Metals, ORPs, PAHs
SS2: BTEX, PHCs, VOCs
SS3: H-Ms, Metals, ORPs, PAHs
SS4: BTEX, PHCs
SS9: BTEX, VOCs
12.7m: spoon bouncing
12.8m: auger grinding for 6 minutes

Unstabilized water level measured at 7.0 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

date	depth (m)	elevation (m)
Jun 22, 2020	1.4	163.5
Jul 8, 2020	1.6	163.3
Aug 7, 2020	1.6	163.3
Sep 11, 2020	1.8	163.1
Oct 8, 2020	1.8	163.1
Nov 6, 2020	1.6	163.3
May 11, 2022	1.5	163.4

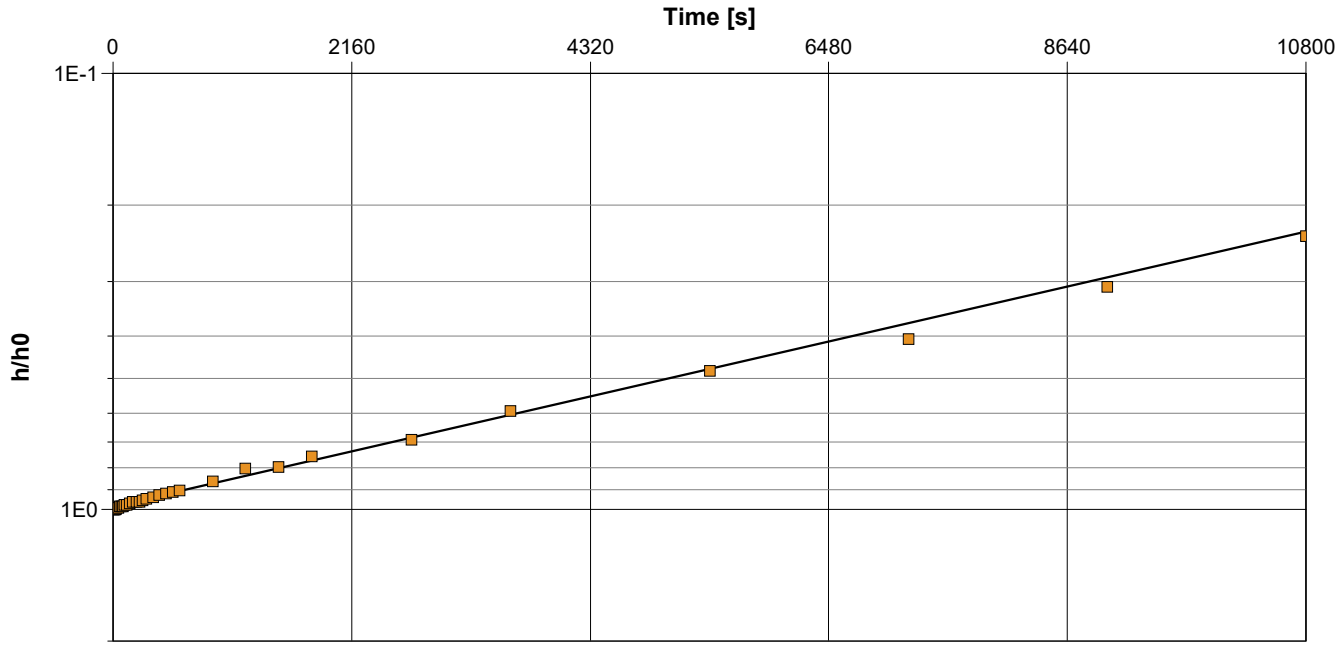
file: 19-040 rev1.gpj

Tech : KM | **PM** : TA | **Rev** : JC

APPENDIX B

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 7085 Goreway Drive
	Number: 19-040
	Client: 7085 Goreway Developments Limited

Location: Mississauga, ON	Slug Test: BH101	Test Well: BH101
Test Conducted by: KM		Test Date: 2020-06-22
Analysis Performed by: TA	BH101	Analysis Date: 2020-07-07
Aquifer Thickness: 15.80 m		

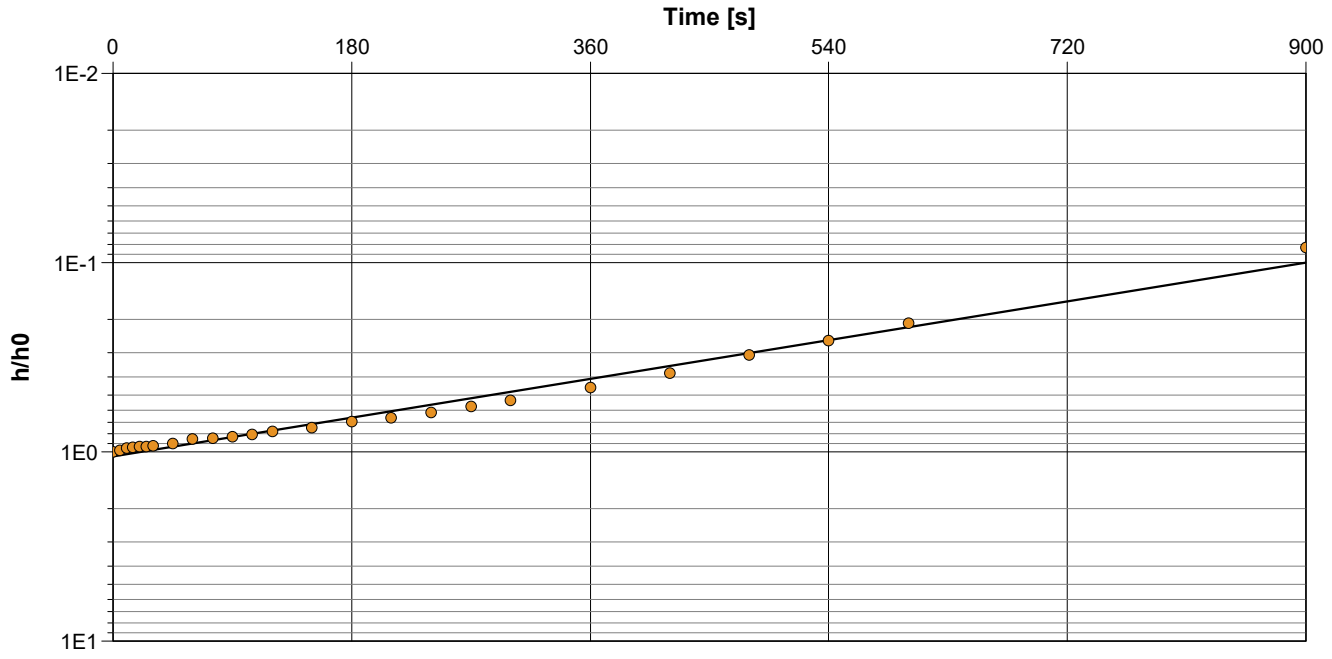


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH101	5.83×10^{-8}	

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 7085 Goreway Drive
	Number: 19-040
	Client: 7085 Goreway Developments Limited

Location: Mississauga, ON	Slug Test: BH102	Test Well: BH102
Test Conducted by: KM		Test Date: 2020-06-22
Analysis Performed by: TA	BH102	Analysis Date: 2020-07-07
Aquifer Thickness: 18.31 m		

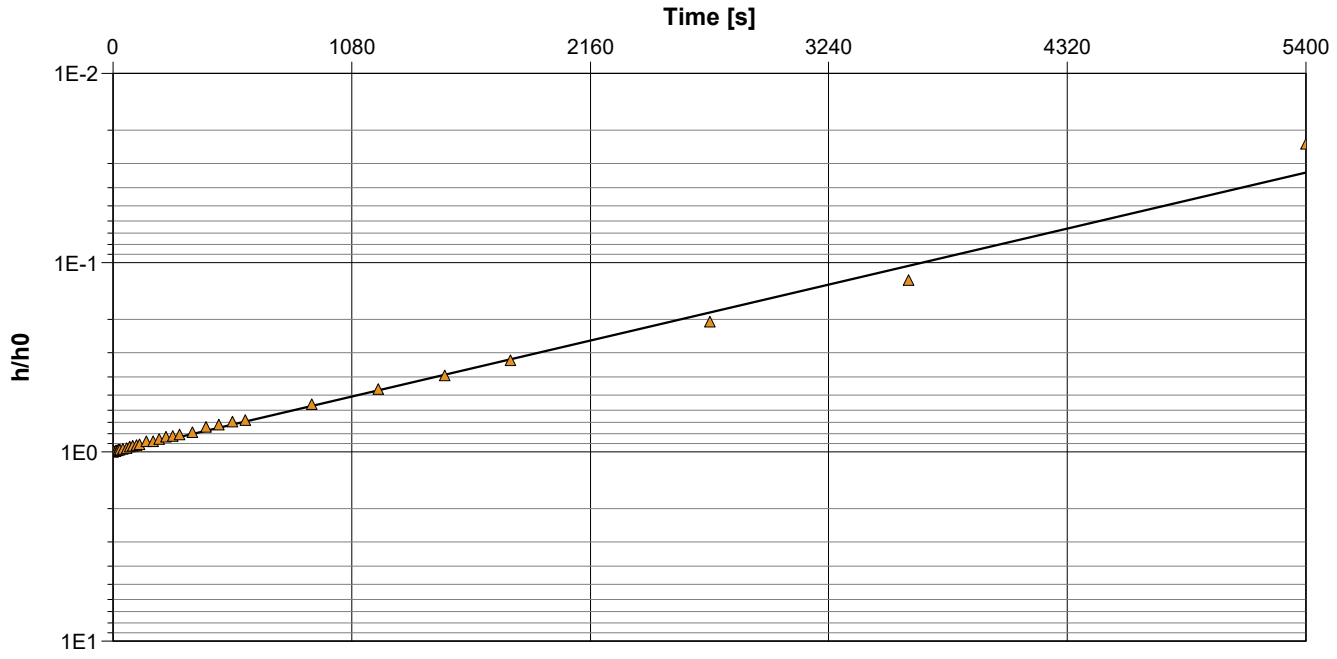


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH102	1.28×10^{-6}	

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 7085 Goreway Drive
	Number: 19-040
	Client: 7085 Goreway Developments Limited

Location: Mississauga, ON	Slug Test: BH103	Test Well: BH103
Test Conducted by: KM		Test Date: 2020-06-22
Analysis Performed by: TA	BH103	Analysis Date: 2020-07-07
Aquifer Thickness: 15.80 m		

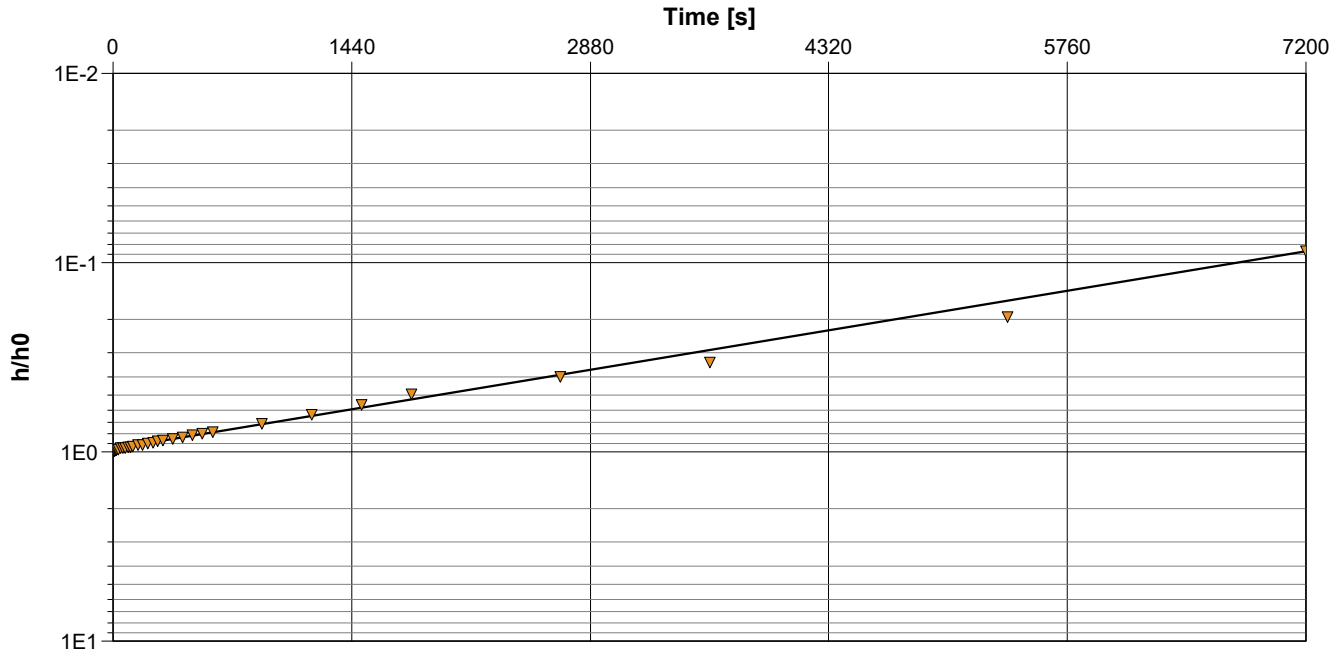


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH103	2.78×10^{-7}	

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 7085 Goreway Drive
	Number: 19-040
	Client: 7085 Goreway Developments Limited

Location: Mississauga, ON	Slug Test: BH105	Test Well: BH105
Test Conducted by: KM		Test Date: 2020-06-23
Analysis Performed by: TA	BH105	Analysis Date: 2020-07-07
Aquifer Thickness: 9.10 m		

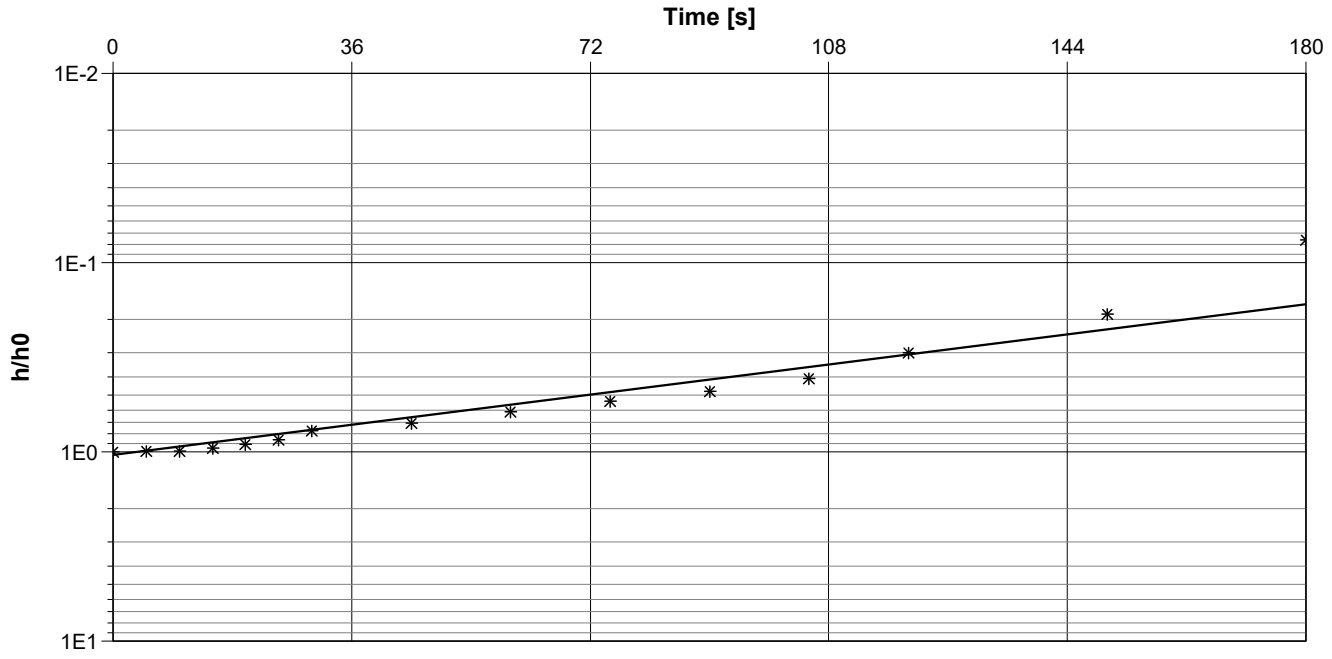


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH105	1.27×10^{-7}	

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 7085 Goreway Drive
	Number: 19-040
	Client: 7085 Goreway Developments Limited

Location: Mississauga, ON	Slug Test: BH107	Test Well: BH107
Test Conducted by: KM		Test Date: 2020-06-22
Analysis Performed by: TA	BH107	Analysis Date: 2020-07-07
Aquifer Thickness: 16.90 m		

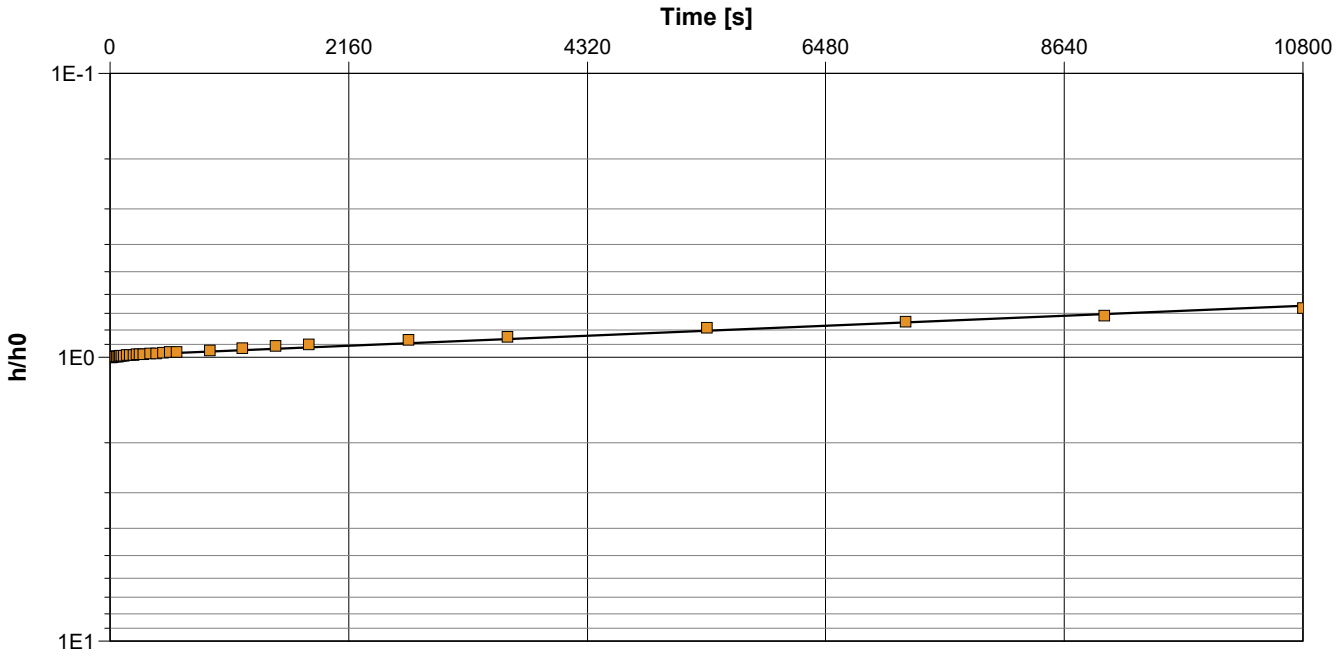


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH107	4.65×10^{-6}	

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 7085 Goreway Drive
	Number: 19-040
	Client: 7085 Goreway Developments Limited

Location: Mississauga, ON	Slug Test: BH109	Test Well: BH109
Test Conducted by: KM		Test Date: 2020-06-23
Analysis Performed by: TA	BH109	Analysis Date: 2020-07-07
Aquifer Thickness: 10.70 m		

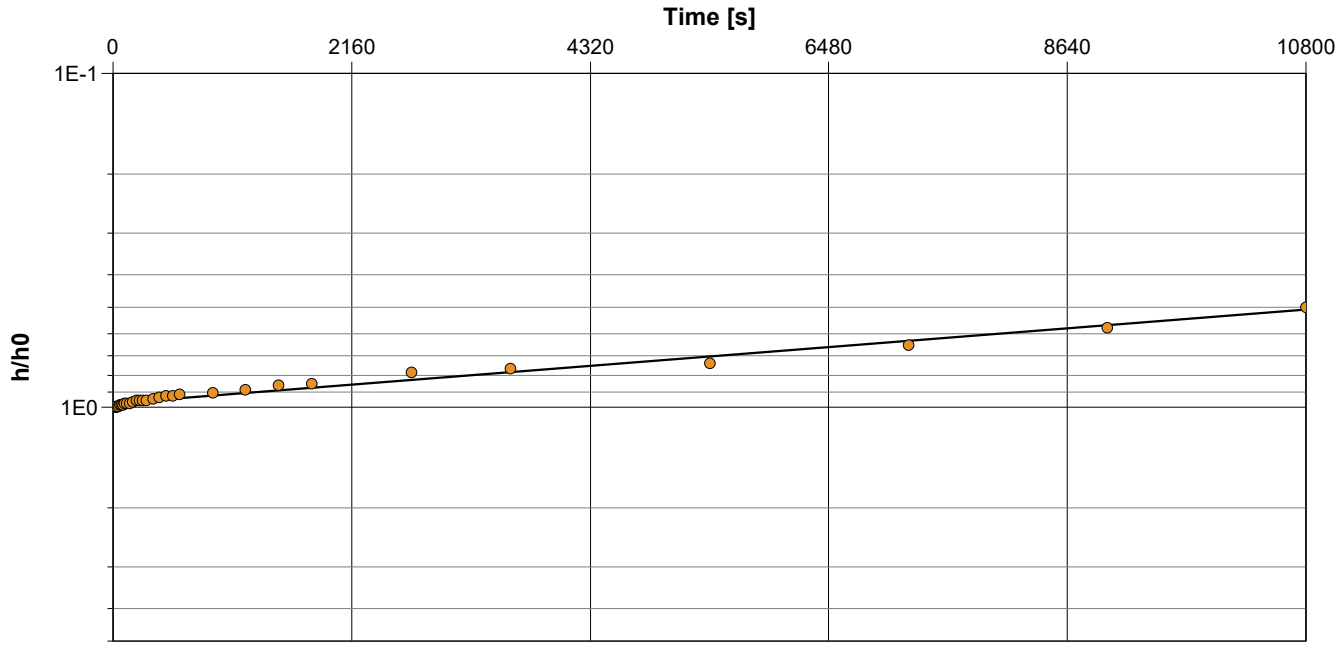


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH109	1.70×10^{-8}	

GROUNDED ENGINEERING	**Slug Test Analysis Report**
	Project: 7085 Goreway Drive
	Number: 19-040
	Client: 7085 Goreway Developments Limited

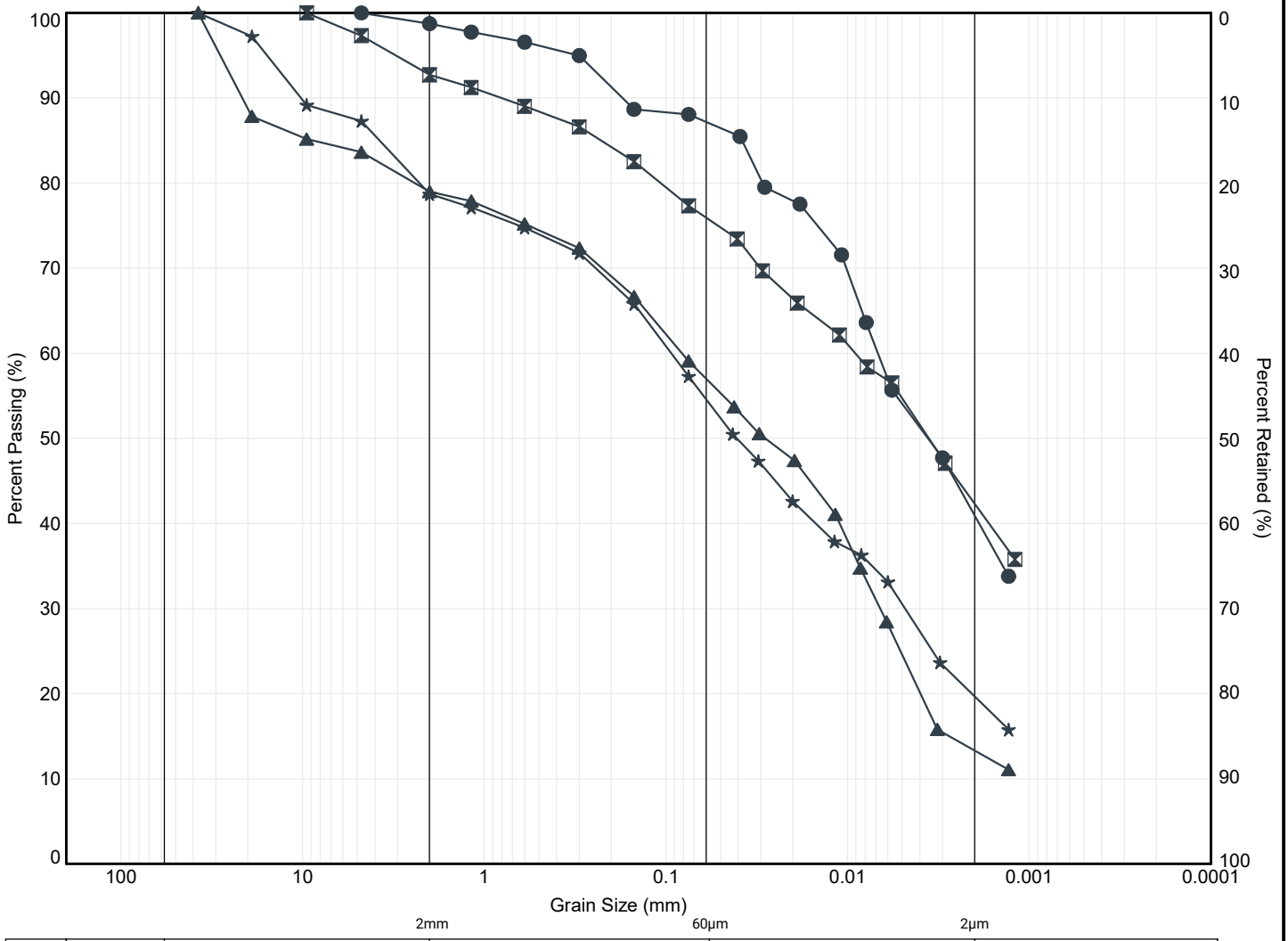
Location: Mississauga, ON	Slug Test: BH111	Test Well: BH111
Test Conducted by: KM		Test Date: 2020-06-23
Analysis Performed by: TA	BH111	Analysis Date: 2020-07-07
Aquifer Thickness: 9.10 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH111	2.13×10^{-8}	

APPENDIX C



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	**102**	SS10	11.0	154.9	1	12	46	41
⊠	**104**	SS4	2.6	163.2	7	17	34	42
▲	**106**	SS10	11.0	153.8	21	22	44	13
★	**109**	SS6	4.9	159.6	21	24	35	20

GROUNDED ENGINEERING

Title: **GRAIN SIZE DISTRIBUTION**

File No.: **19-040**

file: 19-040 rev1.gpj

APPENDIX D

K from Grain Size Analysis Report

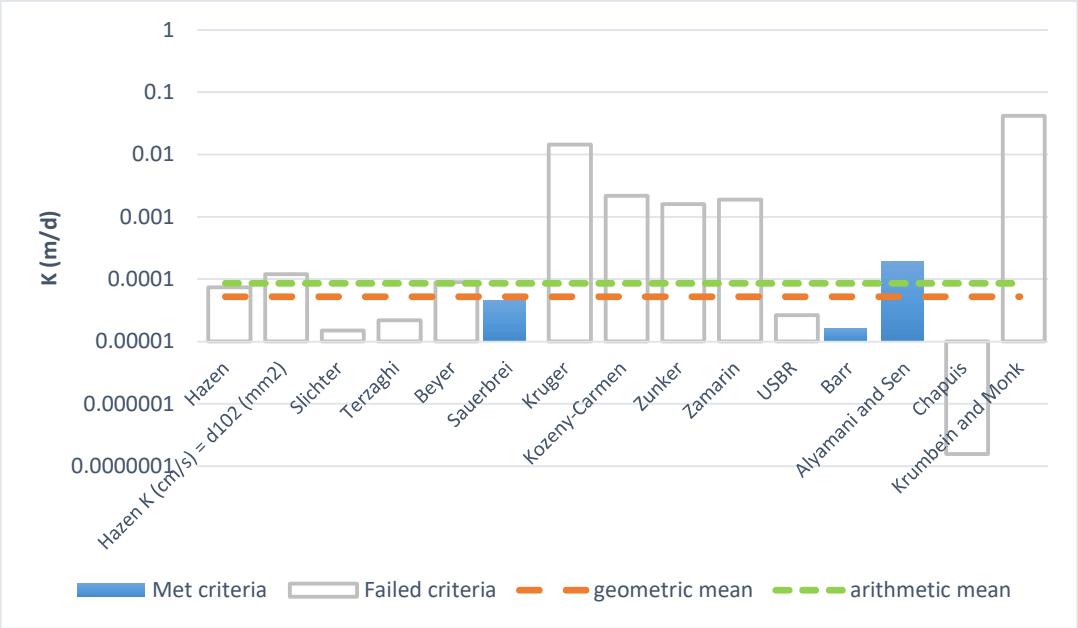
Date: 13-Jul-20

Sample Name: BH102 SS10

Mass Sample (g): 100

T (oC) 20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	8.6E-08	8.6E-10	0.00	
Hazen K (cm/s) = d_{10} (mm)	1.4E-07	1.4E-09	0.00	
Slichter	1.7E-08	1.7E-10	0.00	
Terzaghi	2.5E-08	2.5E-10	0.00	
Beyer	1.0E-07	1.0E-09	0.00	
Sauerbrei	5.3E-08	5.3E-10	0.00	
Kruger	1.7E-05	1.7E-07	0.01	
Kozeny-Carmen	2.5E-06	2.5E-08	0.00	
Zunker	1.9E-06	1.9E-08	0.00	
Zamarin	2.2E-06	2.2E-08	0.00	
USBR	3.1E-08	3.1E-10	0.00	
Barr	1.9E-08	1.9E-10	0.00	
Alyamani and Sen	2.3E-07	2.3E-09	0.00	
Chapuis	1.8E-10	1.8E-12	0.00	
Krumbein and Monk	4.8E-05	4.8E-07	0.04	
geometric mean	6.1E-08	6.1E-10	0.00	
arithmetic mean	1.0E-07	1.0E-09	0.00	

K from Grain Size Analysis Report

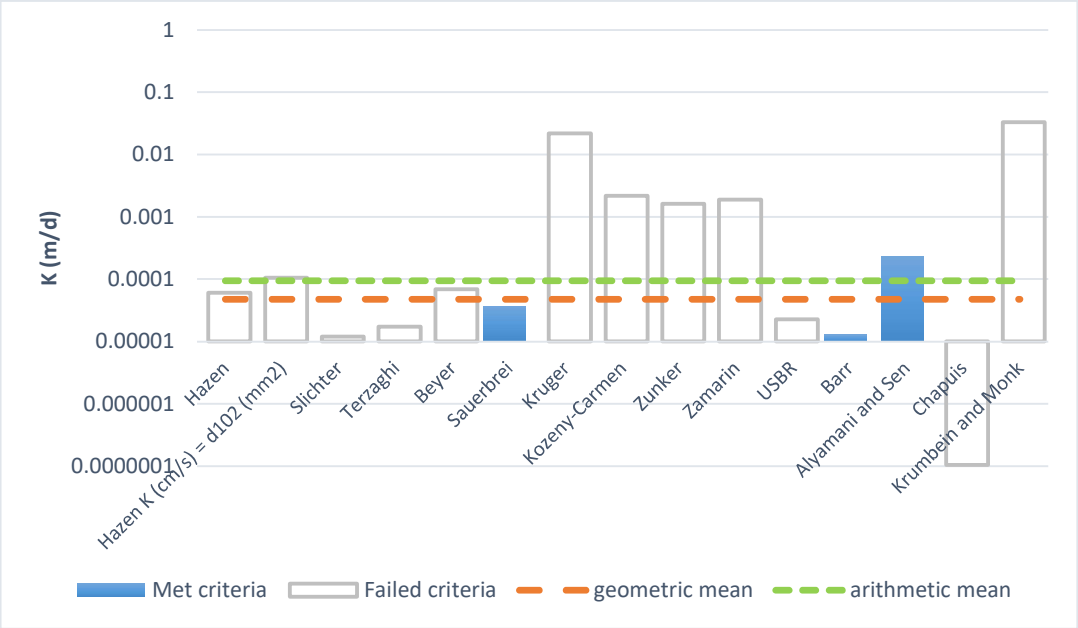
Date: 13-Jul-20

Sample Name: BH104 SS4

Mass Sample (g): 100

T (oC) 20

Poorly sorted clay with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	7.0E-08	7.0E-10	0.00	
Hazen K (cm/s) = d_{10} (mm)	1.2E-07	1.2E-09	0.00	
Slichter	1.4E-08	1.4E-10	0.00	
Terzaghi	2.0E-08	2.0E-10	0.00	
Beyer	8.0E-08	8.0E-10	0.00	
Sauerbrei	4.2E-08	4.2E-10	0.00	
Kruger	2.5E-05	2.5E-07	0.02	
Kozeny-Carmen	2.5E-06	2.5E-08	0.00	
Zunker	1.9E-06	1.9E-08	0.00	
Zamarin	2.2E-06	2.2E-08	0.00	
USBR	2.6E-08	2.6E-10	0.00	
Barr	1.5E-08	1.5E-10	0.00	
Alyamani and Sen	2.7E-07	2.7E-09	0.00	
Chapuis	1.2E-10	1.2E-12	0.00	
Krumbein and Monk	3.8E-05	3.8E-07	0.03	
geometric mean	5.5E-08	5.5E-10	0.00	
arithmetic mean	1.1E-07	1.1E-09	0.00	

K from Grain Size Analysis Report

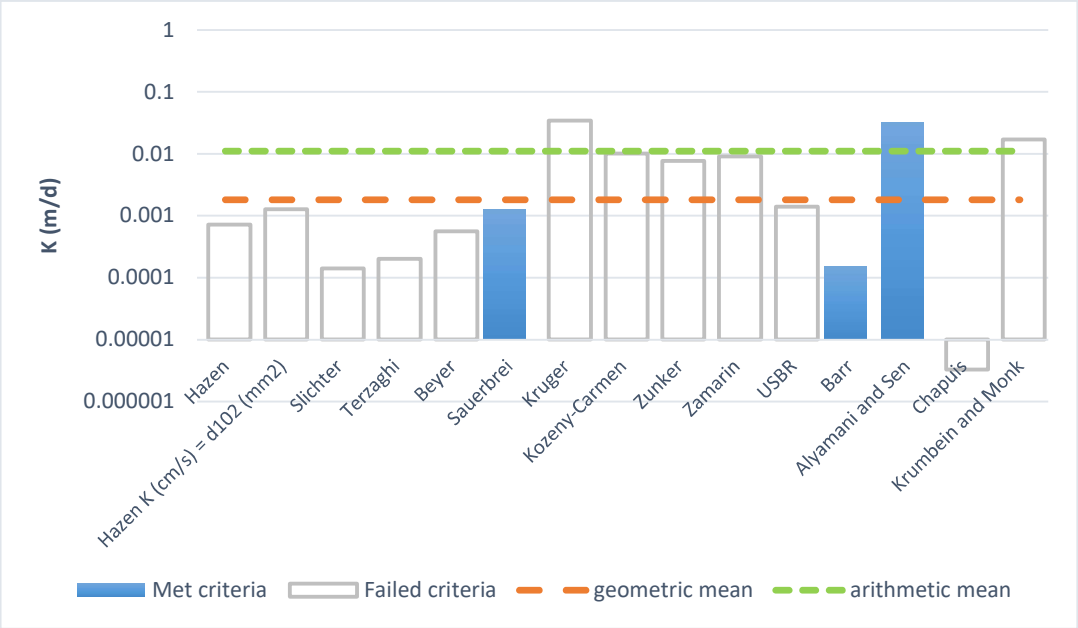
Date: 13-Jul-20

Sample Name: BH106 SS10

Mass Sample (g): 100

T (oC) 20

Poorly sorted sandy gravelly silt with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	8.3E-07	8.3E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	1.5E-06	1.5E-08	0.00	
Slichter	1.6E-07	1.6E-09	0.00	
Terzaghi	2.3E-07	2.3E-09	0.00	
Beyer	6.5E-07	6.5E-09	0.00	
Sauerbrei	1.4E-06	1.4E-08	0.00	
Kruger	4.0E-05	4.0E-07	0.03	
Kozeny-Carmen	1.2E-05	1.2E-07	0.01	
Zunker	8.9E-06	8.9E-08	0.01	
Zamarin	1.0E-05	1.0E-07	0.01	
USBR	1.6E-06	1.6E-08	0.00	
Barr	1.7E-07	1.7E-09	0.00	
Alyamani and Sen	3.7E-05	3.7E-07	0.03	
Chapuis	3.8E-09	3.8E-11	0.00	
Krumbein and Monk	2.0E-05	2.0E-07	0.02	
geometric mean	2.1E-06	2.1E-08	0.00	
arithmetic mean	1.3E-05	1.3E-07	0.01	

K from Grain Size Analysis Report

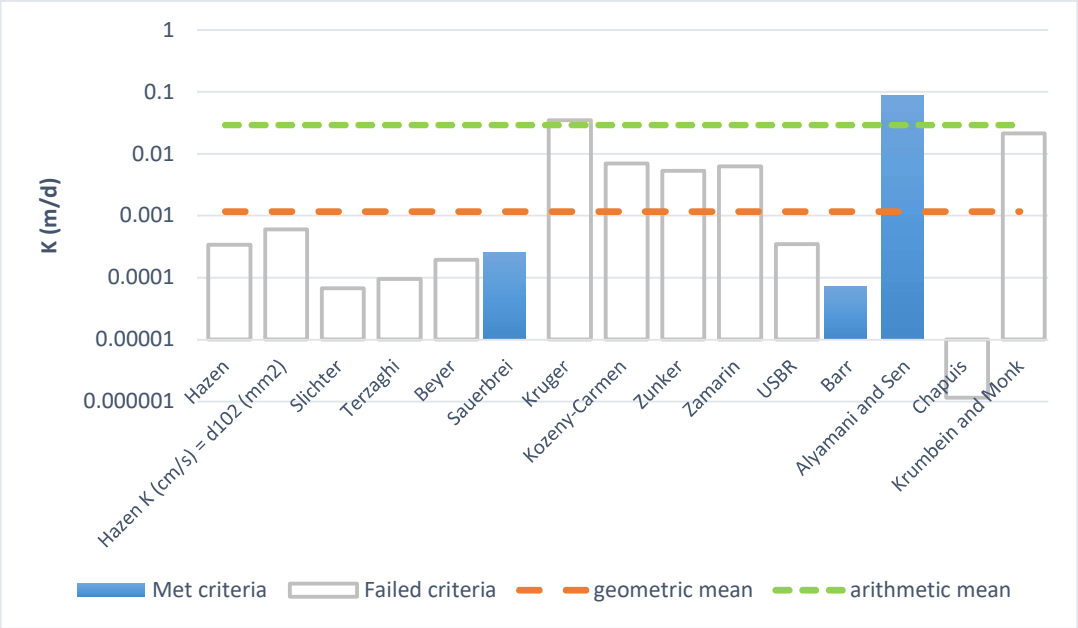
Date: 13-Jul-20

Sample Name: BH109 SS6

Mass Sample (g): 100

T (oC) 20

Poorly sorted sandy gravelly silt with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	3.9E-07	3.9E-09	0.00	
Hazen K (cm/s) = d_{10} (mm)	7.0E-07	7.0E-09	0.00	
Slichter	7.7E-08	7.7E-10	0.00	
Terzaghi	1.1E-07	1.1E-09	0.00	
Beyer	2.2E-07	2.2E-09	0.00	
Sauerbrei	3.0E-07	3.0E-09	0.00	
Kruger	4.0E-05	4.0E-07	0.03	
Kozeny-Carmen	8.1E-06	8.1E-08	0.01	
Zunker	6.1E-06	6.1E-08	0.01	
Zamarin	7.3E-06	7.3E-08	0.01	
USBR	4.0E-07	4.0E-09	0.00	
Barr	8.3E-08	8.3E-10	0.00	
Alyamani and Sen	1.0E-04	1.0E-06	0.09	
Chapuis	1.3E-09	1.3E-11	0.00	
Krumbein and Monk	2.5E-05	2.5E-07	0.02	
geometric mean	1.4E-06	1.4E-08	0.00	
arithmetic mean	3.4E-05	3.4E-07	0.03	

Adopting the equation form presented in Vukovic and Soro (1992),

$$K = \frac{\rho g}{\mu} N \varphi(n) d_e^2$$

the following values and equations aresubstituted into the appropriate terms to evalute the models listed in the table below. The values of d_e to be entered should be in cm units. The values of K calculated have the units cm/s, except for the Alyamani and Sen model (see footnote).

Source	N	$\varphi(n)$	d_e	Applicable Conditions
Hazen simplified (Freeze and Cherry, 1979)	$10\frac{\mu}{\rho g}$	1	d_{10}	uniformly graded sand, n = 0.375 T = 10 °C
Hazen (1892)[a]	6×10^{-4}	$[1 + 10(n - 0.26)]$	d_{10}	0.01 cm < d_{10} < 0.3 cm U < 5
Slichter (1898)[a]	1×10^{-2}	$n^{3.287}$	d_{10}	0.01 cm < d_{10} < 0.5 cm
Terzaghi (1925)[a]	10.7×10^{-3} smooth grains 6.1×10^{-3} coarse grains	$\left(\frac{n - 0.13}{\sqrt[3]{1-n}}\right)^2$	d_{10}	sandy soil, coarse sand
Beyer (1964)[a]	$5.2 \times 10^{-4} \log\frac{500}{U}$	1	d_{10}	0.006 cm < d_{10} <0.06 cm $1 < U < 20$
Sauerbrei (1932)[a] (Vuković and Soro, 1992)	$(3.75 \times 10^{-5}) \times \tau$ $\tau \cong 1.093 \times 10^{-4} T^2 + 2.102 \times 10^{-2} T + 0.5889$	$\frac{n^3}{(1-n)^2}$	d_{17}	sand and sandy clay d_{17} < 0.05 cm
Krüger (1919)[a]	4.35×10^{-4}	$\frac{n}{(1-n)^2}$	$\frac{1}{\sum_{i=1}^{n} \frac{\Delta w_i}{d_i}}$	medium sand $U > 5$ T = 0 °C
Kozeny-Carmen (1953)[a]	8.3×10^{-3}	$\frac{n^3}{(1-n)^2}$	d_{10} or $\frac{1}{\frac{3}{2}\frac{\Delta w_1}{d_1} + \sum_{i=2}^{n} \Delta g_i \frac{d_i^g + d_i^d}{2 d_i^g d_i^d}}$ $d_1 = \frac{1}{\frac{1}{2}\left(\frac{1}{d_i^g} + \frac{1}{d_i^d}\right)}$	Coarse sand
Zunker (1930)[a]	0.7×10^{-3} for nonuniform, clayey, angular grains 1.2×10^{-3} for nonuniform 1.4×10^{-3} for uniform, coarse grains 2.4×10^{-3} for uniform sand, well rounded grains	$\frac{n}{(1-n)}$	$\frac{1}{\sum_{i=1}^{n} \Delta g_i \frac{d_i^g - d_i^d}{d_i^g d_i^d ln\left(\frac{d_i^g}{d_i^d}\right)}}$	no fractions finer than d = 0.0025 mm
Zamarin (1928)[a]	8.65×10^{-3}	$\frac{n^3}{(1-n)^2} C_n$ $C_n = (1.275 - 1.5n)^2$	$\frac{1}{\sum_{i=1}^{n} \Delta g_i \frac{\ln\left(\frac{d_i^g}{d_i^d}\right)}{d_i^g - d_i^d}}$	Large grained sands with no fractions having d < 0.00025 mm
USBR (United States Bureau of Reclamation) (Bialas, 1966)[a]	$(4.8 \times 10^{-4})(10^{0.3})$	1.0	$d_{20}^{1.15}$	Medium grained sands with U < 5; derived for T = 15 °C
Barr (2001)	$\frac{1}{(36)5C_s^2}$ C_s^2 = 1 for spherical grains C_s^2 = 1.35 for angular grains	$\frac{n^3}{(1-n)^2}$	d_{10}	unspecified
Alyamani and Sen (1993)	1300	1.0	$[I_o + 0.025(d_{50} - d_{10})]$	unspecified
Chapuis (2004)	$\frac{\mu}{\rho g}$	$10^{1.291\xi - 0.6435}$ $\xi = \frac{n}{1-n}$	$d_{10}^{\left(\frac{10^{(0.5304 - 0.2937\xi)}}{2}\right)}$	$0.3 < n < 0.7$ $0.10 < d_{10} < 2.0$ mm $2 < U < 12$ $d_{10}/d_5 < 1.4$
Krumbein and Monk (1942)	7.501×10^{-6}	$e^{(-1.31 \times \sigma_\phi)}$ $\sigma_\phi = \frac{\frac{d_{84\phi} - d_{16\phi}}{4} + \frac{d_{95\phi} - d_{5\phi}}{6.6}}{2}$	$2^{\left(\frac{d_{16\phi} + d_{50\phi} + d_{84\phi}}{3}\right)}$	natural sands with lognormal grain size distribution

* indicates formulas were taken from Vuković and Soro, (1992)
N = constant dependent on characteristics of the porous medium
$\varphi(n)$ = function of porosity
T = water temp. (°C)
g = 980 cm s^{-2}
$\rho = 3.1 \times 10^{-8} T^3 - 7.0 \times 10^{-6} T^2 + 4.19 \times 10^{-5} T + 0.99985$
$\mu = -7.0 \times 10^{-8} T^3 + 1.002 \times 10^{-5} T^2 - 5.7 \times 10^{-4} T + 0.0178$
$\tau = 1.093 \times 10^{-4} T^2 + 2.102 \times 10^{-2} T + 0.5889$
n = porosity as fraction of aquifer volume
d_i^g = the maximum grain diameter in fraction i
d_i^d = the minimum grain diameter in fraction i
d_{10} = grain size (cm) corresponding to 10% by weight passing through the sieves
d_{20} = grain size (cm) corresponding to 20% by weight passing through the sieves
d_{50} = grain size (cm) corresponding to 50% by weight passing through the sieves
d_{60} = grain size (cm) corresponding to 60% by weight passing through the sieves
$U = d_{60}/d_{10}$
Δg_i = the fraction of mass that passes between sieves i and $i+1$ where i is the smaller sieve
Δw_i = fraction of total weight of sample with fraction identifier 'i'
d_i = mean grain diameter of the fraction i
$d_{i\phi}$ = mean grain diameter of the fraction i in phi units ($\phi = \log_2 (d_e/d_o)$, d_e in mm, d_o = 1 mm)
I_o = x-intercept (grain size) of a percent grain retention curve plotted on arithmetic axes and focussing on data below 50% retained

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APPENDIX E

FINAL REPORT

CA40142-MAY22 R1

19-040, 7085 Gore Way, Mississauga, ON

Prepared for

Grounded Engineering Inc.

FINAL REPORT

First Page

CLIENT DETAILS

Client	Grounded Engineering Inc.
Address	12 Banigan Drive Toronto, Ontario M4H1E9. Canada
Contact	Tarak Ali
Telephone	647-264-7909
Facsimile	
Email	tali@groundedeng.ca
Project	19-040, 7085 Gore Way, Mississauga, ON
Order Number	
Samples	Ground Water (2)

LABORATORY DETAILS

Project Specialist	Jill Campbell, B.Sc.,GISAS
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	2165
Facsimile	705-652-6365
Email	jill.campbell@sgs.com
SGS Reference	CA40142-MAY22
Received	05/11/2022
Approved	05/26/2022
Report Number	CA40142-MAY22 R1
Date Reported	05/26/2022

COMMENTS

RL - SGS Reporting Limit

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present:YES
Custody Seal Present:YES

Chain of Custody Number:026692

Increased NPE RL due to sample matrix

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

TABLE OF CONTENTS

Client: Grounded Engineering Inc.
Project: 19-040, 7085 Gore Way, Mississauga, ON
Project Manager: Tarak Ali
Samplers: Cameron H.

MATRIX: WATER

L1 = SANSEW / WATER / - - Mississauga - Storm Sewer - BL_259_05

L2 = SANSEW / WATER / - - Peel Table 1 - Sanitary Sewer Discharge - BL_53_2010

				Sample Number	8	9
				Sample Name	SW-BH105	SW-BH105 Field Filtered
				Sample Matrix	Ground Water	Ground Water
				Sample Date	11/05/2022	11/05/2022
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
General Chemistry						
Biochemical Oxygen Demand (BOD5)	mg/L	2	15	300	< 4 ↑	---
Total Suspended Solids	mg/L	2	15	350	211	---
Total Kjeldahl Nitrogen	as N mg/L	0.5	1	100	< 0.5	---
Metals and Inorganics						
Total Chlorine	mg/L	0.02	1		< 0.02	---
Fluoride	mg/L	0.06		10	0.16	---
Cyanide (total)	mg/L	0.01	0.02	2	< 0.01	---
Sulphate	mg/L	2		1500	190	---
Aluminum (total)	mg/L	0.001	1	50	2.69	0.272
Antimony (total)	mg/L	0.0009		5	< 0.0009	< 0.0009
Arsenic (total)	mg/L	0.0002	0.02	1	0.0243	0.0018
Cadmium (total)	mg/L	0.000003	0.008	0.7	0.000080	0.000007
Chromium (total)	mg/L	0.00008	0.08	5	0.0195	0.00506
Copper (total)	mg/L	0.0002	0.04	3	0.0165	0.0037
Cobalt (total)	mg/L	0.000004		5	0.00169	0.000502
Lead (total)	mg/L	0.00009	0.12	3	0.0154	0.00065
Manganese (total)	mg/L	0.00001	0.05	5	0.110	0.0353
Molybdenum (total)	mg/L	0.00004		5	0.0124	0.00775
Nickel (total)	mg/L	0.0001	0.08	3	0.0037	0.0013
Phosphorus (total)	mg/L	0.003	0.4	10	0.340	0.024
Selenium (total)	mg/L	0.00004	0.02	1	0.00071	0.00045

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L2 = SANSEW / WATER / - - Peel Table 1 - Sanitary Sewer Discharge - BL_53_2010

				Sample Number	8	9
				Sample Name	SW-BH105	SW-BH105 Field Filtered
				Sample Matrix	Ground Water	Ground Water
				Sample Date	11/05/2022	11/05/2022
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
Metals and Inorganics (continued)						
Silver (total)	mg/L	0.00005	0.12	5	0.00011	< 0.00005
Tin (total)	mg/L	0.00006		5	0.00062	0.00164
Titanium (total)	mg/L	0.00005		5	0.0403	0.00882
Zinc (total)	mg/L	0.002	0.04	3	0.163	0.005
Aluminum (0.2µm)	mg/L	0.001			---	0.004
Microbiology						
E. Coli	cfu/100mL	0	200		< 2↑	---
Nonylphenol and Ethoxylates						
Nonylphenol	mg/L	0.001		0.02	< 0.002↑	---
Nonylphenol Ethoxylates	mg/L	0.01		0.2	< 0.01	---
Nonylphenol diethoxylate	mg/L	0.01			< 0.01	---
Nonylphenol monoethoxylate	mg/L	0.01			< 0.01	---
Oil and Grease						
Oil & Grease (total)	mg/L	2			< 2	---
Oil & Grease (animal/vegetable)	mg/L	4		150	< 4	---
Oil & Grease (mineral/synthetic)	mg/L	4		15	< 4	---

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L2 = SANSEW / WATER / - - Peel Table 1 - Sanitary Sewer Discharge - BL_53_2010

					Sample Number	8	9
					Sample Name	SW-BH105	SW-BH105 Field Filtered
					Sample Matrix	Ground Water	Ground Water
					Sample Date	11/05/2022	11/05/2022
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
Other (ORP)						
pH	No unit	0.05	9	10	8.54	---
Chromium VI	mg/L	0.0002	0.04		0.0041	---
Mercury (total)	mg/L	0.00001	0.0004	0.01	0.00005	---
Mercury (dissolved)	mg/L	0.00001			---	< 0.00001
PAHs						
Benzo(b+j)fluoranthene	mg/L	0.0001			< 0.0001	---
Phenols						
4AAP-Phenolics	mg/L	0.002	0.008	1	0.003	---
SVOCs						
di-n-Butyl Phthalate	mg/L	0.002		0.08	< 0.002	---
Bis(2-ethylhexyl)phthalate	mg/L	0.002		0.012	< 0.002	---
PAHs (Total)	mg/L		0.002		< 0.001	---
Perylene	mg/L	0.0005			< 0.0005	---

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L2 = SANSEW / WATER / - - Peel Table 1 - Sanitary Sewer Discharge - BL_53_2010

				Sample Number	8	9
				Sample Name	SW-BH105	SW-BH105 Field Filtered
				Sample Matrix	Ground Water	Ground Water
				Sample Date	11/05/2022	11/05/2022
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
SVOCs - PAHs						
7Hdibenzo(c,g)carbazole	mg/L	0.0001			< 0.0001	---
Anthracene	mg/L	0.0001			< 0.0001	---
Benzo(a)anthracene	mg/L	0.0001			< 0.0001	---
Benzo(a)pyrene	mg/L	0.0001			< 0.0001	---
Benzo(e)pyrene	mg/L	0.0001			< 0.0001	---
Benzo(ghi)perylene	mg/L	0.0002			< 0.0002	---
Benzo(k)fluoranthene	mg/L	0.0001			< 0.0001	---
Chrysene	mg/L	0.0001			< 0.0001	---
Dibenzo(a,h)anthracene	mg/L	0.0001			< 0.0001	---
Dibenzo(a,i)pyrene	mg/L	0.0001			< 0.0001	---
Dibenzo(a,j)acridine	mg/L	0.0001			< 0.0001	---
Fluoranthene	mg/L	0.0001			< 0.0001	---
Indeno(1,2,3-cd)pyrene	mg/L	0.0002			< 0.0002	---
Phenanthrene	mg/L	0.0001			< 0.0001	---
Pyrene	mg/L	0.0001			< 0.0001	---

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L2 = SANSEW / WATER / - - Peel Table 1 - Sanitary Sewer Discharge - BL_53_2010

				Sample Number	8	9
				Sample Name	SW-BH105	SW-BH105 Field Filtered
				Sample Matrix	Ground Water	Ground Water
				Sample Date	11/05/2022	11/05/2022
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
VOCs						
Chloroform	mg/L	0.0005		0.04	< 0.0005	---
1,2-Dichlorobenzene	mg/L	0.0005		0.05	< 0.0005	---
1,4-Dichlorobenzene	mg/L	0.0005		0.08	< 0.0005	---
cis-1,2-Dichloroethene	mg/L	0.0005		4	< 0.0005	---
trans-1,3-Dichloropropene	mg/L	0.0005		0.14	< 0.0005	---
Methylene Chloride	mg/L	0.0005		2	< 0.0005	---
1,1,2,2-Tetrachloroethane	mg/L	0.0005		1.4	< 0.0005	---
Methyl ethyl ketone	mg/L	0.02		8	< 0.02	---
Styrene	mg/L	0.0005		0.2	< 0.0005	---
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005		1	< 0.0005	---
Trichloroethylene	mg/L	0.0005		0.4	< 0.0005	---
VOCs - BTEX						
Benzene	mg/L	0.0005	0.002	0.01	< 0.0005	---
Ethylbenzene	mg/L	0.0005	0.002	0.16	< 0.0005	---
Toluene	mg/L	0.0005	0.002	0.27	< 0.0005	---
Xylene (total)	mg/L	0.0005	0.0044	1.4	< 0.0005	---
m-p-xylene	mg/L	0.0005			< 0.0005	---
o-xylene	mg/L	0.0005			< 0.0005	---

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	SANSEW / WATER / - - Mississauga - Storm Sewer - BL_259_05 L1	SANSEW / WATER / - - Peel Table 1 - Sanitary Sewer Discharge - BL_53_2010 L2
SW-BH105					
Total Suspended Solids	SM 2540D	mg/L	211	15	
Aluminum	SM 3030/EPA 200.8	mg/L	2.69	1	
Arsenic	SM 3030/EPA 200.8	mg/L	0.0243	0.02	
Manganese	SM 3030/EPA 200.8	mg/L	0.110	0.05	
Zinc	SM 3030/EPA 200.8	mg/L	0.163	0.04	

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 375.4 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphate	DIO5045-MAY22	mg/L	2	<2	2	20	111	80	120	93	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0020-MAY22	mg/L	2	< 2	12	30	103	70	130	NV	70	130

Chlorine

Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-008

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Chlorine	EWL0298-MAY22	mg/L	0.02	< 0.02	ND	20	92	90	110	NA		

QC SUMMARY

Cyanide by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0145-MAY22	mg/L	0.01	<0.01	ND	10	93	90	110	100	75	125

Fluoride by Specific Ion Electrode

Method: SM 4500 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0301-MAY22	mg/L	0.06	<0.06	2	10	100	90	110	96	75	125

Hexavalent Chromium by SFA

Method: EPA218.6/EPA3060A I Internal ref.: ME-CA-IENVISKA-LAK-AN-012

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chromium VI	SKA0153-MAY22	mg/L	0.0002	<0.0002	ND	20	103	80	120	100	75	125

QC SUMMARY

Mercury by CVAAS

Method: EPA 7471A/SM 3112B | Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0028-MAY22	mg/L	0.00001	< 0.00001	ND	20	105	80	120	108	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0112-MAY22	mg/L	0.00005	<0.00005	ND	20	96	90	110	86	70	130
Aluminum (total)	EMS0112-MAY22	mg/L	0.001	<0.001	ND	20	98	90	110	86	70	130
Aluminum (0.2µm)	EMS0112-MAY22	mg/L	0.001	<0.001	ND	20	98	90	110	86	70	130
Arsenic (total)	EMS0112-MAY22	mg/L	0.0002	<0.0002	1	20	98	90	110	96	70	130
Cadmium (total)	EMS0112-MAY22	mg/L	0.000003	<0.000003	ND	20	98	90	110	94	70	130
Cobalt (total)	EMS0112-MAY22	mg/L	0.000004	<0.000004	17	20	97	90	110	96	70	130
Chromium (total)	EMS0112-MAY22	mg/L	0.00008	<0.00008	18	20	94	90	110	94	70	130
Copper (total)	EMS0112-MAY22	mg/L	0.0002	<0.0002	16	20	91	90	110	90	70	130
Manganese (total)	EMS0112-MAY22	mg/L	0.00001	<0.00001	ND	20	96	90	110	98	70	130
Molybdenum (total)	EMS0112-MAY22	mg/L	0.00004	<0.00004	2	20	103	90	110	101	70	130
Nickel (total)	EMS0112-MAY22	mg/L	0.0001	<0.0001	10	20	94	90	110	93	70	130
Lead (total)	EMS0112-MAY22	mg/L	0.00009	<0.00001	ND	20	103	90	110	103	70	130
Phosphorus (total)	EMS0112-MAY22	mg/L	0.003	<0.003	13	20	90	90	110	NV	70	130
Antimony (total)	EMS0112-MAY22	mg/L	0.0009	<0.0009	ND	20	109	90	110	117	70	130
Selenium (total)	EMS0112-MAY22	mg/L	0.00004	<0.00004	ND	20	98	90	110	107	70	130
Tin (total)	EMS0112-MAY22	mg/L	0.00006	<0.00006	ND	20	103	90	110	NV	70	130
Titanium (total)	EMS0112-MAY22	mg/L	0.00005	<0.00005	ND	20	94	90	110	NV	70	130
Zinc (total)	EMS0112-MAY22	mg/L	0.002	<0.002	16	20	98	90	110	93	70	130

QC SUMMARY

Microbiology

Method: SM 9222D | Internal ref.: ME-CA-IENVIMIC-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
E. Coli	BAC9204-MAY22	cfu/100mL	-	ACCEPTED	ACCEPTED							

Nonylphenol and Ethoxylates

Method: ASTM D7065-06 | Internal ref.: ME-CA-IENVIGC-LAK-AN-015

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nonylphenol diethoxylate	GCM0304-MAY22	mg/L	0.01	<0.01			82	55	120			
Nonylphenol Ethoxylates	GCM0304-MAY22	mg/L	0.01	0								
Nonylphenol monoethoxylate	GCM0304-MAY22	mg/L	0.01	<0.01			81	55	120			
Nonylphenol	GCM0304-MAY22	mg/L	0.001	<0.001			87	55	120			

QC SUMMARY

Oil & Grease

Method: MOE E3401 | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0286-MAY22	mg/L	2	<2	NSS	20	99	75	125			

Oil & Grease-AV/MS

Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0286-MAY22	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0286-MAY22	mg/L	4	< 4	NSS	20	NA	70	130			

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0294-MAY22	No unit	0.05	NA	0		100			NA		

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0166-MAY22	mg/L	0.002	<0.002	ND	10	101	80	120	102	75	125

QC SUMMARY

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
7Hdibenzo(c,g)carbazole	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	107	50	140	NSS	50	140
Anthracene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	100	50	140	NSS	50	140
Benzo(a)anthracene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	103	50	140	NSS	50	140
Benzo(a)pyrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	99	50	140	NSS	50	140
Benzo(b+j)fluoranthene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	102	50	140	NSS	50	140
Benzo(e)pyrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	108	50	140	NSS	50	140
Benzo(ghi)perylene	GCM0292-MAY22	mg/L	0.0002	< 0.0002	NSS	30	103	50	140	NSS	50	140
Benzo(k)fluoranthene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	109	50	140	NSS	50	140
Bis(2-ethylhexyl)phthalate	GCM0292-MAY22	mg/L	0.002	< 0.002	NSS	30	129	50	140	NSS	50	140
Chrysene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	101	50	140	NSS	50	140
di-n-Butyl Phthalate	GCM0292-MAY22	mg/L	0.002	< 0.002	NSS	30	114	50	140	NSS	50	140
Dibenzo(a,h)anthracene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	102	50	140	NSS	50	140
Dibenzo(a,i)pyrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	87	50	140	NSS	50	140
Dibenzo(a,j)acridine	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	99	50	140	NSS	50	140
Fluoranthene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	104	50	140	NSS	50	140
Indeno(1,2,3-cd)pyrene	GCM0292-MAY22	mg/L	0.0002	< 0.0002	NSS	30	103	50	140	NSS	50	140
Perylene	GCM0292-MAY22	mg/L	0.0005	< 0.0005	NSS	30	104	50	140	NSS	50	140
Phenanthrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	100	50	140	NSS	50	140
Pyrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	103	50	140	NSS	50	140

QC SUMMARY

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0292-MAY22	mg/L	2	< 2	6	10	92	90	110	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0144-MAY22	as N mg/L	0.5	<0.5	ND	10	106	90	110	103	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENVIGC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	96	50	140
1,2-Dichlorobenzene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	95	50	140
1,4-Dichlorobenzene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	95	60	130	94	50	140
Benzene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	95	50	140
Chloroform	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	95	50	140
cis-1,2-Dichloroethene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	98	60	130	97	50	140
Ethylbenzene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	95	60	130	94	50	140
m-p-xylene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	96	60	130	95	50	140
Methyl ethyl ketone	GCM0258-MAY22	mg/L	0.02	<0.02	ND	30	102	50	140	101	50	140
Methylene Chloride	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	100	60	130	96	50	140
o-xylene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	98	60	130	97	50	140
Styrene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	96	50	140
Tetrachloroethylene (perchloroethylene)	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	94	60	130	91	50	140
Toluene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	95	60	130	93	50	140
trans-1,3-Dichloropropene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	97	50	140
Trichloroethylene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	95	60	130	93	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

SGS Environment, Health & Safety - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 026692 Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Nicole Bryant
Received Date: May 11, 22 (mm/dd/yy)
Received Time: 16 : 30 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Ice
Temperature Upon Receipt (°C): 8.8.8
LAB LIMS #: CA40142-May22

REPORT INFORMATION	INVOICE INFORMATION
Company: Greenfield Eng	☑ (same as Report Information)
Contact: Tarek Ali	Company:
Address: 1 Bonnieglen Rd, TO, ON M4H 1G6	Contact:
Phone:	Address:
Fax:	Phone:
Email: tali@greenfieldeng.ca	Email:

Quotation #: P.O. #:
Project #: 19-040 Site Location/ID: 7085 Goreway Drive, Mississauga, ON

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days) — TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date: *NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park ☐ Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table _____ Appx. _____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations: ☐ Reg 347/558 (3 Day min TAT) ☑ PWQO ☐ MMER ☐ CCME ☐ Other: ☐ MISA ☐ ODWS Not Reportable *See note

Sewer By-Law: ☑ Sanitary ☑ Storm Municipality: Mississauga / Peel

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M & I: Metals & Inorganics (ref: CrVI, CN, Hg, pH, (B-HWS), EC, SAR - soil) (Cl, Na-water)	M & I: Full Metals Suite (ICP metals plus B-HWS- soil only) Hg, CrVI	M & I: ICP Metals only (Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mo, Ni, Se, Ag, Tl, V, Zn)	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other (please specify): PWQO	Other: Sewer Use: Mississauga Storm / Peel Combined	Other: Water Characterization Pkg (Specify pkg / Peel Combined) General ☐ Extended ☐	SPLP: Specify tests ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	TCLP: Specify tests ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	COMMENTS:
1	SW-BH105	05/11/22	13:15	20	GW														X				
2	SW-BH105	↓	↓	2	↓	Y												X					Al (0.2 um) Hg (0.45um)
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

Observations/Comments/Special Instructions: Mississauga Storm, Peel Sanitary/Combined & PWQO Standards

Sampled By (NAME): Cameron Hines Signature: Date: 05 / 11 / 22 (mm/dd/yy)
Relinquished by (NAME): Cameron Hines Signature: Date: ____/____/____ (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.5 Date of Issue: 11 June 2021

FINAL REPORT

CA40142-MAY22 R1

19-040, 7085 Gore Way, Mississauga, ON

Prepared for

Grounded Engineering Inc.

FINAL REPORT

First Page

CLIENT DETAILS

Client	Grounded Engineering Inc.
Address	12 Banigan Drive Toronto, Ontario M4H1E9. Canada
Contact	Tarak Ali
Telephone	647-264-7909
Facsimile	
Email	tali@groundedeng.ca
Project	19-040, 7085 Gore Way, Mississauga, ON
Order Number	
Samples	Ground Water (2)

LABORATORY DETAILS

Project Specialist	Jill Campbell, B.Sc.,GISAS
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	2165
Facsimile	705-652-6365
Email	jill.campbell@sgs.com
SGS Reference	CA40142-MAY22
Received	05/11/2022
Approved	05/26/2022
Report Number	CA40142-MAY22 R1
Date Reported	06/08/2022

COMMENTS

RL - SGS Reporting Limit

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present:YES
Custody Seal Present:YES

Chain of Custody Number:026692

Increased NPE RL due to sample matrix

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

TABLE OF CONTENTS

Client: Grounded Engineering Inc.
Project: 19-040, 7085 Gore Way, Mississauga, ON
Project Manager: Tarak Ali
Samplers: Cameron H.

MATRIX: WATER

L1 = PWQO / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	8	9
Sample Name	SW-BH105	SW-BH105 Field Filtered
Sample Matrix	Ground Water	Ground Water
Sample Date	11/05/2022	11/05/2022

Parameter	Units	RL	L1	Result	Result
General Chemistry					
Biochemical Oxygen Demand (BOD5)	mg/L	2		< 4 ↑	---
Total Suspended Solids	mg/L	2		211	---
Total Kjeldahl Nitrogen	as N mg/L	0.5		< 0.5	---
Metals and Inorganics					
Total Chlorine	mg/L	0.02	0.002	< 0.02	---
Fluoride	mg/L	0.06		0.16	---
Cyanide (total)	mg/L	0.01		< 0.01	---
Sulphate	mg/L	2		190	---
Aluminum (total)	mg/L	0.001		2.69	0.272
Antimony (total)	mg/L	0.0009	0.02	< 0.0009	< 0.0009
Arsenic (total)	mg/L	0.0002	0.005	0.0243	0.0018
Cadmium (total)	mg/L	0.000003	0.0001	0.000080	0.000007
Chromium (total)	mg/L	0.00008		0.0195	0.00506
Copper (total)	mg/L	0.0002	0.001	0.0165	0.0037
Cobalt (total)	mg/L	0.000004	0.0009	0.00169	0.000502
Lead (total)	mg/L	0.00009	0.001	0.0154	0.00065
Manganese (total)	mg/L	0.00001		0.110	0.0353
Molybdenum (total)	mg/L	0.00004	0.04	0.0124	0.00775
Nickel (total)	mg/L	0.0001	0.025	0.0037	0.0013
Phosphorus (total)	mg/L	0.003	0.01	0.340	0.024
Selenium (total)	mg/L	0.00004	0.1	0.00071	0.00045

Client: Grounded Engineering Inc.
Project: 19-040, 7085 Gore Way, Mississauga, ON
Project Manager: Tarak Ali
Samplers: Cameron H.

MATRIX: WATER

L1 = PWQO / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	8	9
Sample Name	SW-BH105	SW-BH105 Field Filtered
Sample Matrix	Ground Water	Ground Water
Sample Date	11/05/2022	11/05/2022

Parameter	Units	RL	L1	Result	Result
Metals and Inorganics (continued)					
Silver (total)	mg/L	0.00005	0.0001	0.00011	< 0.00005
Tin (total)	mg/L	0.00006		0.00062	0.00164
Titanium (total)	mg/L	0.00005		0.0403	0.00882
Zinc (total)	mg/L	0.002	0.02	0.163	0.005
Aluminum (0.2µm)	mg/L	0.001	0.015	---	0.004
Microbiology					
E. Coli	cfu/100mL	0	100	< 2↑	---
Nonylphenol and Ethoxylates					
Nonylphenol	mg/L	0.001		< 0.002↑	---
Nonylphenol Ethoxylates	mg/L	0.01		< 0.01	---
Nonylphenol diethoxylate	mg/L	0.01		< 0.01	---
Nonylphenol monoethoxylate	mg/L	0.01		< 0.01	---
Oil and Grease					
Oil & Grease (total)	mg/L	2		< 2	---
Oil & Grease (animal/vegetable)	mg/L	4		< 4	---
Oil & Grease (mineral/synthetic)	mg/L	4		< 4	---

Client: Grounded Engineering Inc.
Project: 19-040, 7085 Gore Way, Mississauga, ON
Project Manager: Tarak Ali
Samplers: Cameron H.

MATRIX: WATER

L1 = PWQO / WATER / - - Table 2 - General - July 1999 PIBS 3303E

			Sample Number	8	9	
			Sample Name	SW-BH105	SW-BH105 Field Filtered	
			Sample Matrix	Ground Water	Ground Water	
			Sample Date	11/05/2022	11/05/2022	
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	
Other (ORP)						
pH	No unit	0.05	8.5	8.54	---	
Chromium VI	mg/L	0.0002	0.001	0.0041	---	
Mercury (total)	mg/L	0.00001	0.0002	0.00005	---	
Mercury (dissolved)	mg/L	0.00001	0.0002	---	< 0.00001	
PAHs						
Benzo(b+j)fluoranthene	mg/L	0.0001		< 0.0001	---	
Phenols						
4AAP-Phenolics	mg/L	0.002	0.001	0.003	---	
SVOCs						
di-n-Butyl Phthalate	mg/L	0.002		< 0.002	---	
Bis(2-ethylhexyl)phthalate	mg/L	0.002		< 0.002	---	
PAHs (Total)	mg/L			< 0.001	---	
Perylene	mg/L	0.0005	0.00000 007	< 0.0005	---	

Client: Grounded Engineering Inc.
Project: 19-040, 7085 Gore Way, Mississauga, ON
Project Manager: Tarak Ali
Samplers: Cameron H.

MATRIX: WATER

L1 = PWQO / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	8	9
Sample Name	SW-BH105	SW-BH105 Field Filtered
Sample Matrix	Ground Water	Ground Water
Sample Date	11/05/2022	11/05/2022

Parameter	Units	RL	L1	Result	Result
SVOCs - PAHs					
7Hdibenzo(c,g)carbazole	mg/L	0.0001		< 0.0001	---
Anthracene	mg/L	0.0001	0.00000 08	< 0.0001	---
Benzo(a)anthracene	mg/L	0.0001	0.00000 04	< 0.0001	---
Benzo(a)pyrene	mg/L	0.0001		< 0.0001	---
Benzo(e)pyrene	mg/L	0.0001		< 0.0001	---
Benzo(ghi)perylene	mg/L	0.0002	0.00000 002	< 0.0002	---
Benzo(k)fluoranthene	mg/L	0.0001	0.00000 02	< 0.0001	---
Chrysene	mg/L	0.0001	0.00000 01	< 0.0001	---
Dibenzo(a,h)anthracene	mg/L	0.0001	0.00000 2	< 0.0001	---
Dibenzo(a,i)pyrene	mg/L	0.0001		< 0.0001	---
Dibenzo(a,j)acridine	mg/L	0.0001		< 0.0001	---
Fluoranthene	mg/L	0.0001	0.00000 08	< 0.0001	---
Indeno(1,2,3-cd)pyrene	mg/L	0.0002		< 0.0002	---
Phenanthrene	mg/L	0.0001	0.00003	< 0.0001	---
Pyrene	mg/L	0.0001		< 0.0001	---

Client: Grounded Engineering Inc.
Project: 19-040, 7085 Gore Way, Mississauga, ON
Project Manager: Tarak Ali
Samplers: Cameron H.

MATRIX: WATER

L1 = PWQO / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	8	9
Sample Name	SW-BH105	SW-BH105 Field Filtered
Sample Matrix	Ground Water	Ground Water
Sample Date	11/05/2022	11/05/2022

Parameter	Units	RL	L1	Result	Result
VOCs					
Chloroform	mg/L	0.0005		< 0.0005	---
1,2-Dichlorobenzene	mg/L	0.0005	0.0025	< 0.0005	---
1,4-Dichlorobenzene	mg/L	0.0005	0.004	< 0.0005	---
cis-1,2-Dichloroethene	mg/L	0.0005		< 0.0005	---
trans-1,3-Dichloropropene	mg/L	0.0005		< 0.0005	---
Methylene Chloride	mg/L	0.0005	0.1	< 0.0005	---
1,1,2,2-Tetrachloroethane	mg/L	0.0005	0.07	< 0.0005	---
Methyl ethyl ketone	mg/L	0.02		< 0.02	---
Styrene	mg/L	0.0005		< 0.0005	---
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	0.05	< 0.0005	---
Trichloroethylene	mg/L	0.0005	0.02	< 0.0005	---
VOCs - BTEX					
Benzene	mg/L	0.0005	0.1	< 0.0005	---
Ethylbenzene	mg/L	0.0005	0.008	< 0.0005	---
Toluene	mg/L	0.0005	0.0008	< 0.0005	---
Xylene (total)	mg/L	0.0005		< 0.0005	---
m-p-xylene	mg/L	0.0005	0.002	< 0.0005	---
o-xylene	mg/L	0.0005	0.04	< 0.0005	---

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	PWQO / WATER / - - Table 2 - General - July 1999 PIBS 3303E L1
SW-BH105				
Anthracene	EPA 3510C/8270D	mg/L	< 0.0001	0.0000008
Benz(a)anthracene	EPA 3510C/8270D	mg/L	< 0.0001	0.0000004
Benzo(g,h,i)perylene	EPA 3510C/8270D	mg/L	< 0.0002	0.00000002
Benzo(k)fluoranthene	EPA 3510C/8270D	mg/L	< 0.0001	0.0000002
Chrysene	EPA 3510C/8270D	mg/L	< 0.0001	0.0000001
Dibenz(a,h)anthracene	EPA 3510C/8270D	mg/L	< 0.0001	0.000002
Fluoranthene	EPA 3510C/8270D	mg/L	< 0.0001	0.0000008
Perylene	EPA 3510C/8270D	mg/L	< 0.0005	0.00000007
Phenanthrene	EPA 3510C/8270D	mg/L	< 0.0001	0.00003
Chromium VI	EPA218.6/EPA3060A	mg/L	0.0041	0.001
Arsenic	SM 3030/EPA 200.8	mg/L	0.0243	0.005
Cobalt	SM 3030/EPA 200.8	mg/L	0.00169	0.0009
Copper	SM 3030/EPA 200.8	mg/L	0.0165	0.001
Lead	SM 3030/EPA 200.8	mg/L	0.0154	0.001
Phosphorus	SM 3030/EPA 200.8	mg/L	0.340	0.01
Silver	SM 3030/EPA 200.8	mg/L	0.00011	0.0001
Zinc	SM 3030/EPA 200.8	mg/L	0.163	0.02
Chlorine	SM 4500	mg/L	< 0.02	0.002
pH	SM 4500	No unit	8.54	8.5
4AAP-Phenolics	SM 5530B-D	mg/L	0.003	0.001
SW-BH105 Field Filtered				
Copper	SM 3030/EPA 200.8	mg/L	0.0037	0.001
Phosphorus	SM 3030/EPA 200.8	mg/L	0.024	0.01

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 375.4 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphate	DIO5045-MAY22	mg/L	2	<2	2	20	111	80	120	93	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0020-MAY22	mg/L	2	< 2	12	30	103	70	130	NV	70	130

Chlorine

Method: SM 4500 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-008

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Chlorine	EWL0298-MAY22	mg/L	0.02	< 0.02	ND	20	92	90	110	NA		

QC SUMMARY

Cyanide by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0145-MAY22	mg/L	0.01	<0.01	ND	10	93	90	110	100	75	125

Fluoride by Specific Ion Electrode

Method: SM 4500 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0301-MAY22	mg/L	0.06	<0.06	2	10	100	90	110	96	75	125

Hexavalent Chromium by SFA

Method: EPA218.6/EPA3060A I Internal ref.: ME-CA-IENVISKA-LAK-AN-012

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chromium VI	SKA0153-MAY22	mg/L	0.0002	<0.0002	ND	20	103	80	120	100	75	125

QC SUMMARY

Mercury by CVAAS

Method: EPA 7471A/SM 3112B | Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0028-MAY22	mg/L	0.00001	< 0.00001	ND	20	105	80	120	108	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0112-MAY22	mg/L	0.00005	<0.00005	ND	20	96	90	110	86	70	130
Aluminum (total)	EMS0112-MAY22	mg/L	0.001	<0.001	ND	20	98	90	110	86	70	130
Aluminum (0.2µm)	EMS0112-MAY22	mg/L	0.001	<0.001	ND	20	98	90	110	86	70	130
Arsenic (total)	EMS0112-MAY22	mg/L	0.0002	<0.0002	1	20	98	90	110	96	70	130
Cadmium (total)	EMS0112-MAY22	mg/L	0.000003	<0.000003	ND	20	98	90	110	94	70	130
Cobalt (total)	EMS0112-MAY22	mg/L	0.000004	<0.000004	17	20	97	90	110	96	70	130
Chromium (total)	EMS0112-MAY22	mg/L	0.00008	<0.00008	18	20	94	90	110	94	70	130
Copper (total)	EMS0112-MAY22	mg/L	0.0002	<0.0002	16	20	91	90	110	90	70	130
Manganese (total)	EMS0112-MAY22	mg/L	0.00001	<0.00001	ND	20	96	90	110	98	70	130
Molybdenum (total)	EMS0112-MAY22	mg/L	0.00004	<0.00004	2	20	103	90	110	101	70	130
Nickel (total)	EMS0112-MAY22	mg/L	0.0001	<0.0001	10	20	94	90	110	93	70	130
Lead (total)	EMS0112-MAY22	mg/L	0.00009	<0.00001	ND	20	103	90	110	103	70	130
Phosphorus (total)	EMS0112-MAY22	mg/L	0.003	<0.003	13	20	90	90	110	NV	70	130
Antimony (total)	EMS0112-MAY22	mg/L	0.0009	<0.0009	ND	20	109	90	110	117	70	130
Selenium (total)	EMS0112-MAY22	mg/L	0.00004	<0.00004	ND	20	98	90	110	107	70	130
Tin (total)	EMS0112-MAY22	mg/L	0.00006	<0.00006	ND	20	103	90	110	NV	70	130
Titanium (total)	EMS0112-MAY22	mg/L	0.00005	<0.00005	ND	20	94	90	110	NV	70	130
Zinc (total)	EMS0112-MAY22	mg/L	0.002	<0.002	16	20	98	90	110	93	70	130

QC SUMMARY

Microbiology

Method: SM 9222D | Internal ref.: ME-CA-IENVIMIC-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
E. Coli	BAC9204-MAY22	cfu/100mL	-	ACCEPTED	ACCEPTED							

Nonylphenol and Ethoxylates

Method: ASTM D7065-06 | Internal ref.: ME-CA-IENVIGC-LAK-AN-015

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nonylphenol diethoxylate	GCM0304-MAY22	mg/L	0.01	<0.01			82	55	120			
Nonylphenol Ethoxylates	GCM0304-MAY22	mg/L	0.01	0								
Nonylphenol monoethoxylate	GCM0304-MAY22	mg/L	0.01	<0.01			81	55	120			
Nonylphenol	GCM0304-MAY22	mg/L	0.001	<0.001			87	55	120			

QC SUMMARY

Oil & Grease

Method: MOE E3401 | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0286-MAY22	mg/L	2	<2	NSS	20	99	75	125			

Oil & Grease-AV/MS

Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0286-MAY22	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0286-MAY22	mg/L	4	< 4	NSS	20	NA	70	130			

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0294-MAY22	No unit	0.05	NA	0		100			NA		

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0166-MAY22	mg/L	0.002	<0.002	ND	10	101	80	120	102	75	125

QC SUMMARY

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
7Hdibenzo(c,g)carbazole	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	107	50	140	NSS	50	140
Anthracene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	100	50	140	NSS	50	140
Benzo(a)anthracene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	103	50	140	NSS	50	140
Benzo(a)pyrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	99	50	140	NSS	50	140
Benzo(b+j)fluoranthene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	102	50	140	NSS	50	140
Benzo(e)pyrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	108	50	140	NSS	50	140
Benzo(ghi)perylene	GCM0292-MAY22	mg/L	0.0002	< 0.0002	NSS	30	103	50	140	NSS	50	140
Benzo(k)fluoranthene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	109	50	140	NSS	50	140
Bis(2-ethylhexyl)phthalate	GCM0292-MAY22	mg/L	0.002	< 0.002	NSS	30	129	50	140	NSS	50	140
Chrysene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	101	50	140	NSS	50	140
di-n-Butyl Phthalate	GCM0292-MAY22	mg/L	0.002	< 0.002	NSS	30	114	50	140	NSS	50	140
Dibenzo(a,h)anthracene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	102	50	140	NSS	50	140
Dibenzo(a,i)pyrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	87	50	140	NSS	50	140
Dibenzo(a,j)acridine	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	99	50	140	NSS	50	140
Fluoranthene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	104	50	140	NSS	50	140
Indeno(1,2,3-cd)pyrene	GCM0292-MAY22	mg/L	0.0002	< 0.0002	NSS	30	103	50	140	NSS	50	140
Perylene	GCM0292-MAY22	mg/L	0.0005	< 0.0005	NSS	30	104	50	140	NSS	50	140
Phenanthrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	100	50	140	NSS	50	140
Pyrene	GCM0292-MAY22	mg/L	0.0001	< 0.0001	NSS	30	103	50	140	NSS	50	140

QC SUMMARY

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0292-MAY22	mg/L	2	< 2	6	10	92	90	110	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENVISFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0144-MAY22	as N mg/L	0.5	<0.5	ND	10	106	90	110	103	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENVIGC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	96	50	140
1,2-Dichlorobenzene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	95	50	140
1,4-Dichlorobenzene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	95	60	130	94	50	140
Benzene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	95	50	140
Chloroform	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	95	50	140
cis-1,2-Dichloroethene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	98	60	130	97	50	140
Ethylbenzene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	95	60	130	94	50	140
m-p-xylene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	96	60	130	95	50	140
Methyl ethyl ketone	GCM0258-MAY22	mg/L	0.02	<0.02	ND	30	102	50	140	101	50	140
Methylene Chloride	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	100	60	130	96	50	140
o-xylene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	98	60	130	97	50	140
Styrene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	96	50	140
Tetrachloroethylene (perchloroethylene)	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	94	60	130	91	50	140
Toluene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	95	60	130	93	50	140
trans-1,3-Dichloropropene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	97	60	130	97	50	140
Trichloroethylene	GCM0258-MAY22	mg/L	0.0005	<0.0005	ND	30	95	60	130	93	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

SGS Environment, Health & Safety - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 026692 Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Nicole Bryant
Received Date: May 11, 22 (mm/dd/yy)
Received Time: 16 : 30 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Ice
Temperature Upon Receipt (°C): 8.8.8
LAB LIMS #: CA40142-May22

REPORT INFORMATION	INVOICE INFORMATION
Company: Greenfield Eng	☑ (same as Report Information)
Contact: Tarek Ali	Company:
Address: 1 Bonnieglen Rd, TO, ON M4H 1G6	Contact:
Phone:	Address:
Fax:	Phone:
Email: tali@greenfieldeng.ca	Email:

Quotation #: P.O. #:
Project #: 19-040 Site Location/ID: 7085 Goreway Drive, Mississauga, ON

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days) — TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date: *NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park ☐ Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table _____ Appx. _____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations: ☐ Reg 347/558 (3 Day min TAT) ☑ PWQO ☐ MMER ☐ CCME ☐ Other: ☐ MISA ☐ ODWS Not Reportable *See note

Sewer By-Law: ☑ Sanitary ☑ Storm Municipality: Mississauga / Peel

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M & I: Metals & Inorganics (ref: CrVI, CN, Hg, pH, (B-HWS), EC, SAR - soil) (Cl, Na-water)	M & I: Full Metals Suite (ICP metals plus B-HWS- soil only) Hg, CrVI	M & I: ICP Metals only (Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mo, Ni, Se, Ag, Tl, V, Zn)	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other (please specify): PWQO	Other: Sewer Use: Mississauga Storm / Peel Combined	Other: Water Characterization Pkg (Specify pkg / Peel Combined) General ☐ Extended ☐	SPLP: Specify tests ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	TCLP: Specify tests ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	COMMENTS:
1	SW-BH105	05/11/22	13:15	20	GW														X				
2	SW-BH105	↓	↓	2	↓	Y												X					Al (0.2 um) Hg (0.45um)
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

Observations/Comments/Special Instructions: Mississauga Storm, Peel Sanitary/Combined & PWQO Standards

Sampled By (NAME): Cameron Hines Signature: Date: 05 / 11 / 22 (mm/dd/yy)
Relinquished by (NAME): Cameron Hines Signature: Date: ____/____/____ (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.5 Date of Issue: 11 June 2021

APPENDIX F

P3 Level | Steady State FEA

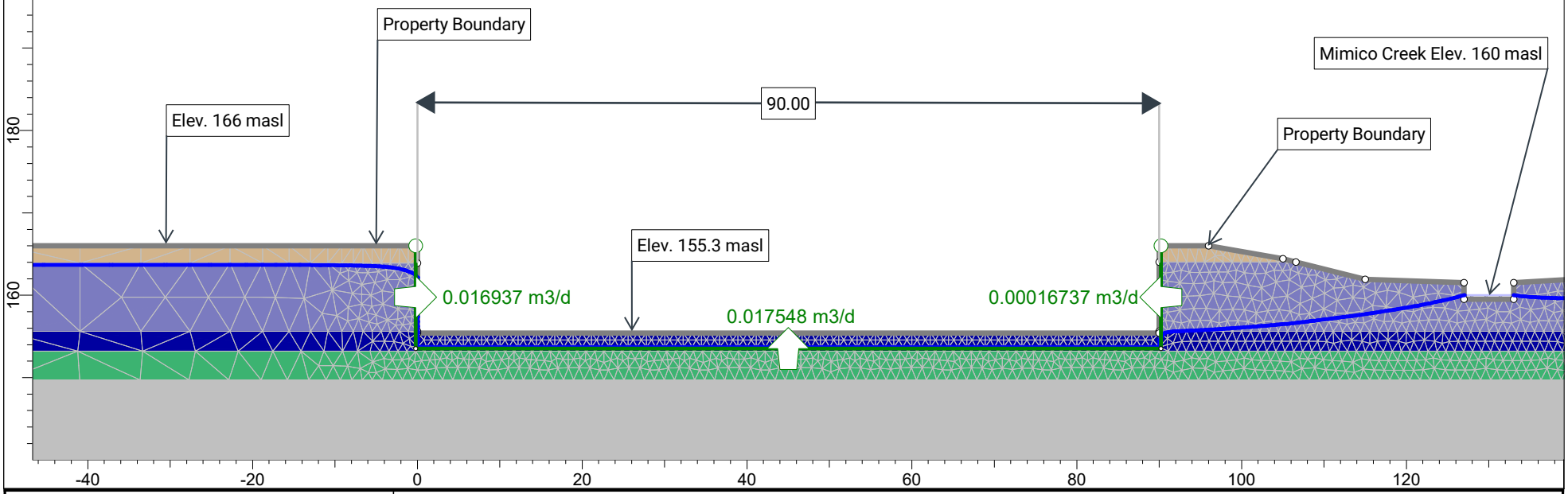
Excavation Dimensions: 61 m x 90 m
Section Cut: E-W

P3 Level Finished Floor: Elev. 155.8± m
P3 Level Base of Excavation: Elev. 155.3± m

Water Table: Elev. 163.8 m
Dewatering Target: Elev. 153.7 m

Q Ground Water = 15,000 L/day
(S.F = 2.0)

Material Name	Color	KS (m/s)
Earth Fill		0.0001
Upper Till		3.58e-08
Silts and Clays		1e-09
Lower Till		1.27e-07
Georgian Bay Formation		2.44e-06



GROUNDED ENGINEERING

Project	19-040 - 7085 Goreway Drive, Mississauga, ON		
Analysis Description	P3 Level | Dewatering	Model	Permeable Shoring | Short Term
Drawn By	TA	Scale 1:730	Date 2022-04-06
Source	Architectural Drawings, dated June 13, 2022, prepared by IBI Group	File Name	19-040 - 7085 Goreway Drive Rev3.slmd

SLIDEINTERPRET 9.019

P3 Level | Steady State FEA

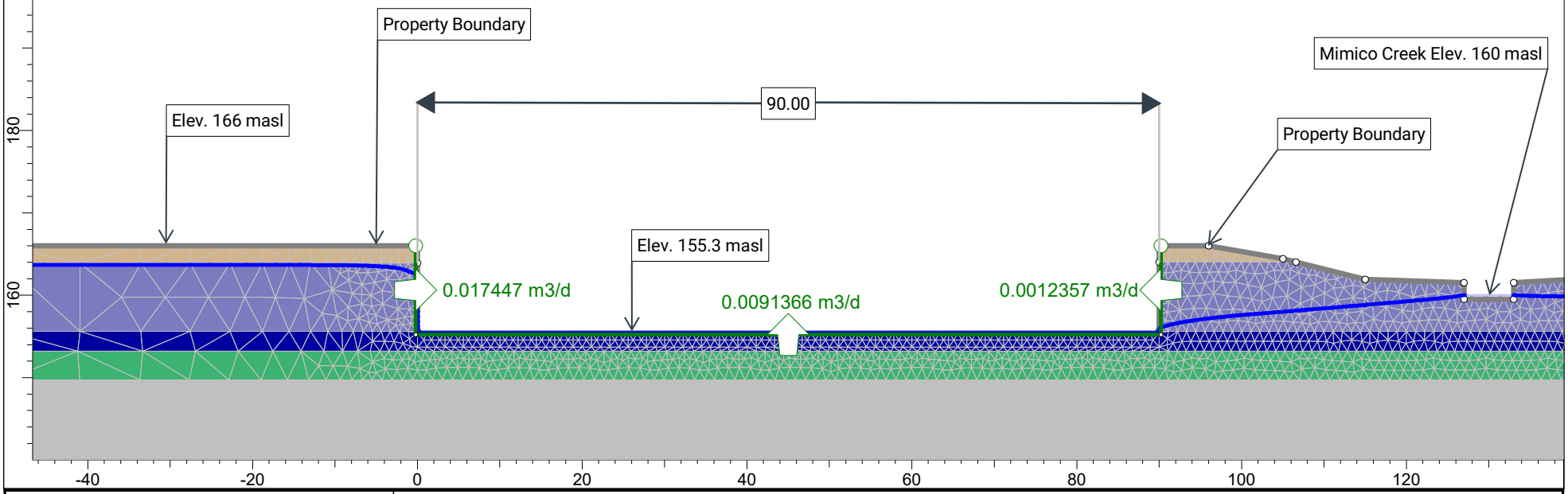
Excavation Dimensions: 61 m x 90 m
Section Cut: E-W

P3 Level Finished Floor: Elev. 155.8± m
P3 Level Drainage Layer: Elev. 155.3± m

Water Table: Elev. 163.8 m

Q Ground Water = 15,000 L/day
(S.F = 2.0)

Material Name	Color	KS (m/s)
Earth Fill		0.0001
Upper Till		3.58e-08
Silts and Clays		1e-09
Lower Till		1.27e-07
Georgian Bay Formation		2.44e-06



GROUNDED ENGINEERING

Project	19-040 - 7085 Goreway Drive, Mississauga, ON		
Analysis Description	P3 Level | Dewatering	Model	Permeable Shoring | Long Term
Drawn By	TA	Scale 1:730	Date 2022-04-06
Source	Architectural Drawings, dated June 13, 2022, prepared by IBI Group	File Name	19-040 - 7085 Goreway Drive Rev3.slmd

SLIDEINTERPRET 9.019

P3 Level | Steady State FEA

Excavation Dimensions: 61 m x 90 m
Section Cut: E-W

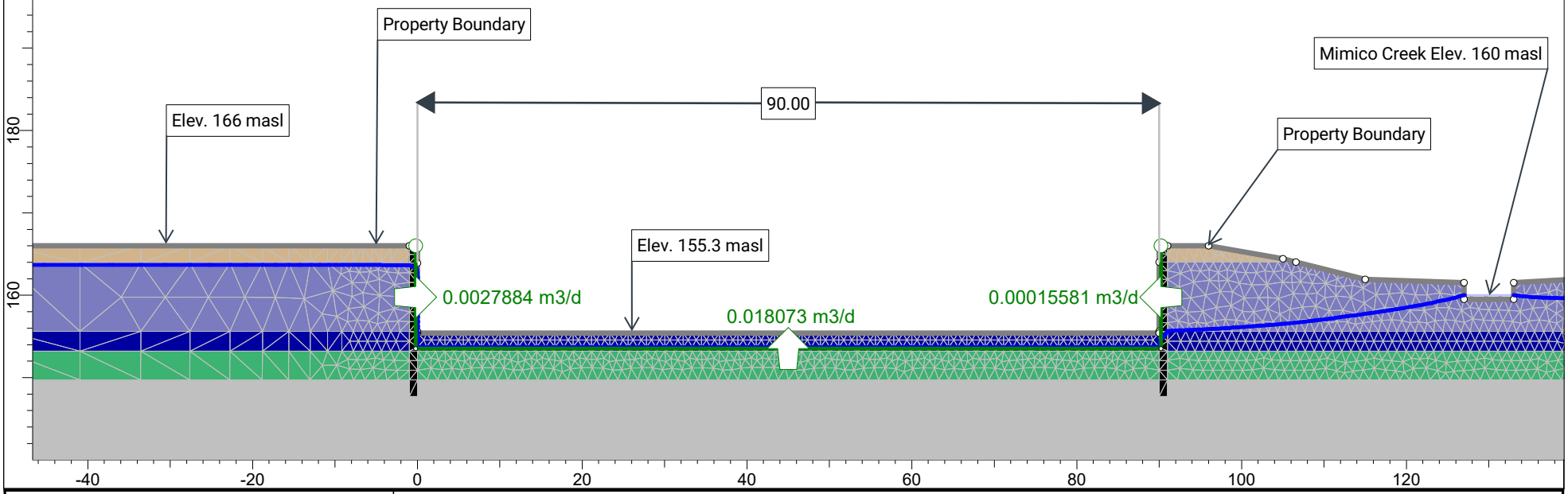
P3 Level Finished Floor: Elev. 155.8± m
P3 Level Base of Excavation: Elev. 155.3± m

Caisson Filler Embedment: Elev. 147.7 m (2 m into bedrock)

Water Table: Elev. 163.8 m
Dewatering Target: Elev. 153.7 m

Q Ground Water = 5,000 L/day
(S.F = 2.0)

Material Name	Color	KS (m/s)
Earth Fill		0.0001
Upper Till		3.58e-08
Silts and Clays		1e-09
Lower Till		1.27e-07
Georgian Bay Formation		2.44e-06



GROUNDED ENGINEERING

Project	19-040 - 7085 Goreway Drive, Mississauga, ON		
Analysis Description	P3 Level | Dewatering	Model	Caisson Wall | Short Term
Drawn By	TA	Scale 1:730	Date 2022-04-06
Source	Architectural Drawings, dated June 13, 2022, prepared by IBI Group	File Name	19-040 - 7085 Goreway Drive Rev3.slmd

SLIDEINTERPRET 9.019

P3 Level | Steady State FEA

Excavation Dimensions: 61 m x 90 m
Section Cut: E-W

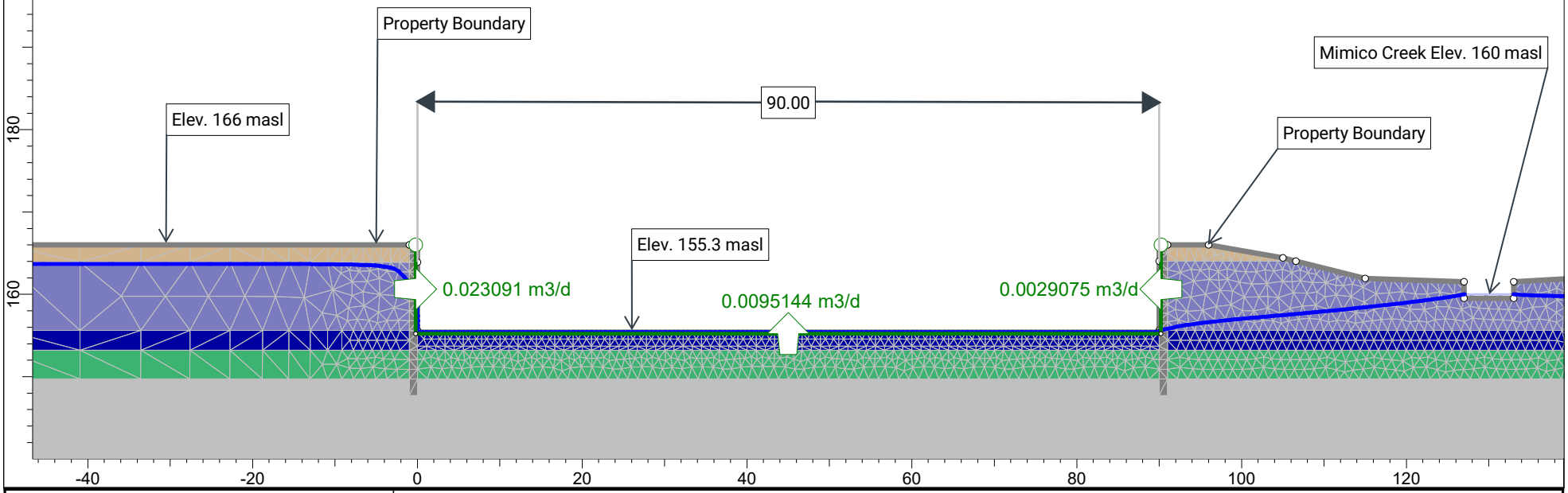
P3 Level Finished Floor: Elev. 155.8± m
P3 Level Drainage Layer: Elev. 155.3± m

Caisson Filler Embedment: Elev. 147.7 m (2 m into bedrock)

Water Table: Elev. 163.8 m

Q Ground Water = 20,000 L/day
(S.F = 2.0)

Material Name	Color	KS (m/s)
Earth Fill		0.0001
Upper Till		3.58e-08
Silts and Clays		1e-09
Lower Till		1.27e-07
Georgian Bay Formation		2.44e-06



GROUNDED ENGINEERING

Project	19-040 - 7085 Goreway Drive, Mississauga, ON		
Analysis Description	P3 Level | Dewatering	Model	Caisson Wall | Long Term
Drawn By	TA	Scale 1:730	Date 2022-04-06
Source	Architectural Drawings, dated June 13, 2022, prepared by IBI Group	File Name	19-040 - 7085 Goreway Drive Rev3.slmd

SLIDEINTERPRET 9.019

APPENDIX G

SHORT TERM - Permeable Shoring

Excavation Dimensions [m]	
N-S	61
E-W	90
Area (m2)	5490
Perimeter (m)	464

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	25	94
Depth (m)	0.025	0.094

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0.017548	61	1,070
Sides		0.016937	338	5,725
Sides (Creek)		0.00016737	126	21
Total				6,816
Factor of Safety	2.0			13,632

Storm Events	
2 Year [L/day]	100 Year [L/day]
137,250	517,000

Summary	L/day	L/min
Groundwater	15,000	10.4
Rainfall	138,000	95.8
Total	153,000	106.3

LONG TERM - Drained Foundations

Excavation Dimensions [m]	
N-S	61
E-W	90
Area (m2)	5490
Perimeter (m)	302

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	25	94
Depth (m)	0.025	0.094

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0.0091366	61	557
Sides		0.017447	338	5,897
Sides (Creek)		0.0012357	126	156
Total				6,610
Factor of Safety	2.0			13,220

Infiltration [L/day]
25902

Summary	L/day	L/min
Groundwater	15,000	10.4
Infiltration	30,000	20.8
Total	45,000	31.3

SHORT TERM - Caisson Wall

Excavation Dimensions [m]	
N-S	61
E-W	90
Area (m2)	5490
Perimeter (m)	464

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	25	94
Depth (m)	0.025	0.094

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0.018073	61	1,102
Sides		0.0027884	338	942
Sides (Creek)		0.00015581	126	20
Total				2,065
Factor of Safety	2.0			4,129

Storm Events	
2 Year [L/day]	100 Year [L/day]
137,250	517,000

Summary	L/day	L/min
Groundwater	5,000	3.5
Rainfall	138,000	95.8
Total	143,000	99.3

LONG TERM - Caisson Wall, Drained Foundations

Excavation Dimensions [m]	
N-S	61
E-W	90
Area (m2)	5490
Perimeter (m)	302

Rainfall Data		
Year	2	100
Hour	3	12
Depth (mm)	25	94
Depth (m)	0.025	0.094

Section		Flow [m3/day]	Length [m]	Volume [L/day]
Base		0.0095144	61	580
Sides		0.023091	338	7,805
Sides (Creek)		0.0029075	126	366
Total				8,751
Factor of Safety	2.0			17,503

Infiltration [L/day]
25902

Summary	L/day	L/min
Groundwater	20,000	13.9
Infiltration	30,000	20.8
Total	50,000	34.7

Appendix B

Water Supply Calculations

Water Supply Calculation

Project No. 4866

Proposed Residential Development - 7085 Goreway Drive, City of Mississauga

Fire Flow:	**7000**	l/min	**116.667** l/s
Water Supply Demand:	**280**	l/capita/day	
Water Supply Demand for ICI:	**300**	l/capita/day	

Land Use	Type	Units or Area	Pop. Density (persons/unit) †	Population	Average Day Demand (l/s) ‡
Residential	High-Rise Units	188	2.7	507	**1.64**
Residential	Townhouse	0.35	175	62	**0.20**
	Total			569	**1.84**

Land Use	Type	Average Day Demand (l/s) ‡	Peak Hour Demand Peaking Factor †	Peak Hour Demand (l/s)	Max Day Demand Peaking Factor †	Max Day Demand (l/s)	Max Day Demand + Fire (l/s)
Residential	High-Rise Units	**1.64**	3.0	**4.93**	2.0	**3.29**	**120.23**
Residential	Townhouse	**0.20**	3.0	**0.60**	1.4	**0.28**	

† As per Region of Peel Design Guidelines
‡ Based on 280 L/D per person based on Region of Peel Design Guidelines

Fire Flow - 7085 Goreway Drive: high-rise

A = Type of Construction

Type of Construction:	C	Description
Wood Frame	1.5	(essentially all combustible)
Ordinary	1	(brick/masonry walls, combustible interior)
Non-Combustible	0.8	(unprotected metal structure, masonry/metal walls)
Fire-Resistive	0.6	(fully protected frame, roof, floors)

Construction Coefficient:	**0.6**	

D = Fire Flow (000's)

GFA	2,848	square metres
Construction Type	0.6	
Fire Flow	7,044	L/min.

-> Fire Flow	**7,000**	**L/min.**

GFA includes the area of the largest floor (ground floor as delineated from CAD) plus 25% of the 2 above floors (assuming they are the same size as ground floor)

E = Occupancy Factor

Fire Hazard of Contents	**Charge**
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Occupancy Factor	-15%	
Fire Flow	**5,950**	**L/min.**

F = Sprinkler Factor

Sprinkler System	**Charge**
n/a	0%
NFPA 13 System	-30%
Fully Supervised System	-50%

Sprinkler Factor:	-40%	incl 10% Standard Connection Size

G = Exposure Factor

Separation	**Charge**	
0 to 3 m	25%	
3.1 to 10 m	20%	
10.1 to 20 m	15%	north (18m to fire hall) and east (19m to TH)
20.1 to 30 m	10%	
30.1 to 45 m	5%	
Exposed Sides	2	

Exposure Factor	30%	(no more than 75%)

H - Net Fire Flow Required

	Charge
F + G Factors	-10%

	5355	L/min.
Fire Flow:	5000	L/min.
	83	L/s

Fire Flow - 7085 Goreway Drive: all townhouses

A = Type of Construction

Type of Construction:	C	Description
Wood Frame	1.5	(essentially all combustible)
Ordinary	1	(brick/masonry walls, combustible interior)
Non-Combustible	0.8	(unprotected metal structure, masonry/metal walls)
Fire-Resistive	0.6	(fully protected frame, roof, floors)

Construction Coefficient:	**0.8**	

D = Fire Flow (000's)

GFA	1,128	square metres
Construction Type	0.8	
Fire Flow	5,911	L/min.

-> Fire Flow	**6,000**	**L/min.**

GFA includes the ground floor area delineated from CAD for all townhouse units x 2 floors

E = Occupancy Factor

Fire Hazard of Contents	**Charge**
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Occupancy Factor	-15%	
Fire Flow	**5,100**	**L/min.**

F = Sprinkler Factor

Sprinkler System	**Charge**
n/a	0%
NFPA 13 System	-30%
Fully Supervised System	-50%

Sprinkler Factor:	0%	incl 10% Standard Connection Size

G = Exposure Factor

Separation	**Charge**	
0 to 3 m	25%	
3.1 to 10 m	20%	north (8m to ex single detached)
10.1 to 20 m	15%	west (19m to prop high-rise)
20.1 to 30 m	10%	
30.1 to 45 m	5%	
Exposed Sides	2	

Exposure Factor	35%	(no more than 75%)

H - Net Fire Flow Required

	Charge
F + G Factors	35%

	6885	L/min.
Fire Flow:	7000	L/min.
	117	L/s

Fire Flow - 7085 Goreway Drive: single townhouse

A = Type of Construction

Type of Construction:	C	Description
Wood Frame	1.5	(essentially all combustible)
Ordinary	1	(brick/masonry walls, combustible interior)
Non-Combustible	0.8	(unprotected metal structure, masonry/metal walls)
Fire-Resistive	0.6	(fully protected frame, roof, floors)

Construction Coefficient:	**0.8**	

D = Fire Flow (000's)

GFA	458	square metres
Construction Type	0.8	
Fire Flow	3,765	L/min.

-> Fire Flow	**4,000**	**L/min.**

GFA includes the ground floor area delineated from CAD for northern most unit x 2 floors

E = Occupancy Factor

Fire Hazard of Contents	**Charge**
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Occupancy Factor	-15%	
Fire Flow	**3,400**	**L/min.**

F = Sprinkler Factor

Sprinkler System	**Charge**
n/a	0%
NFPA 13 System	-30%
Fully Supervised System	-50%

Sprinkler Factor:	0%	incl 10% Standard Connection Size

G = Exposure Factor

Separation	**Charge**	
0 to 3 m	25%	
3.1 to 10 m	20%	north (8m to ex res) east (5m to eastern-most TH unit)
10.1 to 20 m	15%	
20.1 to 30 m	10%	south (30m to southern-most TH unit)
30.1 to 45 m	5%	
Exposed Sides	3	

Exposure Factor	55%	(no more than 75%)

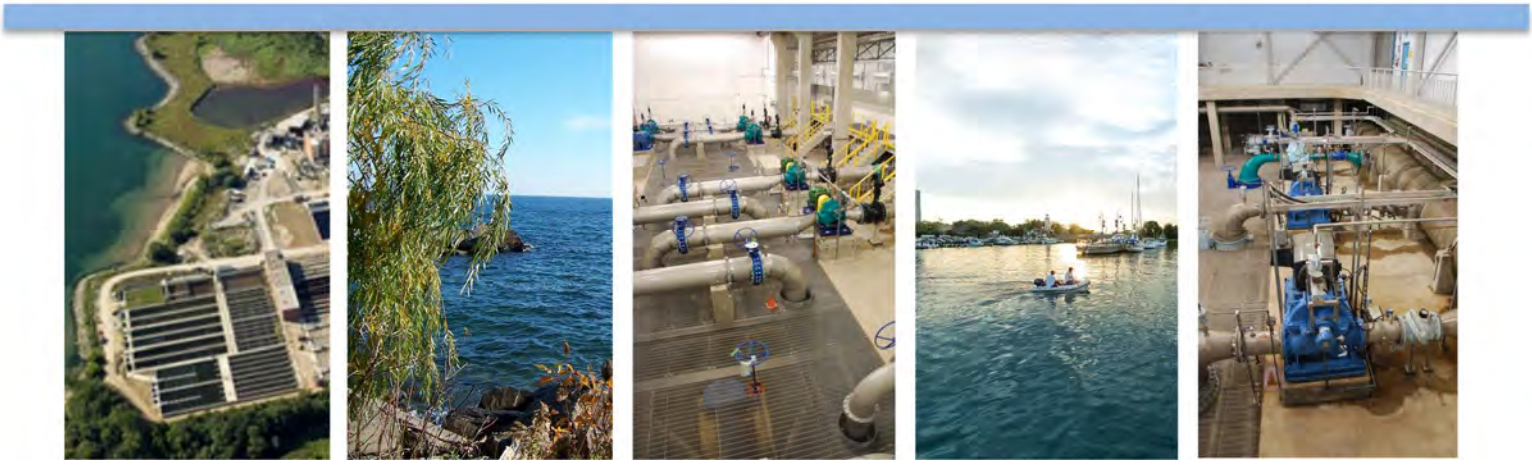
H - Net Fire Flow Required

	Charge
F + G Factors	55%

	5270	L/min.
Fire Flow:	5000	L/min.
	83	L/s

Region of Peel
Working for you

2013 Water and Wastewater
Master Plan for the Lake-Based Systems



Volume III - Water Master Plan

Final Report
P001-0005

March 31, 2014

BluePlan
ENGINEERING CONSULTANTS LIMITED

AECOM

3 Existing Water Transmission System

3.1 Existing Infrastructure

The Region of Peel's lake-based water transmission system services the City of Mississauga, much of the City of Brampton, and parts of the Town of Caledon. The system consists of two Lake Ontario-based water treatment plants (the Lakeview WTP and the Lorne Park WTP), transmission mains, pumping stations, reservoirs and elevated tanks that deliver water to customers through seven pressure zones separated by approximately 30-metre intervals of elevation. The lake-based water transmission system consists of three main trunk systems: west, central and east. The existing transmission facilities are summarized in Table 3.2.

Separate from the water transmission system, the water distribution system conveys treated water from the water transmission facilities to the customers. With the exception of east-west sub-transmission, the water distribution system is not included in the 2013 Master Plan for the lake-based system.

The Region of Peel also maintains four municipal groundwater systems servicing rural communities in the Town of Caledon. These municipal groundwater systems are not included in the 2013 Master Plan for the lake-based system.

Table 3.2 Existing lake-based water transmission facilities

West Trunk System	Central Trunk System	East Trunk System
Snelgrove Elevated Tank (WS6)	Mayfield West Elevated Tank (CS7)	Bolton Elevated Tank (BS6)
West Brampton Reservoir (WS4) and Pumping Station (5LLP, 6HLP)	North Brampton Reservoir (CS5) and Pumping Station (6LLP, 7HLP)	Tullamore Reservoir (ES4) and Pumping Station (5LLP, 6HLP)
Meadowvale North Reservoir (WS3) and Pumping Station (4LLP, 5HLP)	East Brampton Reservoir (CS4) and Pumping Station (5LLP, 6HLP)	Airport Road Reservoir (ES3) and Pumping Station (4LLP, 5HLP, York)
Streetsville Reservoir (WS2) and Pumping Station (3LLP, 4HLP)	Beckett Sproule Reservoir (CS3) and Pumping Station (4LLP, 5HLP)	Beckett Sproule Transfer Pumping Station
Herridge Reservoir (WS1) and Pumping Station (2LLP, 3HLP)	Hanlan Reservoir (CS2) and Pumping Station (3LLP, 4HLP)	
Lorne Park Water Treatment Plant and Pumping Station (1HLP, 2HLP)	Silverthorn Reservoir (CS1) and Pumping Station (2LLP, 3HLP)	
	Lakeview Water Treatment Plant and Pumping Station (1HLP, 2HLP)	

Note: W – West; C – Central; E – East; S – Storage; LLP – Low Lift Pump; HLP – High Lift Pump
 # - pressure zone serviced by the facility

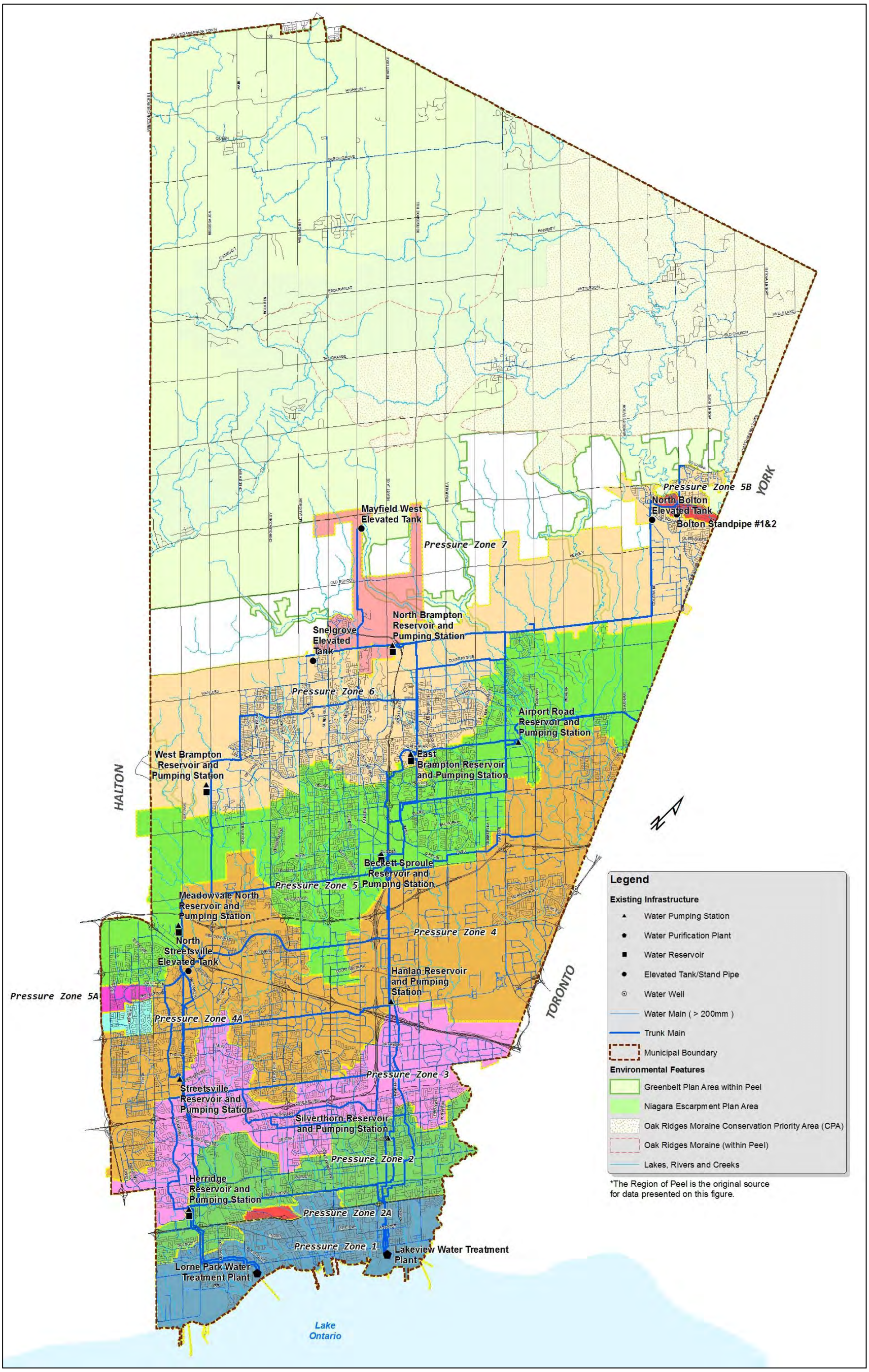


Figure 3.2 Existing Region of Peel Lake-Based Water Transmission System

Appendix C

Sanitary Servicing Calculations

Sanitary Flow Calculation

Project No. 4866

Proposed Residential Development - 7085 Goreway Drive, City of Mississauga

Site Area:	0.99	ha
Infiltration Rate:	0.2	l/ha/sec
Generation Rate:	302.8	l/person/day‡

Estimated Site Discharge

Land Use	Type	Area (ha.)	Units‡	Pop. Density (person/ha)†	Pop. Density (person/unit)†	Population	Average Flow (L/s)	Harmon's Peaking Factor	Peak Flow (L/s)	Infiltration (L/s)	Total Flow (L/s)
Residential	High-Rise Units	0.64	188	475	2.7	507	1.80	3.97	7.20	0.13	**7.33**
Residential	Townhouse	0.35	20	175		62	0.22	4.29	0.93	0.07	**1.00**
		0.99									
					Total	**569**	2.02	3.94	~~**8.13** *~~	0.20	**13.20**
									13.00 *		

† As per Region of Peel Design Criteria

‡ Based on site plan prepared by IBI Group

* Region of Peel Standard Drawing 2-9-2 states the domestic sewage flow for populations less than 1000 persons shall be 0.013 m^3/s

Population	Peak Flow (m^3/sec)	Population	Peak Flow (m^3/sec)	Population	Peak Flow (m^3/sec)
1000	0.0130	4750	0.0542	13000	0.1292
1050	0.0139	5000	0.0569	14000	0.1376
1100	0.0145	5250	0.0594	15000	0.1459
1150	0.0151	5500	0.0618	16000	0.1540
1200	0.0157	5750	0.0640	17000	0.1620
1300	0.0169	6000	0.0666	18000	0.1700
1400	0.0181	6250	0.0691	19000	0.1779
1500	0.0193	6500	0.0710	20000	0.1857
1600	0.0204	6750	0.0737	25000	0.2236
1700	0.0217	7000	0.0762	30000	0.2601
1800	0.0228	7250	0.0784	35000	0.2955
1900	0.0239	7500	0.0809	40000	0.3298
2000	0.0251	7750	0.0830	45000	0.3634
2200	0.0273	8000	0.0854	50000	0.3963
2400	0.0296	8250	0.0878	55000	0.4286
2600	0.0318	8500	0.0898	60000	0.4603
2800	0.0340	8750	0.0922	65000	0.4915
3000	0.0361	9000	0.0945	70000	0.5224
3250	0.0387	9250	0.0968	75000	0.5528
3500	0.0415	9500	0.0981	80000	0.5828
3750	0.0441	9750	0.1010	85000	0.6126
4000	0.0467	10000	0.1033	90000	0.6420
4250	0.0492	11000	0.1120	95000	0.6711
4500	0.0518	12000	0.1210	100000	0.7000

Notes:
1. Domestic sewage flows are based upon a unit sewage flow of 302.8 Lpcd.
2. The flows in the above table include the Harmon Peaking Factor.
3. Domestic sewage flow for less than 1000 persons shall be 0.013m^3/sec.
4. Domestic sewage flow for greater than 100,000 persons shall be 7.0 x 10^{-6} m^3/sec per capita.
5. Lpcd = Litres per capita per day 1 Litre = 0.001 $metre^3$

Region of Peel
Working for you

Date: June 2005 Rev: 1

Approved:

SEWAGE FLOWS
(EXCLUDING INFILTRATION)

STD. DWG. ~~2-5-2~~ 2-9-2

SUBDIVISION 7085 Goreway Drive
(CITY OF MISSISSAUGA)

CONSULTANT Schaeffer & Associates Ltd.

DRAINAGE AREA PLAN NO.

REGIONAL MUNICIPALITY OF PEEL

SANITARY SEWER DESIGN SHEET
PRE-DEVELOPMENT CONDITIONS

PROJECT No. 2019-4866
DESIGNED BY D.T. / H.S.
DATE 23-Apr-20

LOCATION	From MH	Up Stream Inv.	To MH	Down Stream Inv.	AREA (ha)	DENSITY persons per ha	POP	CUM. AREA (ha)	CUM. POP.	SEWAGE FLOW (L/sec)	INFILTRATION FLOW (L/sec)	FOUNDATION DRAINS (L/sec)	TOTAL FLOW (L/sec)	Length (m)	Pipe Dia NOM (mm)	Pipe Dia ACT (mm)	Grade (%)	Capacity (L/sec)	Full Velocity (m/s)
GOREWAY DRIVE - SOUTH			1A		0.51		33												
GOREWAY DRIVE - NORTH (West Side)			1A		3.40		123												
GOREWAY DRIVE - NORTH (East - excl.subject site)			1A		1.45	50	73												
GOREWAY DRIVE - NORTH (Subject site)			1A		0.99	50	50												
DORCAS STREET	**1A**		**2A**		**0.00**		**0**	**6.35**	**279**	**13.00**	**1.27**	**0.000**	**14.27**	**61.0**	**250**	**254.0**	**0.48**	**42.98**	**0.85**
								6.35	**279**										
MINOTOLA AVENUE - NORTH			2A		6.68		300												
MINOTOLA AVENUE	**2A**		**3A**		**1.82**		**271**	**14.85**	**850**	**13.00**	**2.97**	**0.000**	**15.97**	**67.0**	**250**	**254.0**	**0.50**	**43.87**	**0.87**
								14.85	**850**										

SUBDIVISION 7085 Goreway Drive
(CITY OF MISSISSAUGA)

CONSULTANT Schaeffer & Associates Ltd.

DRAINAGE AREA PLAN NO.

REGIONAL MUNICIPALITY OF PEEL

SANITARY SEWER DESIGN SHEET

POST-DEVELOPMENT CONDITIONS

PROJECT No. 2019-4866
DESIGNED BY G.V. / K.S.
DATE 23-Apr-20

LOCATION	From MH	Up Stream Inv.	To MH	Down Stream Inv.	AREA (ha)	DENSITY persons per ha	POP	CUM. AREA (ha)	CUM. POP.	SEWAGE FLOW (L/sec)	INFILTRATION FLOW (L/sec)	FOUNDATION DRAINS (L/sec)	TOTAL FLOW (L/sec)	Length (m)	Pipe Dia NOM (mm)	Pipe Dia ACT (mm)	Grade (%)	Capacity (L/sec)	Full Velocity (m/s)
GOREWAY DRIVE - SOUTH			1A		0.51		33												
GOREWAY DRIVE - NORTH (West Side)			1A		3.40		123												
GOREWAY DRIVE - NORTH (East - excl.subject site)			1A		1.45	50	73												
GOREWAY DRIVE - NORTH (Subject site)			1A		0.99		569												
DORCAS STREET	**1A**		**2A**		**0.00**		**0**	**6.35**	**798**	**13.00**	**1.27**	**0.000**	**14.27**	**61.0**	**250**	**254.0**	**0.48**	**42.98**	**0.85**
								6.35	**798**										
MINOTOLA AVENUE - NORTH			2A		6.68		300												
MINOTOLA AVENUE	**2A**		**3A**		**1.82**		**271**	**14.85**	**1369**	**17.79**	**2.97**	**0.000**	**20.76**	**67.0**	**250**	**254.0**	**0.50**	**43.87**	**0.87**
								14.85	**1369**										

SUBDIVISION PASTORIA HOLDINGS.
CONSULTANT.....
DRAINAGE AREA PLAN No. 48

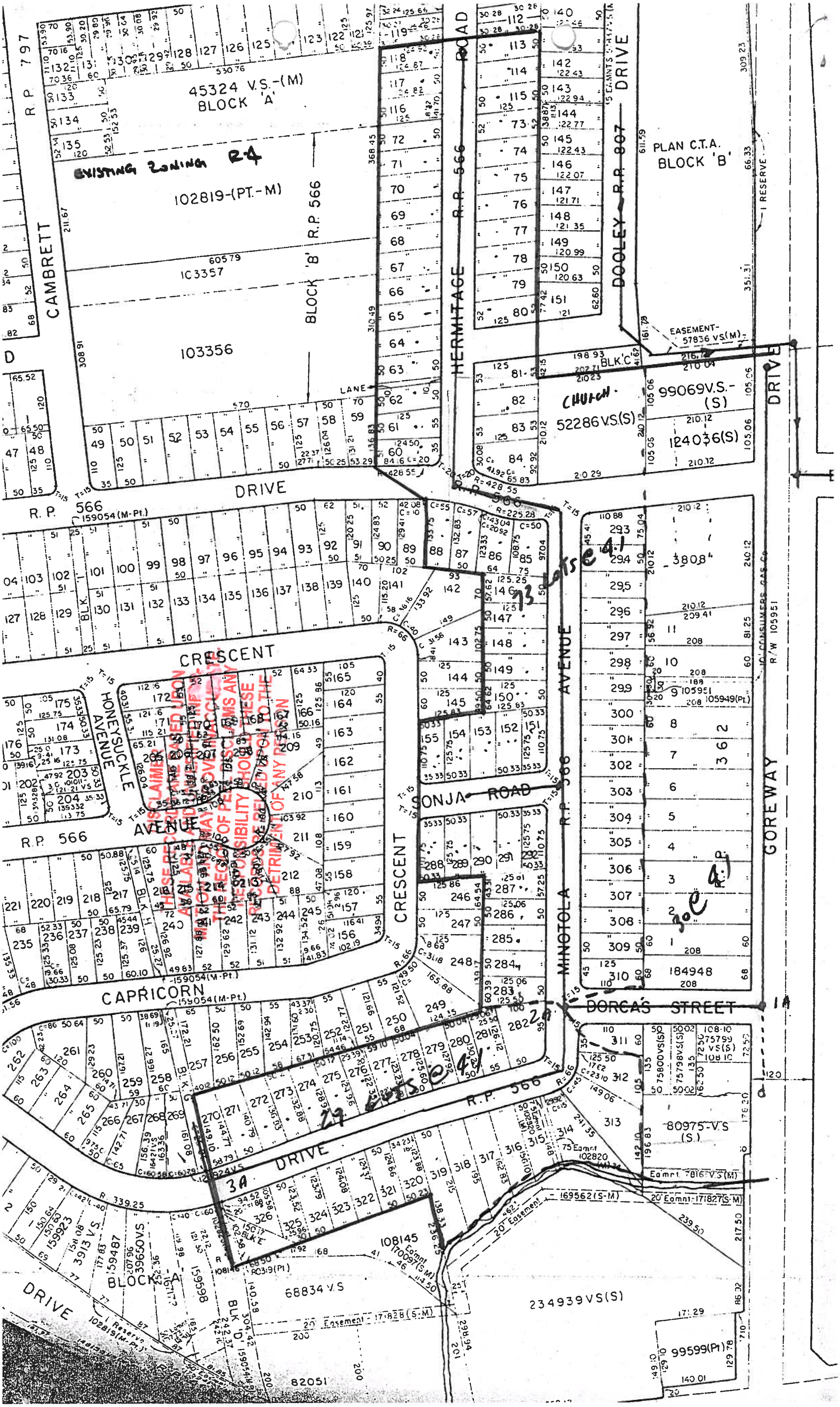
REGIONAL MUNICIPALITY OF PEEL
SANITARY SEWER DESIGN CHART

SHEET No..... OF.....
PROJECT No..... n= .....
DESIGNED..... DATE.....

Rd 248.2

LOCATION	FROM M.H.	TO M.H.	AREA (acres)	DENSITY persons per acre	POPULATION	CUM. AREA (acres)	CUM. POP.	SEWAGE FLOW ① (c.f.s.)	INFILTRATION FLOW ② (c.f.s.)	FOUNDATION DRAINS ③ (c.f.s.)	TOTAL FLOW ①+②+③ (c.f.s.)	LENGTH (ft.)	PIPE DIA. (Inches)	GRADIENT %	CAPACITY (c.f.s.)	VELOCITY (f.p.s.)	DROP IN LOWER M.H.
EXISTING SYSTEM.																	
	1A	2A															
GOREWAY NORTH TO 1A				30@4.1	123												
GOREWAY SOUTH TO 1A				8@4.1	33	6.90	156	.70	.50	—	1.27						
	2A	3A															
MINOTOLA NORTH			16.5	73@4.1	300	23.4	456	.70	.50	—	1.27		SYSTEM GRADE 10" @ .65%				
ADD PROPOSED PROPOSAL TO SYSTEM			4.5		271	27.9	727	.70	.50	—	1.27						
SUMMARY — EXISTING 10" SYSTEM WESTERLY TO MINOTOLA ADEQUATE IN TERMS OF CAPACITY																	
— NOT REC. DUE TO THE FOLLOWING:																	
1) CONNECTION MH. VERY SHALLOW (5')																	
2) HAVE TO CROSS NEWLY BUILT 4 LANE ARTERIAL ROAD																	
RECOMMEND TO CONNECT TO 30" TRUNK SEWER TO THE EAST																	

NOTE – SEWAGE FLOWS FOR LIGHT INDUSTRIAL AND LIGHT COMMERCIAL SHALL BE BASED ON 30 p.p.a. and 20 p.p.a. RESPECTIVELY.



CAMBRETT
R.P. 797
45324 V.S.-(M)
BLOCK 'A'
EXISTING ZONING R4
102819-(PT.-M)
103357
103356
BLOCK 'B' R.P 566
LANE
HERMITAGE ROAD
R.P. 566
DOOLEY DRIVE
R.P. 807
PLAN C.T.A.
BLOCK 'B'
1 RESERVE
EASEMENT-
57836 VS(M)
BLK.C
CHURCH
99069V.S.-(S)
52286 V.S.(S)
124036(S)
DRIVE
R.P. 566
159054(M-Pt.)
CRESCENT
HONEYSUCKLE AVENUE
AVENUE
R.P 566
3808
73 Lots @ 4.1
MINOTOLA AVENUE
R.P. 566
SONJA ROAD
CRESCENT
GOREWAY DRIVE
10' CONSUMERS GAS Co.
R/W 105951
105949(Pt.)
30 @ 4.P
184948
CAPRICORN
-159054(M-Pt.)
159054(M-Pt.)
DORCAS STREET
1A
2A
29 Lots @ 4.1
R.P. 566
DRIVE
3A
75800VS(S)
75798VS(S)
75799 VS(S)
80975-V.S (S)
75 Eamnt
102820
Eamnt 7816 V.S(M)
169562(S-M)
20' Eamnt-171827(S-M)
20' Easement
108145
Eamnt
170097(S-M)
103319(Pt)
BLK E
BLOCK A
39650VS
159487
3913 VS
159923
68834 V.S
234939VS(S)
20' Easement - 171828 (S-M)
1 Reserve
102819(M-Pt.)
DRIVE
BLK 'D'
159054(M-Pt.)
82051
99599(Pt)

Appendix D

Stormwater Management Calculations

SWM TANK ALLOWABLE RELEASE RATE CALCULATION

Existing Site Peak Flow Rates

Returning Period	Area (ha)	Runoff Coefficient C	Intensity (mm/hr)	Discharge Q (L/s)
2	0.765	0.50	59.89	63.7
5	0.765	0.50	80.51	85.6
10	0.765	0.50	99.17	105.5
25	0.765	0.55	113.89	133.2
50	0.765	0.60	127.13	162.2
100	0.765	0.63	140.69	187.0

Post-Development Uncontrolled Release Rate to Goreway

Returning Period	Area (ha)	Runoff Coefficient C	Intensity (mm/hr)	Discharge Q (L/s)
2	0.023	0.85	59.89	3.3
5	0.023	0.85	80.51	4.4
10	0.023	0.85	99.17	5.4
25	0.023	0.94	113.89	6.8
50	0.023	1.00	127.13	8.1
100	0.023	1.00	140.69	9.0

Post-Development SWM Tank Allowable Release Rate

Returning Period	Area (ha)	Runoff Coefficient C	Tank Allowable Release Rate (L/s)
2	0.742	0.85	60.4
5	0.742	0.85	81.2
10	0.742	0.85	100.1
25	0.742	0.94	126.4
50	0.742	1.00	154.1
100	0.742	1.00	178.0

100-year Required Storage

Project: 4866

Modified Rational Method

Internal Area	Controlled Area (ha) =	0.742
	100 year C =	1.00
	100yr Allowable Release Rate (l/s) =	184.6
	Actual Release Rate (l/s) =	60.4
External Area	Area (ha) =	0.000
	C =	0.00
	100-year C =	0.00
Roof Storage	Release Rate from roof(l/s) =	0.00

100 Year Storm

Design Storm =	City of Mississauga
A =	1450
B =	4.9
C =	0.78

	100 Year					Total	Maximum	Required
Time	I	Total	Rooftop	External	Total	Runoff	Release	Storage
(min)	Intensity	Runoff	Runoff	Runoff	Runoff	Volume	Volume	Volume
15	140.69	290.21	0.00	0.00	290.21	261.19	54.36	206.83
20	118.12	243.66	0.00	0.00	243.66	292.39	72.48	219.91
25	102.41	211.25	0.00	0.00	211.25	316.87	90.60	226.27
30	90.77	187.25	0.00	0.00	187.25	337.04	108.72	228.32
35	81.77	168.68	0.00	0.00	168.68	354.22	126.84	227.38
40	74.58	153.84	0.00	0.00	153.84	369.21	144.96	224.25
45	68.68	141.68	0.00	0.00	141.68	382.53	163.08	219.45
50	63.75	131.51	0.00	0.00	131.51	394.52	181.20	213.32
55	59.56	122.86	0.00	0.00	122.86	405.45	199.32	206.13
60	55.95	115.42	0.00	0.00	115.42	415.50	217.44	198.06
65	52.81	108.92	0.00	0.00	108.92	424.80	235.56	189.24
70	50.03	103.21	0.00	0.00	103.21	433.48	253.68	179.80
75	47.58	98.14	0.00	0.00	98.14	441.61	271.80	169.81
80	45.38	93.60	0.00	0.00	93.60	449.27	289.92	159.35
85	43.39	89.51	0.00	0.00	89.51	456.51	308.04	148.47
90	41.60	85.81	0.00	0.00	85.81	463.39	326.16	137.23
95	39.97	82.44	0.00	0.00	82.44	469.93	344.28	125.65
100	38.47	79.36	0.00	0.00	79.36	476.17	362.40	113.77
105	37.10	76.53	0.00	0.00	76.53	482.15	380.52	101.63
110	35.84	73.92	0.00	0.00	73.92	487.88	398.64	89.24
115	34.66	71.51	0.00	0.00	71.51	493.39	416.76	76.63
120	33.58	69.26	0.00	0.00	69.26	498.69	434.88	63.81

Required Storage (m^3): 228

City of Mississauga
Orifice Plate

Allowable Release Rate = 0.060 m^3/s

CALCULATE DIAMETER KNOWING Q & H	
Q(m^3/s)=	0.000
Td(m) =	0.27
Approx A=	0.0000
Approx D=	0
A(m^2) =	0.000
D(mm) =	**0**

Control Manhole Orifice Plate

DIA (mm)=	**172**	
AREA m^2=	0.023	
COEFF =	**0.62**	
GRAVITY =	9.81	
K =	1.0	
D/S HGL=	N/A	m
Orifice Inv.=	163.95	m

Effective Head m	Depth Water At CTL MH m	Qp m^3/s	TOTAL FLOW Qp m^3/s	ELEVATION of Water m	
0.00	0.086	0.000	0.000	164.04	
0.320	0.406	0.036	0.036	164.36	
0.400	0.486	0.040	0.040	164.44	
0.895	**0.981**	**0.060**	**0.060**	**164.93**	**100-year**
2.000	2.086	0.090	0.090	166.04	
2.320	2.406	0.097	0.097	166.36	
3.000	3.086	0.111	0.111	167.04	

ORIFICE FLOW $Q(m^3/s)=$ COEF*AREA*(2*GRAVITY*HEAD/K)^0.5

WEIR FLOW $Q(m^3/s)=$ CLH^1.5 C=1.5

Schaeffers Consulting Engineers

Printed: 19-May-22

STANDARD OFFLINE
Jellyfish Filter Sizing Report

Project Information

Date	Wednesday, May 11, 2022
Project Name	Mississauga
Project Number	4866
Location	Mississauga

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.

Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF6-5-1 is recommended to meet the water quality objective by treating a flow of 27.8 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 313 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF6-5-1	5	1	1.8	27.8	313

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled inspections and maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance interval is designed to be a minimum of 12 months, but this will vary depending on site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.

Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

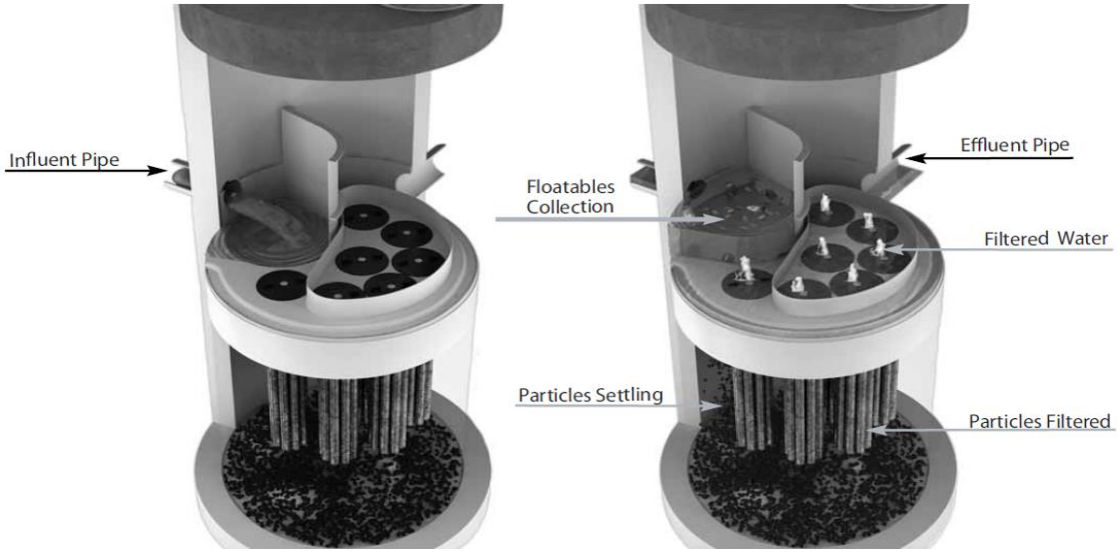
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 77% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field-tested on an urban site with 25 TARP qualifying rain events and field monitored according to the TARP field test protocol, demonstrating:

- A median TSS removal efficiency of 89%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 77%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Wednesday, May 11, 2022
Project Name:	Mississauga
Project Number:	4866
Location:	Mississauga

Designer Information

Company:	Schaeffers Consulting Engineers
Contact:	Giancarlo Volpe
Phone #:	

Notes

Rainfall

Name:	TORONTO CENTRAL
State:	ON
ID:	100
Record:	1982 to 1999
Co-ords:	45°30'N, 90°30'W

Drainage Area

Total Area:	0.792 ha
Imperviousness:	93%

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 18 years of TORONTO CENTRAL rainfall data:	**20.2 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 4393 m³, with a suspended sediment concentration of 60 mg/L.	**264 kg***

** Indicates that sediment loading is the limiting parameter in the sizing of this Jellyfish system*

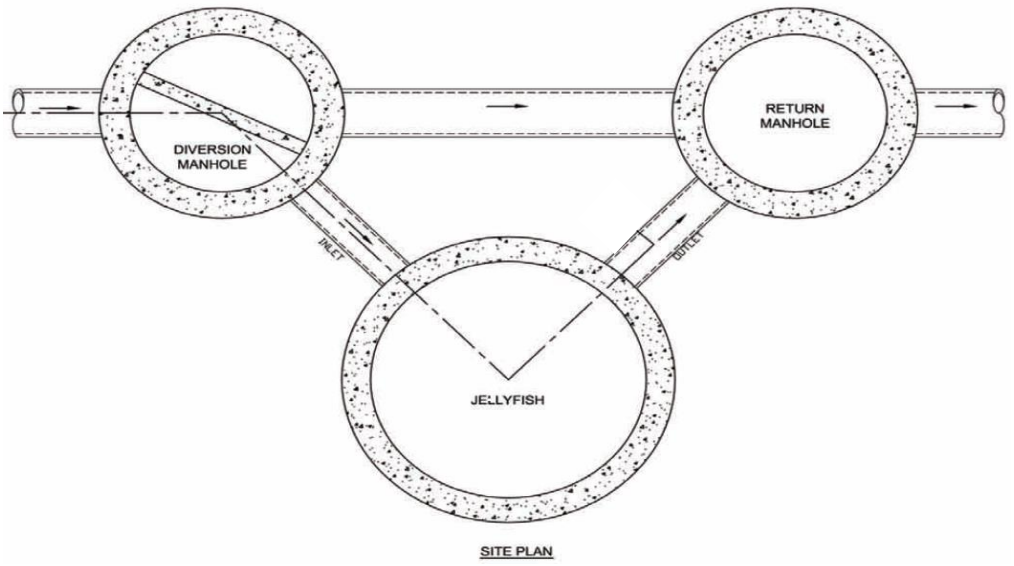
Recommendation

The Jellyfish Filter model JF6-5-1 is recommended to meet the water quality objective by treating a flow of 27.8 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 313 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m³)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	1	1	1.2	2313	0.34	379	7.6	85
JF4-2-1	2	1	1.2	2313	0.34	379	12.6	142
JF6-3-1	3	1	1.8	5205	0.79	848	17.7	199
JF6-4-1	4	1	1.8	5205	0.79	848	22.7	256
JF6-5-1	**5**	**1**	**1.8**	**5205**	**0.79**	**848**	**27.8**	**313**
JF6-6-1	6	1	1.8	5205	0.79	848	28.6	370
JF8-6-2	6	2	2.4	9252	1.42	1469	35.3	398
JF8-7-2	7	2	2.4	9252	1.42	1469	40.4	455
JF8-8-2	8	2	2.4	9252	1.42	1469	45.4	512
JF8-9-2	9	2	2.4	9252	1.42	1469	50.5	569
JF8-10-2	10	2	2.4	9252	1.42	1469	50.5	626
JF10-11-3	11	3	3.0	14456	2.21	2302	63.1	711
JF10-12-3	12	3	3.0	14456	2.21	2302	68.2	768
JF10-12-4	12	4	3.0	14456	2.21	2302	70.7	796
JF10-13-4	13	4	3.0	14456	2.21	2302	75.7	853
JF10-14-4	14	4	3.0	14456	2.21	2302	78.9	910
JF10-15-4	15	4	3.0	14456	2.21	2302	78.9	967
JF10-16-4	16	4	3.0	14456	2.21	2302	78.9	1024
JF10-17-4	17	4	3.0	14456	2.21	2302	78.9	1081
JF10-18-4	18	4	3.0	14456	2.21	2302	78.9	1138
JF10-19-4	19	4	3.0	14456	2.21	2302	78.9	1195
JF12-20-5	20	5	3.6	20820	3.2	2771	113.6	1280
JF12-21-5	21	5	3.6	20820	3.2	2771	113.7	1337
JF12-22-5	22	5	3.6	20820	3.2	2771	113.7	1394
JF12-23-5	23	5	3.6	20820	3.2	2771	113.7	1451
JF12-24-5	24	5	3.6	20820	3.2	2771	113.7	1508
JF12-25-5	25	5	3.6	20820	3.2	2771	113.7	1565
JF12-26-5	26	5	3.6	20820	3.2	2771	113.7	1622
JF12-27-5	27	5	3.6	20820	3.2	2771	113.7	1679

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter, however note the inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation. However, depending on site parameters this can vary to an optional configuration of the inlet pipe entering the unit below the outlet invert elevation.
- The Jellyfish Filter can accommodate multiple inlet pipes within certain restrictions.
- While the optional inlet below deck configuration offers 0 to 360 degree flexibility between the inlet and outlet pipe, typical systems conform to the following:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Minimum Outlet Pipe Diameter (mm)
1.2	62º	150	200
1.8	**59º**	**200**	**250**
2.4	52º	250	300
3.0	48º	300	450
3.6	40º	300	450

- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish Vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft² (0.142 lps/m²).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow

event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the

local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL
In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

TABLE 2.01.03.03c: STORMWATER QUANTITY CONTROL REQUIREMENTS

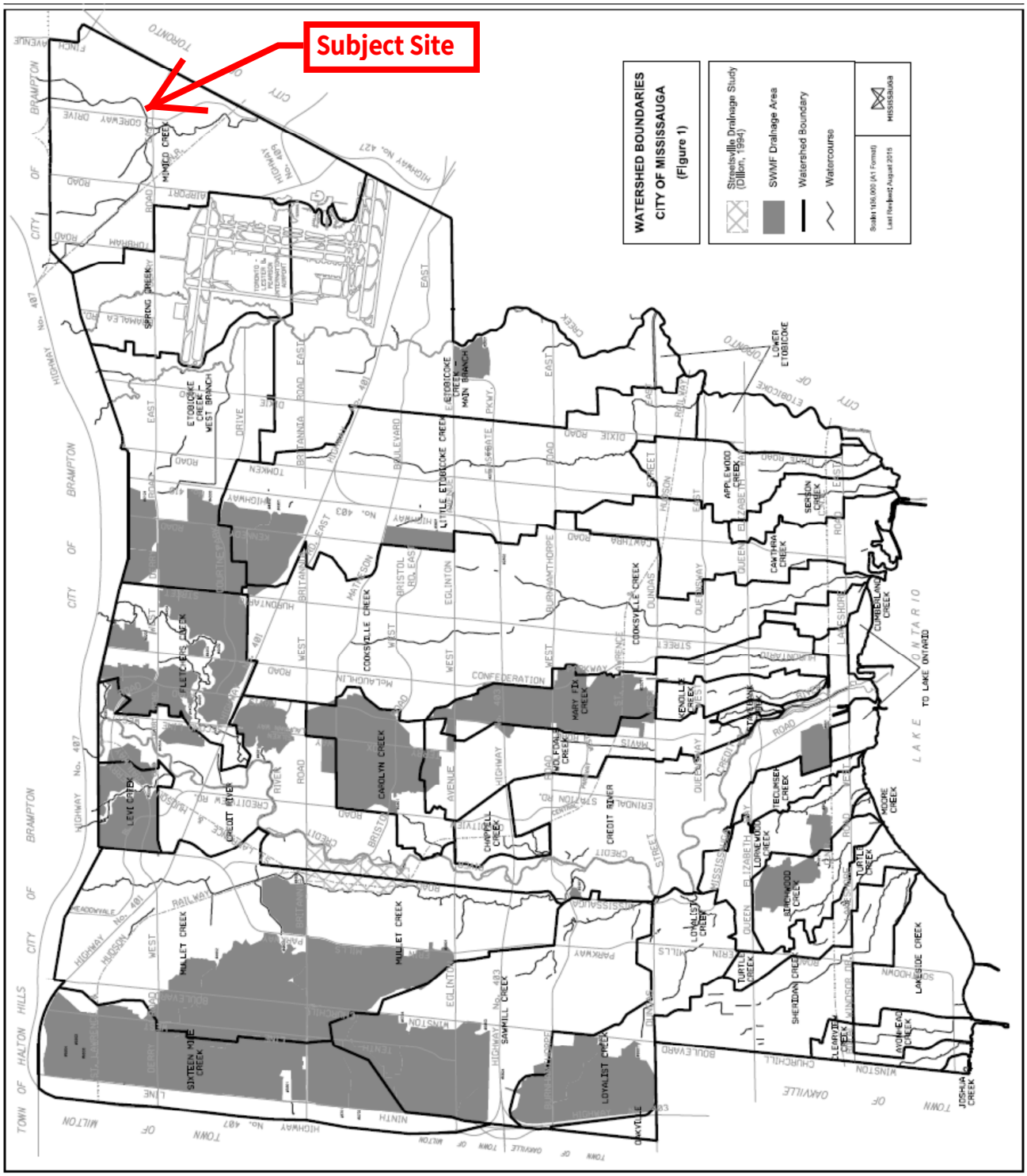
Note 1: In all cases, the storm sewer capacity constraints may govern

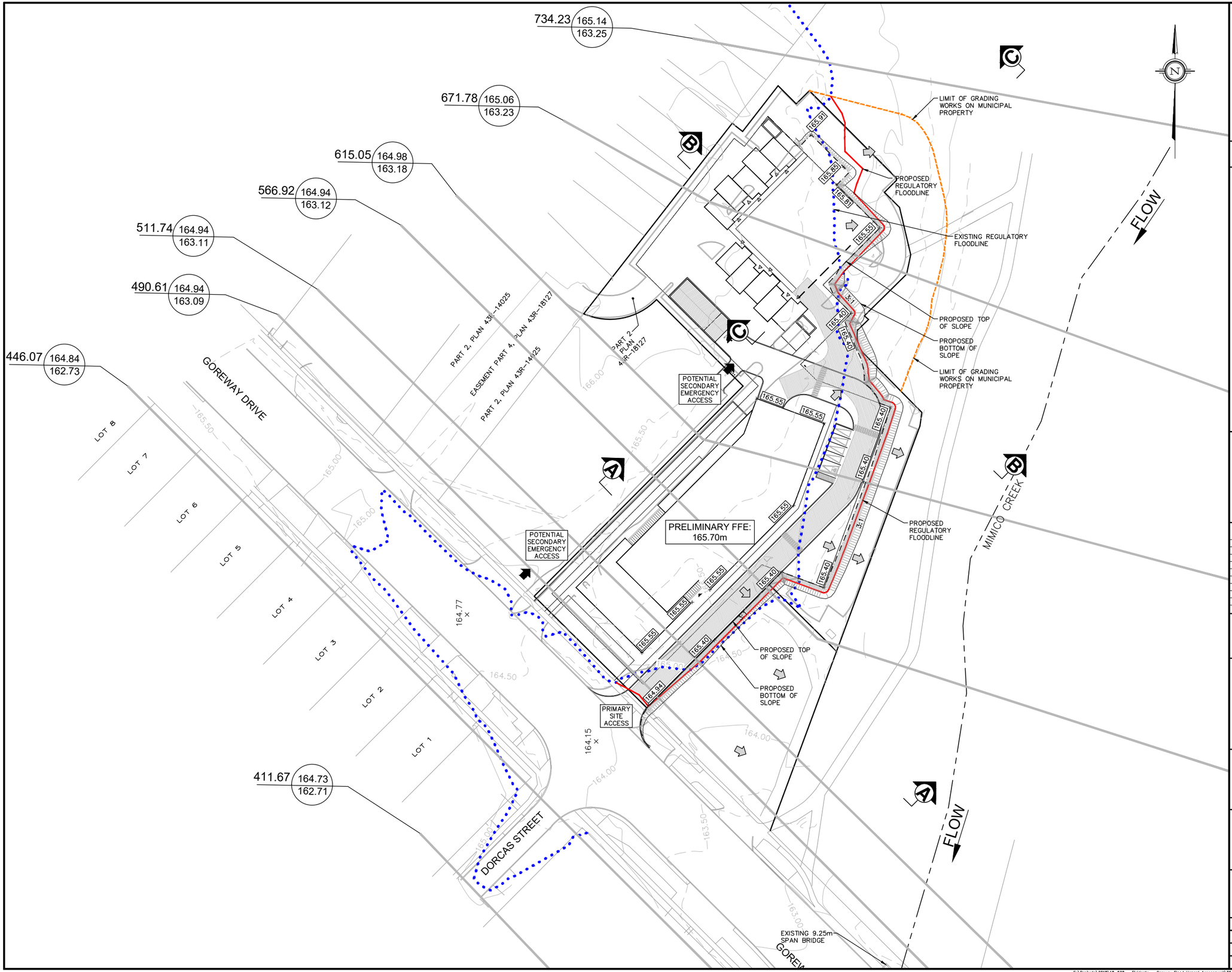
Note 2: Where "pre-development" is listed as part of the requirement, it is implied as raw land for which the run-off co-efficient=0.25 but will not exceed 0.50 for a site that may already be developed

Note 3: CVC-Credit Valley Conservation, TRCA-Toronto Region Conservation Authority, CH-Conservation Halton

Subwatershed Name (Conservation Authority)	Quantity Control Criteria	References & Notes
Loyalist Creek (CVC)	East of Winston Churchill Blvd - Provide post to pre control for only 10 year design storm	Loyalist Creek Watershed Study (CBCL Limited, 1980)
	West of Winston Churchill Blvd - Provide post to pre control for all storms (i.e. 2,5,10,25,50 & 100 year)	Erin Mills West Loyalist Creek Drainage Report (Proctor & Redfern Group, 1985)
Mary Fix Creek (CVC)	10 Year Post to 2 Year Pre-development Control	-
Mimico Creek (TRCA)	Provide post to pre control for all storms (i.e. 2,5,10,25,50 & 100 year)	Hydrologic Model: VISUAL OTTHYMO-Return period peak flows based on the AES - 12 hour design storm Hydrology Study:Mimico Hydrology Update (Marshall Macklin Monaghan, 2009)
Moore Creek (CVC)	No control required	-
Mullet Creek (CVC)	Provide post to pre control for all storms (i.e. 2,5,10,25,50 & 100 year) & Regional storm	Hydrologic Model: GAWSER Model-Return period peak flows based on 24 hour SCS Type II distribution
	Consider storm sewer constraints outlined in Streetsville Area Drainage Study (Dillon, 1994)	Gateway West Subwatershed Study (Gartner Lee Limited & Cosburn Patterson Mather, 1999)
	□	Gateway West Subwatershed Study Update by Kidd Consulting (Update in Progress)
Sawmill Creek (CVC)	Provide post to pre control for all storms (i.e. 2,5,10,25,50 & 100 year)	Hydrologic Model: GAWSER Model-Return period peak flows based on 24 hour SCS Type II distribution Sawmill Creek Subwatershed Study (Proctor & Redfern Limited, 1993)
Serson Creek (CVC)	100 Year Post to 2 Year Pre-development Control	Large number of buildings (> 150) in the regulated flood plain

A-1 - Watershed Boundaries





E:\Projects\2018\18-528 - Fieldgate - Goreway Flood Hazard Assessment\05_Design\051_DRAWINGS\528_BASE.dwg

Date Plotted: Feb 23, 2022 - 2:03pm

KEY PLAN
N.T.S.

LEGEND

- PROPERTY LINE
- EXISTING RIVER
- EX. MAJOR CONTOUR
- EX. MINOR CONTOUR
- GRECK EXISTING CONDITIONS REGULATORY FLOODLINE
- PROPOSED REGULATORY FLOODLINE
- PROPOSED BOTTOM OF SLOPE
- PROPOSED TOP OF SLOPE
- OVERLAND FLOW
- × 165.55 PRELIMINARY PROPOSED GRADES (TO BE CONFIRMED DURING DETAILED DESIGN)

GRECK REGULATORY FLOODLINE
165.06 / 163.23 — 671.78 HEC-RAS ID
100yr FLOODLINE
SECTION LINE

BENCHMARK(S)
BENCHMARK No. BM448
ELEVATION = 162.55m
LOCATION: MISSISSAUGA, ON
DESCRIPTION:

COMPLETED BY:
KORMAR ONTARIO LAND SURVEYORS
1137 CENTRE ST. THORNHILL, ONTARIO
COMPLETED: JUNE 20, 2017 (905) 738-0053

NO.	REVISION	DATE	BY	APPROVED

Greck
5770 Highway 7, Woodbridge, Ontario, L4L 1T8

CLIENT NAME:
7085 GOREWAY DEVELOPMENTS LIMITED

7085 GOREWAY DRIVE MISSISSAUGA, ONTARIO

FLOODLINE HAZARD ASSESSMENT PROPOSED CONCEPTUAL DESIGN

DESIGNED BY: S.S.	SCALES:		PROJECT No. 18-528
CHECKED BY: E.G.	HORIZONTAL:	1:1000	DRAWING No. FPM
DRAWN BY: J.N.	VERTICAL:	N/A	SHEET No. 01
DATE: JULY 20, 2018			

Project: 7085 Goreway Drive
(CITY OF MISSISSAUGA)
Consultant: Schaeffer & Associates Ltd.
DRAINAGE AREA PLAN NO.: N/A

STORM SEWER DESIGN SHEET

CITY OF MISSISSAUGA
7085 Goreway Drive - Post Development

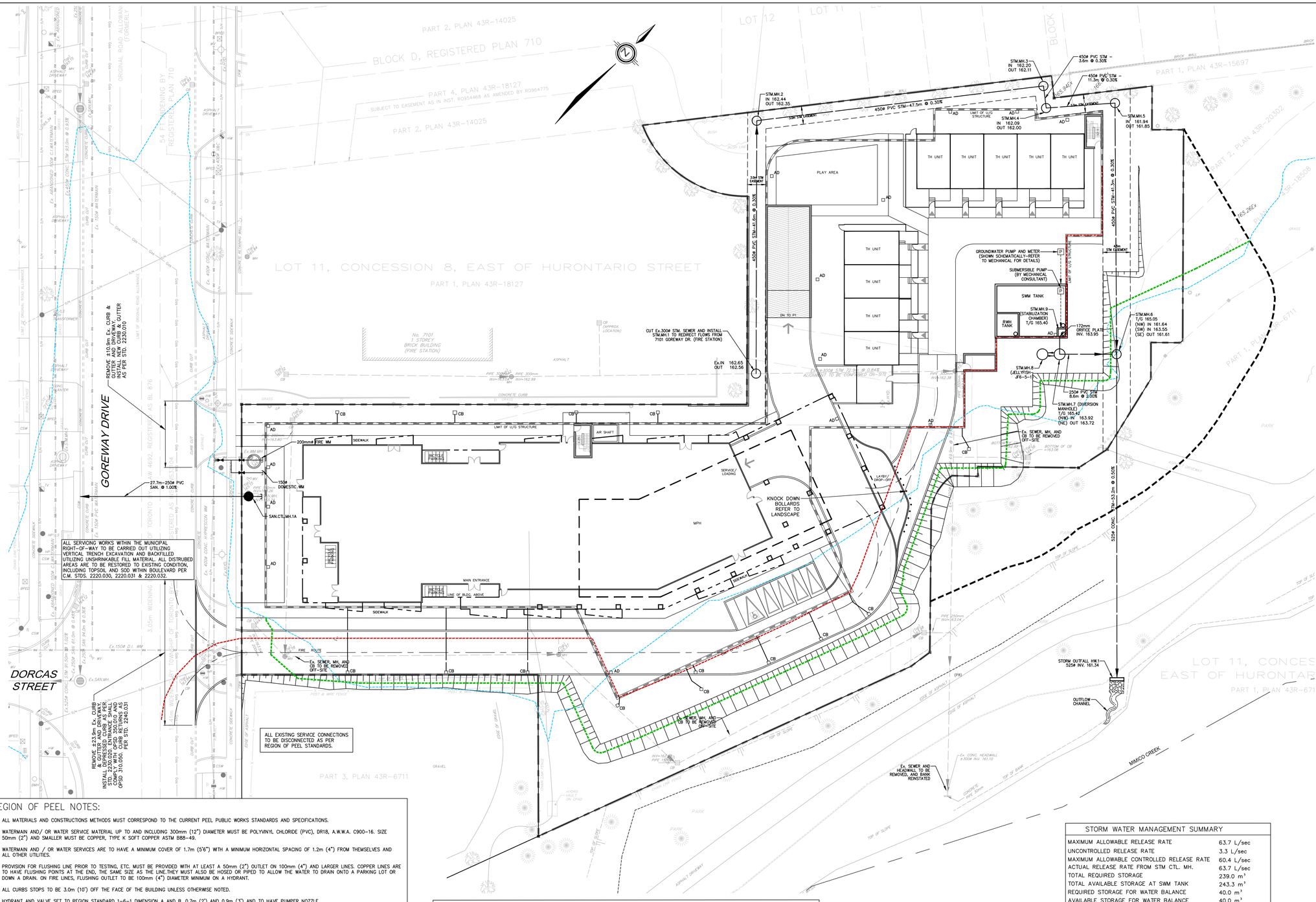
PROJECT No.: 2019-4866
DESIGNED BY: H.H.T.
CHECKED BY:
DATE: May 26, 2022

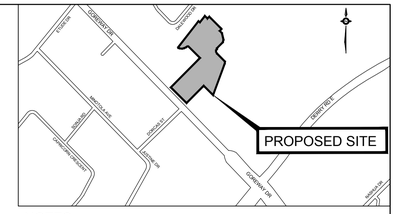
AREA NO	LOCATION	LAND USE	UPSTREAM		DOWNSTREAM		NO. OF HECTARES		AREA x STORM C0-EFF.				TIME OF CONCENTRATION		$I10_{YR}$	$I100_{YR}$	Q_{10}=2.78 x CIA / 1000 (m^3/s)	Q_{100}=2.78 x CIA / 1000 (m^3/s)	PIPE						
			MH	INV	MH	INV	IN AREA	TOTAL	C	INCR AxC	TOTAL SECT AxC	TOTAL AxCx2.78	IN AREA	TOT					Length (m)	SIZE NOM (mm)	SIZE ACT (mm)	GRADE	TYPE OF PIPE	CAPACITY (m^3/s)	VELOCITY (m/s)
	Fire Hall				1		0.340	0.34	0.94	0.319	0.319	0.886		15.00		140.69		**0.125**	= 100-yr capture rate from Fire Hall						
	Easement - 3.0m	BY-PASS	1		2		0.00	0.00	0.00	0.000	0.000	0.000	0.81	15.00	99.17		0.000	0.125	41.6	450	457	0.30	CONC	0.141	0.86
	Easement - 3.0m	BY-PASS	2		3		0.00	0.00	0.00	0.000	0.000	0.000	0.92	15.81	96.10		0.000	0.125	47.5	450	457	0.30	CONC	0.141	0.86
	Easement - 3.0m	BY-PASS	3		4		0.00	0.00	0.00	0.000	0.000	0.000	0.17	16.73	92.85		0.000	0.125	3.6	450	457	0.30	CONC	0.141	0.86
	Easement - 3.0m	BY-PASS	4		5		0.00	0.00	0.00	0.000	0.000	0.000	0.55	16.90	92.26		0.000	0.125	11.3	450	457	0.30	CONC	0.141	0.86
	Easement - 4.5m	BY-PASS	5		6		0.00	0.00	0.00	0.000	0.000	0.000	0.80	16.90	92.26		0.000	0.125	41.3	450	457	0.30	CONC	0.141	0.86
								0.00			**0.000**			**17.70**											
	7085 Goreway Drive		7		6								100-YR Controlled Flow From The Tank =					**0.0637**	8.6	250	254	2.00	UR-PVC	0.076	1.50
	Easement - 4.5m	BY-PASS	6		HW.1		0.000	0.00	0.00	0.000	0.000	0.000	0.72	15.00	142.37	140.69	0.000	**0.188**	53.2	525	533	0.50	CONC	0.275	1.23

$I10_{YR}=35.1(T)^{-0.695}$, T in hours
Inlet Time = 15 min

Appendix E

Engineering Drawings





NOTES

1. THE LOCATION OF ALL UNDERGROUND AND ABOVE GROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON CONTRACT DRAWINGS, AND WHERE SHOWN THE ACCURACY OF THE LOCATION AND ELEVATION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. PRIOR TO COMMENCING CONSTRUCTION, THE CONTRACTOR SHALL VERIFY EXACT LOCATION AND ELEVATION OF SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITIES OF DAMAGE.
2. ANY CONFLICTS WITH EXISTING SERVICES AND/OR UTILITIES SHALL BE REPORTED TO THE ENGINEER FOR REVIEW AND ADVICE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
3. INFORMATION REGARDING ANY EXISTING SERVICES AND/OR UTILITIES SHOWN ON THIS DRAWING ARE FURNISHED AS THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE SEES FIT WITH THE UNDERSTANDING THAT THE OWNER, ENGINEER AND CITY DISCLAIM ALL RESPONSIBILITY FOR ITS ACCURACY AND/OR SUFFICIENCY.
4. THE CONTRACTOR SHALL PROVIDE DETAILS FOR SUPPORT OF Ex. SERVICES AND/OR UTILITIES FOR ENGINEER'S APPROVAL PRIOR TO START OF CONSTRUCTION.

LEGEND

- DENOTES HYDRANT
- AD DENOTES AREA DRAIN
- DENOTES CATCHBASIN
- DENOTES STORM MANHOLE
- DENOTES SANITARY MANHOLE
- VC DENOTES VALVE & CHAMBER
- VB DENOTES VALVE & BOX
- DENOTES EXISTING REGULATORY FLOODPLAIN
- DENOTES LINE OF FLOODPLAIN (REGIONAL)
- DENOTES 6.0m SETBACK FROM PROPOSED ENGINEERED LONG TERM STABLE TOP OF SLOPE
- DENOTES EXISTING PROPERTY LINE
- DENOTES PROPOSED PROPERTY LINE
- DENOTES LINE OF U/G
- OHR DENOTES EXISTING OVERHEAD HYDRO
- Gas DENOTES EXISTING GAS MAIN
- B DENOTES EXISTING BELL CABLE

REGION OF PEEL NOTES:

1. ALL MATERIALS AND CONSTRUCTIONS METHODS MUST CORRESPOND TO THE CURRENT PEEL PUBLIC WORKS STANDARDS AND SPECIFICATIONS.
2. WATERMAIN AND/ OR WATER SERVICE MATERIAL UP TO AND INCLUDING 300mm (12") DIAMETER MUST BE POLYVINYL CHLORIDE (PVC), DR18, A.W.W.A. C900–16. SIZE 50mm (2") AND SMALLER MUST BE COPPER, TYPE K SOFT COPPER ASTM B88–49.
3. WATERMAIN AND / OR WATER SERVICES ARE TO HAVE A MINIMUM COVER OF 1.7m (5'6") WITH A MINIMUM HORIZONTAL SPACING OF 1.2m (4") FROM THEMSELVES AND ALL OTHER UTILITIES.
4. PROVISION FOR FLUSHING LINE PRIOR TO TESTING, ETC. MUST BE PROVIDED WITH AT LEAST A 50mm (2") OUTLET ON 100mm (4") AND LARGER LINES. COPPER LINES ARE TO HAVE FLUSHING POINTS AT THE END, THE SAME SIZE AS THE LINE.THEY MUST ALSO BE HOSED OR PIPED TO ALLOW THE WATER TO DRAIN ONTO A PARKING LOT OR DOWN A DRAIN. ON FIRE LINES, FLUSHING OUTLET TO BE 100mm (4") DIAMETER MINIMUM ON A HYDRANT.
5. ALL CURBS STOPS TO BE 3.0m (10') OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED.
6. HYDRANT AND VALVE SET TO REGION STANDARD 1–6–1 DIMENSION A AND B, 0.7m (2') AND 0.9m (3') AND TO HAVE PUMPER NOZZLE.
7. WATERMAIN TO BE INSTALLED TO GRADES AS SHOWN ON APPROVED SITE PLAN. COPY OF GRADE SHEET MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHERE REQUESTED BY INSPECTOR.
8. WATERMAIN MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 0.30m (12") OVER / 0.5m (20") UNDER SEWERS AND ALL OTHERS UTILITIES WHEN CROSSING.
9. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING LINES IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATING FROM EXISTING SYSTEMS.
10. ALL LIVE TAPPING AND OPERATION OF REGION WATER VALVES SHALL BE ARRANGED THROUGH THE REGIONAL INSPECTOR ASSIGNED OR BY CONTACTING THE OPERATIONS AND MAINTENANCE DIVISION.
11. ALL PROPOSED WATER PIPING MUST BE ISOLATED THROUGH A TEMPORARY CONNECTION THAT SHALL INCLUDE AN APPROPRIATE CROSS–CONNECTION CONTROL DEVICE, CONSISTENT WITH THE DEGREE OF HAZARD, FOR BACKFLOW PREVENTION OF THE ACTIVE DISTRIBUTION SYSTEM, CONFORMING TO REGION OF PEEL STANDARD 1–7–7 OR 1–7–8.
12. LOCATION OF ALL EXISTING UTILITIES IN THE FIELD TO BE ESTABLISHED BY THE CONTRACTOR.
13. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE FOR LOCATES, EXPOSING, SUPPORTING AND PROTECTING OF ALL UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES EXISTING AT THE TIME OF CONSTRUCTION IN THE AREA OF THEIR WORK WHETHER SHOWN ON THE PLANS OR NOT AND FOR ALL REPAIRS AND CONSEQUENCES RESULTING FROM DAMAGE TO SAME.
14. THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE TO GIVE 72 HOURS WRITTEN NOTICE TO THE UTILITIES PRIOR TO CROSSING SUCH UTILITIES, FOR THE PURPOSE OF INSPECTION BY THE CONCERNED UTILITY. THIS INSPECTION WILL BE FOR THE DURATION OF THE CONSTRUCTION, WITH THE CONTRACTOR RESPONSIBLE FOR ALL COSTS ARISING FROM SUCH INSPECTION.

GENERAL NOTES

1. ALL CONCRETE AND PLASTIC SEWER PIPE SHALL HAVE RUBBER GASKET JOINTS.
2. ALL SEWERS SHALL BE CONSTRUCTED WITH BEDDING IN ACCORDANCE WITH OPSD 802.03 CLASS "B" UNLESS OTHERWISE NOTED.
3. PLASTIC SEWER PIPES SHALL BE CONSTRUCTED WITH ULTRA RIB OR APPROVED EQUAL UP TO THE MAXIMUM DIAMETER OF 600mm.
4. ALL WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CURRENT CITY OF MISSISSAUGA AND OPSD STANDARD DRAWINGS AND SPECIFICATIONS.
5. DOUBLE CATCHBASIN LEADS TO BE 300mm UNLESS OTHERWISE NOTED. ALL CATCHBASIN LEADS TO BE EITHER C–14–ES MINIMUM OR P.V.C. TYPE S.D.R. 28.
6. ALL BACKFILL FOR SEWERS, WATERMAINS AND UTILITIES ON PAVED AREAS MUST BE MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY.
7. INVERTS, ELEVATIONS AND EXACT LOCATIONS OF ALL EXISTING UNDERGROUND SERVICES TO BE VERIFIED IN THE FIELD BEFORE COMMENCING ANY WORK.
8. ALL AREAS DISTURBED DURING CONSTRUCTION TO BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE CITY OF MISSISSAUGA AND REGION OF PEEL.
9. GRASSED AREAS TO BE TOPPED WITH 150mm TOPSOIL AND SODDED WITH No.1 NURSERY SOD.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING MUD AND DUST ON ALL PUBLIC ROADS TO THE SATISFACTION OF THE CITY AND REGION.

STORM WATER MANAGEMENT SUMMARY

MAXIMUM ALLOWABLE RELEASE RATE	63.7 L/sec
UNCONTROLLED RELEASE RATE	3.3 L/sec
MAXIMUM ALLOWABLE CONTROLLED RELEASE RATE	60.4 L/sec
ACTUAL RELEASE RATE FROM STM CTL. MH.	63.7 L/sec
TOTAL REQUIRED STORAGE	239.0 m³
TOTAL AVAILABLE STORAGE AT SWM TANK	243.3 m³
REQUIRED STORAGE FOR WATER BALANCE	40.0 m³
AVAILABLE STORAGE FOR WATER BALANCE	40.0 m³
100 YR. HWL AT ORIFICE	164.93 m
ORIFICE PLATE SIZE	172mm DIA.
STORM TANK MAXIMUM WATER DEPTH	3.08 m

PLUMBING NOTES:

1. ALL AD/CB/TRENCH DRAINS DESIGNED TO CAPTURE 100 YR STM. EVENT AND DIRECTED TO INTERNAL PLUMBING SYSTEM – PLUMBING TO BE DESIGNED BY MECHANICAL ENGINEER.
2. THE BUILDING SANITARY AND STORM SYSTEM MUST BE DESIGNED TO BE ABLE TO OPERATE UNDER MUNICIPAL SEWER SURCHARGE CONDITIONS.
3. ALL AREA DRAINS TO BE CONNECTED TO SWM TANK – PLUMBING TO BE DESIGNED BY MECHANICAL ENGINEER.
4. ROOF DRAINS TO BE CONNECTED TO RWH TANK – PLUMBING TO BE DESIGNED BY MECHANICAL ENGINEER.

BENCHMARK NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC DATUM AND ARE RELATED TO CITY OF MISSISSAUGA BENCH MARK No. BM448 HAVING PUBLISHED ELEVATION OF 162.55 METRES.

No.	Date	Issued for
3.	MAR.08.2023	ISSUED FOR ZBA SUBMISSION
2.	JUNE.06.2022	ISSUED FOR ZBA SUBMISSION
1.	APR.24.2020	ISSUED FOR ZBA SUBMISSION

REGISTERED PROFESSIONAL ENGINEER
H./H. TOZCU
100130655
MAR.08.2023
PROVINCE OF ONTARIO

REDWOOD ON GOREWAY
7085 GOREWAY DRIVE

CITY OF MISSISSAUGA

SCHAEFFERS
CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.
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PRELIMINARY SITE SERVICING PLAN

DRAWN BY: M.P.	DESIGNED BY: M.P.	CHECKED BY: H.S.
SCALE: 1:300	DATE: APR. 2020	
PROJECT No. 2019-4866	DRAWING No. SS-1	

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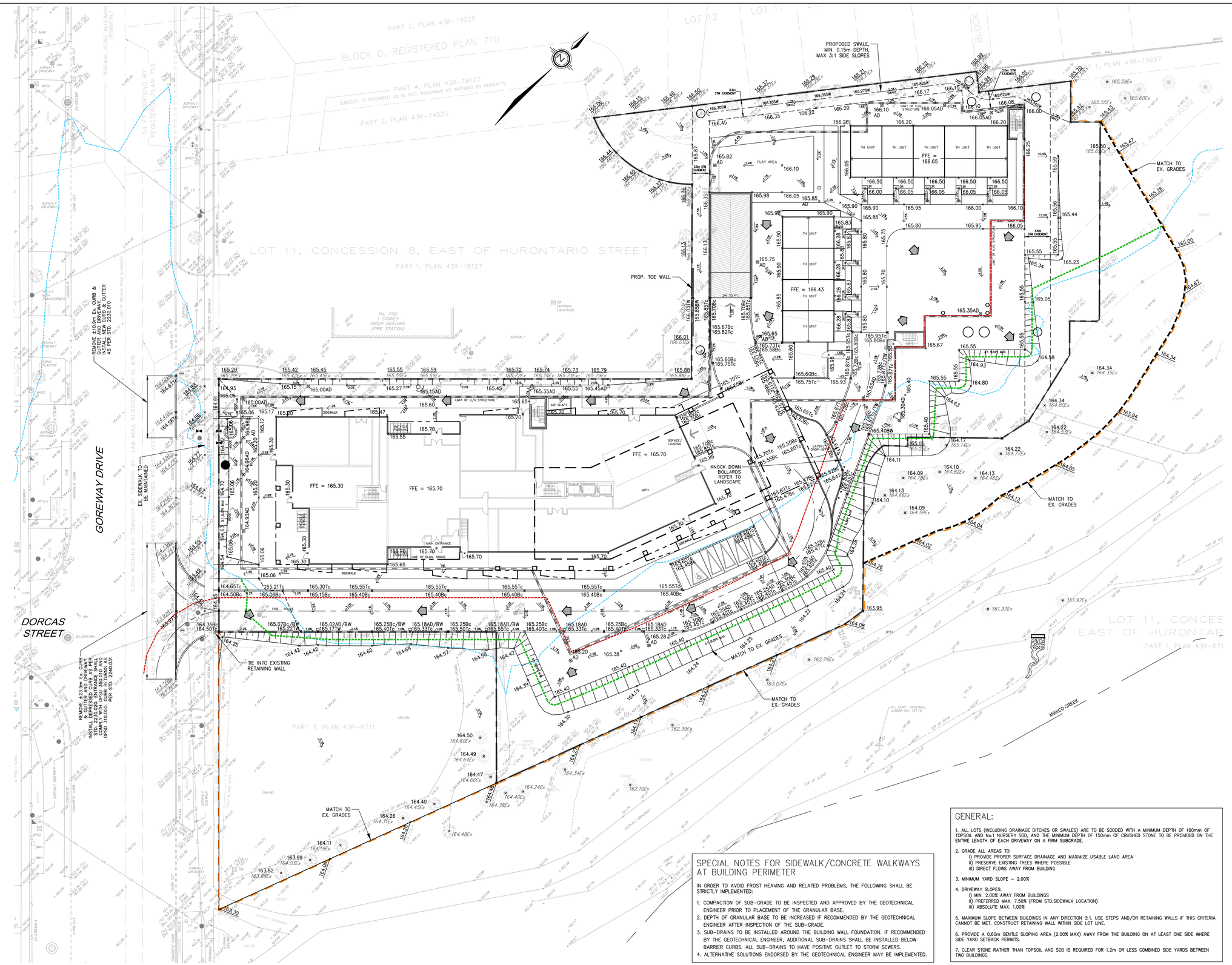

NOTES

1. THE LOCATION OF ALL UNDERGROUND AND ABOVE GROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON CONTRACT DRAWINGS, AND WHERE SHOWN THE ACCURACY OF THE LOCATION AND ELEVATION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. PRIOR TO COMMENCING CONSTRUCTION, THE CONTRACTOR SHALL VERIFY EXACT LOCATION AND ELEVATION OF SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITIES OF DAMAGE.
2. ANY CONFLICTS WITH EXISTING SERVICES AND/OR UTILITIES SHALL BE REPORTED TO THE ENGINEER FOR REVIEW AND ADVICE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
3. INFORMATION REGARDING ANY EXISTING SERVICES AND/OR UTILITIES SHOWN ON THIS DRAWING ARE FURNISHED AS THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE SEES FIT WITH THE UNDERSTANDING THAT THE OWNER, ENGINEER AND CITY DISCLAIM ALL RESPONSIBILITY FOR ITS ACCURACY AND/OR SUFFICIENCY.
4. THE CONTRACTOR SHALL PROVIDE DETAILS FOR SUPPORT OF Ex. SERVICES AND/OR UTILITIES FOR ENGINEERS APPROVAL PRIOR TO START OF CONSTRUCTION.

LEGEND

- DENOTES HYDRANT
- AD DENOTES AREA DRAIN
- DENOTES CATCHBASIN
- DENOTES STORM MANHOLE
- DENOTES SANITARY MANHOLE
- VC DENOTES VALVE & CHAMBER
- VB DENOTES VALVE & BOX
- DENOTES EXISTING REGULATORY FLOODPLAIN
- DENOTES LINE OF FLOODPLAIN (REGIONAL)
- DENOTES 6.0m SETBACK FROM PROPOSED ENGINEERED LONG TERM STABLE TOP OF SLOPE
- DENOTES EXISTING PROPERTY LINE
- DENOTES PROPOSED PROPERTY LINE
- DENOTES LINE OF U/G
- OHR DENOTES EXISTING OVERHEAD HYDRO
- DENOTES LIMIT OF GRADING
- + 131.48 DENOTES PROPOSED ELEVATION
- + 131.48TC DENOTES PROPOSED TOP OF CURB
- + 131.48BC DENOTES PROPOSED BOTTOM OF CURB
- + 131.48TW DENOTES PROPOSED TOP OF WALL
- + 131.48BW DENOTES PROPOSED BOTTOM OF WALL
- + 131.48SW DENOTES PROPOSED SWALE
- + *130.29EX* DENOTES EXISTING ELEVATION
- DENOTES EMERGENCY OVERLAND FLOW ARROW

BENCHMARK NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC(1928) AND ARE RELATED TO CITY OF MISSISSAUGA BENCH MARK No. BM448 HAVING PUBLISHED ELEVATION OF 162.55 METRES.

No.	Date	Issued for
3.	MAR.08.2023	ISSUED FOR ZBA SUBMISSION
2.	JUNE.06.2022	ISSUED FOR ZBA SUBMISSION
1.	APR.24.2020	ISSUED FOR ZBA SUBMISSION

REGISTERED PROFESSIONAL ENGINEER
H. H. TOZCU
100130655
MAR.08.2023
PROVINCE OF ONTARIO

SPECIAL NOTES FOR SIDEWALK/CONCRETE WALKWAYS AT BUILDING PERIMETER

IN ORDER TO AVOID FROST HEAVING AND RELATED PROBLEMS, THE FOLLOWING SHALL BE STRICTLY IMPLEMENTED:

1. COMPACTION OF SUB-GRADE TO BE INSPECTED AND APPROVED BY THE GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF THE GRANULAR BASE.
2. DEPTH OF GRANULAR BASE TO BE INCREASED IF RECOMMENDED BY THE GEOTECHNICAL ENGINEER AFTER INSPECTION OF THE SUB-GRADE.
3. SUB-DRAINS TO BE INSTALLED AROUND THE BUILDING WALL FOUNDATION. IF RECOMMENDED BY THE GEOTECHNICAL ENGINEER, ADDITIONAL SUB-DRAINS SHALL BE INSTALLED BELOW BARRIER CURBS. ALL SUB-DRAINS TO HAVE POSITIVE OUTLET TO STORM SEWERS.
4. ALTERNATIVE SOLUTIONS ENDORSED BY THE GEOTECHNICAL ENGINEER MAY BE IMPLEMENTED.

GENERAL:

1. ALL LOTS (INCLUDING DRAINAGE DITCHES OR SWALES) ARE TO BE SODDED WITH A MINIMUM DEPTH OF 100mm OF TOPSOIL AND No.1 NURSERY SOD, AND THE MINIMUM DEPTH OF 150mm OF CRUSHED STONE TO BE PROVIDED ON THE ENTIRE LENGTH OF EACH DRIVEWAY ON A FIRM SUBGRADE.
2. GRADE ALL AREAS TO:
   I) PROVIDE PROPER SURFACE DRAINAGE AND MAXIMIZE USABLE LAND AREA
   II) PRESERVE EXISTING TREES WHERE POSSIBLE
   III) DIRECT FLOWS AWAY FROM BUILDING
3. MINIMUM YARD SLOPE – 2.00%
4. DRIVEWAY SLOPES:
   I) MIN. 2.00% AWAY FROM BUILDINGS
   II) PREFERRED MAX. 7.50% (FROM STD.SIDEWALK LOCATION)
   III) ABSOLUTE MAX. 1.00%
5. MAXIMUM SLOPE BETWEEN BUILDINGS IN ANY DIRECTION 3:1. USE STEPS AND/OR RETAINING WALLS IF THIS CRITERIA CANNOT BE MET. CONSTRUCT RETAINING WALL WITHIN SIDE LOT LINE.
6. PROVIDE A 0.60m GENTLE SLOPING AREA (2.00% MAX) AWAY FROM THE BUILDING ON AT LEAST ONE SIDE WHERE SIDE YARD SETBACK PERMITS.
7. CLEAR STONE RATHER THAN TOPSOIL AND SOD IS REQUIRED FOR 1.2m OR LESS COMBINED SIDE YARDS BETWEEN TWO BUILDINGS.

REDWOOD ON GOREWAY
7085 GOREWAY DRIVE

CITY OF MISSISSAUGA

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