Municipal Class Environmental Assessment for
Road Improvements near Derry Road East and Alstep Drive:

Environmental Study Report

Appendix F: Background Hydrogeological Assessment

Bombardier Aerospace Project (Off-Site Work), Mississauga, Ontario

Hydrogeological Investigation

Client:
EXP – Transport Division

Attention: Mr. Carlyle Glean

Type of Document:
Updated Final

Project Name:
Bombardier Aerospace Project (Off-Site Work), Mississauga, Ontario

Project Number:
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1 Introduction

1.1 Project Description

EXP Services Inc. (EXP) was retained by EXP – Transport Division to prepare a Hydrogeological Investigation Report associated with the proposed road development work in Mississauga as part of Bombardier Aerospace Project (Off-Site Work), Mississauga, Ontario (hereinafter referred to as the 'Site').

As we understand, Bombardier Inc. is planning to carry out some road development work in the City of Mississauga, as part of the Bombardier Aerospace project (Off-Site Work). The proposed hydrogeological investigation is required to be completed as part of the detail design process.

Exp understands that the proposed road development work will include road widening, pavement construction and Alstep Drive Extension (approximately 200 m) to meet Bramalea Road. It is also proposed to extend the existing 750 mm diameter storm sewer along the Alstep Drive underneath the proposed road extension. It is expected that the lowest invert elevation of the extended section of the storm sewer is approximately 168.8 meters above sea level (masl). The Site location plan is shown on Figure 1.

City of Mississauga / Region of Peel requires updating the hydrogeological investigation report, to meet the Agency's requirements and to consider the preferred design options for various sections of the proposed road development work. We understand that following alternative designs are selected as preferred options for various sections (Attachment 1):

EXP conducted a Geotechnical Investigation in conjunction with this investigation onsite. The pertinent information gathered from the noted investigation is utilized for this report.

1.2 Project Objectives

The main objectives of the Hydrogeological Investigation are as follows:

- Establish the local hydrogeological settings within the Site;
- Assess construction dewatering flow rates and potential impacts;
- Assess groundwater quality;
- Evaluate the permitting requirements (EASR) for dewatering and dewatering effluent disposal purposes;
- Prepare a Hydrogeological Investigation Reports; and
- Register an online record in the EASR, if required.

1.3 Scope of Work

To achieve the investigation objectives, EXP has completed the following scope of work:

- Reviewed available geological and hydrogeological information for the Site; search water well records in the MECP database to find wells within 500 m of the project area;

- Installed two (2) groundwater monitoring wells within the project area (as part of geotechnical drilling program), approximately 5 m deep, 50 mm diameter;
- Developed all four (4) monitoring wells and conducted Single Well Response Tests (SWRT) to assess hydraulic properties of the saturated soils at the Site;
- Conducted two (2) groundwater level surveys;
- Collected one (1) groundwater sample at a selected monitoring well location for analyses of parameters listed in the Regional Municipality of Peel Sanitary and Combined Sewer Use By-Law ;
- Evaluated the information collected during the field investigation program, including SWRT results, groundwater level measurements and groundwater water quality;
- Preparation of site plans, cross sections and groundwater contour mapping for the Site;
- Estimated construction dewatering flow rates using analytical methods;
- Evaluated requirement of an online registration in MECP EASR for construction dewatering;
- Evaluated potential dewatering related effects on the surrounding environment; and,
- Prepared a Hydrogeological Investigation Report.

The hydrogeological report will also address the requirements of the Regional Municipality of Peel / City of Mississauga requirements for disposal of dewatering effluent into their sewer system (storm / sanitary). The scope of work outlined above is prepared to assess dewatering and does not include a review of Environmental Site Assessments (ESA).

1.4 Review of Previous Reports

The following reports were reviewed as part of this Hydrogeological Investigation:

- EXP Services Inc. (June 19, 2020), Geotechnical Investigation and Pavement Condition Evaluation, Mississauga, Ontario, prepared for Bombardier Inc.

2 Hydrogeological Setting

2.1 Regional Setting

2.1.1 Regional Physiography

The Site is within a physiographic region named the Peel Plain. The physiographic landform is known as the Bevelled Till Plains. The Peel Plain is surrounded by the South Slope which extends along the northern boundary of the Iroquois Plain (Chapman & Putnam, 2007).

The plain is the lake bottom of former glacial Lake Peel, which was created between the front of the ice-lobe and the Niagara Escarpment. The Peel Plain is a level-to-undulating area of clay soils. The topography of the Plain gradually slopes down southeast, toward Lake Ontario, following the topography of the underlying till. A calm lake environment resulted in the deposition of silts and clays, particularly in depressions of the till. These sediments are quite thin, which suggests Lake Peel had a brief existence.

2.1.2 Regional Geology and Hydrogeology

The surficial geology can be described as clay to silt textured till, fine textured glaciolacustrine deposits (mainly silt and clay), and modern alluvial deposits of clay, silt, sand and gravel (Ministry of Northern Development and Mines, 2012). The surficial geology of the Site and surrounding areas is shown on Figure 2.

Bedrock in the project area primarily consists of interbedded shale, limestone, dolostone and siltstone, which belong to the Georgian Bay Formation, Upper Ordovician (Ministry of Northern Development and Mines, 2012).

Groundwater across the area flows southeast, towards Lake Ontario (Oak Ridges Moraine Groundwater Program, 2018). Local deviation from the regional groundwater flow pattern may occur in response to changes in topography and/or soils, as well as the presence of surface water features and/or existing subsurface infrastructure.

2.1.3 Existing Water Well Survey

Water Well Records (WWRs) were compiled from the database maintained by the Ministry of the Environment, Conservation and Parks (MECP) and reviewed to determine the number of water wells documented within a 500-m radius of the Site boundaries. The locations of the MECP WWRs within 500 m of the Site are shown on Figure 3. A summary of the WWR is included in Appendix A.

The MECP WWR database lists forty-four (44) records within a 500 m radius from the Site boundary. No well records are identified onsite. The reported depths to groundwater ranged from approximately 3.0 m to 21.3 meters below ground surface (mbgs).

The database indicates that the offsite wells are at an approximate distance of approximately eight (8) m or greater from the Site boundary. All offsite wells were reportedly identified as monitoring and observation wells, test holes, dewatering wells, water supply wells, abandoned and/or listed with unknown use.

Six (6) water supply wells were identified as water supply wells within 500 m distance from the Site boundary. Well uses of all these water supply wells were given in the data base as livestock (1st well use) and domestic (2nd well use). The closest water supply well is located approximately 82 m away from the Site boundary. Based on the old dates of installation of the water supply wells (September 1959 to July 1960) and since the area is municipally serviced, it is unlikely that the noted water supply wells are still active.

2.2 Site Setting

2.2.1 Site Topography

The Site is in an urban area. The topography is considered relatively flat, with a regional gradual southeasterly slope towards Etobicoke Creek and Lake Ontario. As indicated on the borehole logs included in Appendix B, the surface elevation of the Site ranges between approximately 172.4 to 175.6 meters above sea level (masl).

2.2.2 Local Surface Water Features

The Site is located within the Etobicoke Creek watershed. No surface water features exist onsite. The nearest surface water features are two seasonal 1st order streams of Etobicoke Creek, located approximately 10 -20 meters south of the Site boundary. Etobicoke Creek is located approximately 400 m southwest and Spring Creek, a main branch of Etobicoke Creek is located approximately 400 m northeast of the Site boundary. Lake Ontario is approximately 15 km from the Site boundary to the southeast.

2.2.3 Local Geology and Hydrogeology

A summary of subsurface soil stratigraphy is provided in the following paragraphs. The soil descriptions are based on the geotechnical investigation and pavement condition evaluation report (EXP, 2020). They are summarized for the hydrogeological interpretations. As such, the information provided in this section shall not be used for the construction design purposes.

The detailed soil profiles encountered in each borehole and the results of moisture content determinations are presented on the attached borehole logs (Appendix B). It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the Hydrogeological Investigation and shall not be interpreted as exact planes of geological change.

The "Notes on Sample Description" preceding the borehole logs form an integral part of and should be read in conjunction with this report. The following is a brief description of the soil conditions encountered during the investigation.

Based on the results of the geotechnical investigation, the general subsurface soil stratigraphy consists of the following units from top to bottom:

Fill Materials

Fill materials were encountered below the topsoil. The fill typically consisted of clayey silt with trace contents of sand and gravel. Trace organic matters (rootlets and organics) were observed in this fill. This layer extended to depths varying from 0.5 to 1.6 m below the existing ground surface or to elevations ranging from 173.5 to 171.6 m.

The black to brown fill materials were in a loose to compact state of compaction as suggested by SPT N-values between 7 and 11 blows/0.3 m. The moisture contents within the fill were found to range from 13 to 24 percent of dry weight, indicating generally a moist condition.

Clayey Silt Till

Below the asphalt pavement structure or fills in all boreholes, the soil explored consisted of a layer of clayey silt till, extending to borehole termination depths between 2.0 and 4.7 m below the ground surface or to elevations ranging from approximately 173.6 to 167.7 m. It was found that this glacial till deposit contains some sand to sandy, and trace gravel.

Grain size distribution analyses were carried out in the geotechnical laboratory on the selected clayey silt till samples

This brown to grey glacial till has a very stiff to hard consistency as suggested by the SPT N-values obtained in this stratum which varied from 19 to in excess of 50 blows/0.3 m. This deposit was moist, with natural moisture contents ranging from about 7 to 20 percent of dry weight.

The presence of cobbles and boulders should always be anticipated in the ice contact drift, owing to their mode of deposition.

The borehole and monitoring well locations are shown on Figure 4. Geological cross-sections were generated based on the available borehole logs completed as part of the previous and current investigations and shown on Figure 5 (cross section A-A'). Borehole logs used to generate both cross-sections are provided in Appendix B.

3 Results

3.1 Monitoring Well Details

The monitoring well network installed as part of the Geotechnical Investigation at the Site consists of the following:

- Two (2) overburden monitoring wells (BH/MW 17 and BH/MW 20) were installed to depths of 4.5 m and 3.1 m, respectively

Diameter of both monitoring wells is 50 mm and were installed with a flush mount protective casing. Borehole logs and monitoring well installation details are provided in Appendix B. The monitoring well locations are shown on Figure 4.

3.2 Water Level Monitoring

As part of the Hydrogeological Investigation, static water levels in the monitoring wells installed onsite were recorded in two (2) monitoring events, May 12 and 19, 2020. A summary of all static water level data as it relates to the elevation survey is summarized in Table 3-1 below.

The groundwater elevation recorded in the intermediate wells ranged from 170.95 masl (1.45 mbgs at BH/MW 17 on May 12, 2020) to 171.28 masl (2.02 mbgs at BH/MW 20 on May 12, 2020).

Table 3-1: Summary of Measured Groundwater Elevations

Monitoring Well ID	Ground Surface Elevation (masl)	Approximate Full Well Depth (mbgs)	Minimum GW Elevation (masl)	Maximum GW Elevation (masl)	Unit	May 12, 2020	May 19, 2020
BH/MW 17	172.4	4.5	170.95	171.14	mbgs	1.45	1.26
					masl	170.95	171.14
BH/MW 20	173.3	3.1	171.05	171.28	mbgs	2.02	2.25
					masl	171.28	171.05

It should be noted that groundwater levels are expected to show seasonal fluctuations and vary in response to prevailing climate conditions. This may also affect the direction and rate of flow.

3.3 Hydraulic Conductivity Testing

Two (2) Single Well Response Tests (SWRT's) were completed on monitoring wells BH/MW 17 and BH/MW 20 on May 19, 2020. The tests were completed to estimate the saturated hydraulic conductivity (K) of the soils at the well screen depths.

The static water level within each monitoring well was measured prior to the start of testing. In advance of performing SWRTs, each monitoring well underwent development to remove fines introduced into the screens following construction. The development process involved purging of the monitoring wells to induce the flow of fresh formation water through the screen. Each monitoring well was permitted to fully recover prior to performing SWRTs.

Hydraulic conductivity values were calculated from the SWRT and constant rate test data as per Hvorslev's solution included in the Aqtesolv Pro. V.4.5 software package. The semi-log plots for normalized drawdown versus time are included in Appendix C.

A summary of the hydraulic conductivity (K) values estimated from the SWRTs are provided in Table 3-2.

Table 3-2: Summary of Hydraulic Conductivity Testing

Monitoring Well	Well Depth (mbgs)	Screen Interval (mbgs)		Soil Formation Screened	Estimated Hydraulic Conductivity (m/s)
		from	to		
BH/MW 17	4.5	1.5	4.5	Clayey Silt Till	1.2E-7
BH/MW 20	3.1	1.6	3.1	Clayey Silt Till	1.5E-7
				Highest Estimated K Value	1.5E-7
				Geometric Mean of Estimated K Values	1.3E-7

SWRTs provide estimates of K for the geological formation in the immediate media zone surrounding the well screens and may not be representative of bulk formation hydraulic conductivity.

As shown in Table 3-2, the highest K for the tested water-bearing zones is estimated to be 1.5E-7 m/s, and the geometric mean of the K values is to be 1.3E- 7 m/s.

3.4 Groundwater Quality

To assess the suitability for discharging pumped groundwater into the sewers owned by the City of Mississauga / Regional Municipality of Peel during dewatering activities, one (1) groundwater sample was collected from monitoring well BH/MW 17 on May 19, 2020 using a bladder pump. Prior to the collection of noted water sample, approximately three (3) standing well volumes of groundwater were purged from the noted well.

Table 3-3 summarizes exceedance(s) of the Sanitary and Combined (Table 1) and Storm (Table 2) Sewer Use By-Law parameters.

When compared to the City of Mississauga Sanitary and Combined Sewer Discharge Criteria (Table 1) no parameter exceedances were reported.

The following parameters exceeded the City of Mississauga Storm Sewer Discharge Criteria (Table 2): Total Suspended Solids and Total Manganese.

There were no exceedances of either By-Law due to the reported detection limit.

Analytical results are provided in Appendix D. A summary of the pertinent results is provided in Table 3-3.

Table 3-3: Summary of Analytical Results

Parameter	Units	City of Mississauga / Regional Municipality of Peel		Concentration BH/MW 17 May 19, 2020
		Sanitary and Combined Sewer Discharge Limit (Table 1)	Storm Sewer Discharge Limit (Table 2)	
Total Suspended Solids (TSS)	mg/L	350	15	**16**
Total Manganese (Mn)	µg/L	5,000	50	**330**

Bold – Exceeds City of Mississauga / Regional Municipality of Peel Sewer Discharge Limit (Table 2).

For the short-term dewatering system (construction phase), it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed both, Sanitary and Storm Sewer Use By-Law limits. To control the concentration of TSS and associated metals, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to the applicable sewer system. The specifications of the treatment system will need to be adjusted to the reported water quality results by the treatment contractor/process engineer.

An agreement to discharge into the sewers owned by the City of Mississauga / Regional Municipality of Peel will be required prior to discharging dewatering effluent.

The Environmental Site Assessment Report(s) shall be reviewed for more information on the groundwater quality conditions at the Site.

4 Construction Dewatering Assessment

Exp understands that the proposed road development work will include road widening, pavement construction and Alstep Drive Extension (approximately 200 m) to meet Bramalea Road. Except for the excavation for the proposed storm sewer extension, other road development extension work needs shallow excavations, which will not extend into the saturated zone.

As per the drawings (31925-D) for the existing storm sewer along Alstep Drive, it is expected that the lowest invert elevation of the extended section of the storm sewer is approximately 168.8 masl, which is below the water table and some dewatering can be expected during construction phase.

It is assumed, as per preferred alternatives, that the lowest invert of the proposed extended section of the existing storm sewer along Alstep Drive does not change. And the preferred alternatives for road extension work do not include excavations extending to the saturated zone.

Table 4-1 presents the assumptions used to calculate the dewatering rate for the Site.

Table 4-1 Dewatering Estimate Assumptions

Input Parameter	Assumption	Units	Notes
Ground Surface Elevation	172.4 – 173.4	masl	Approximate elevation based on the borehole logs (BHs 17-20)
Highest groundwater elevation	172.3	masl	The highest recorded groundwater elevation measured across the Site plus 1 meter to account for some seasonal fluctuation.
Lowest Sewer Invert Elevation	168.8	masl	Based on Architectural Drawing 31925-D
Dewatering Target Elevation	167.8	masl	Assumed to be approximately 1.0 m below the lowest invert elevation
Bottom Elevation of Water-Bearing Zone	164.8	masl	Assumed (3 m below target water level)
Excavation Area (Length x Width)	180 x 2	(m x m)	Approximate length x width of Site for the proposed development
Hydraulic Conductivity (K)	1.5E-7	m/s	Highest K-value for overburden

4.1 Dewatering Flow Rate Estimate and Zone of Influence

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

$$Q_w = xK(H^2 - h^2)/Lo$$

Where:

Qw = Rate of pumping (m^3/sec)
X = Length of excavation (m)
K = Hydraulic conductivity (m/sec)
H = Hydraulic head beyond the influence of pumping (static groundwater elevation) (m)
h = Hydraulic head above the base of aquifer in an excavation (m)
Lo = Distance of influence (m) for linear flow condition

It is expected that the initial dewatering rate will be higher in order to remove groundwater from within the overburden formation. The dewatering rates are expected to decrease once the target water level is achieved in the excavation footprint as groundwater will have been removed, primarily from storage resulting in lower seepage rates into the excavation.

4.2 Sichardt's Radius of Influence

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

The estimated radius of influence (Ro) due to pumping is based on Sichardt's formula as follows:

$$R_o = C(H - h)\sqrt{(K)}$$

Where:

Ro = Estimated radius of influence (m)
H = Hydraulic head in aquifer (static water level or saturated depth) (m)
h = Dynamic water level (m)
K = Hydraulic conductivity (m/sec)
C = Constant (3,000) for radial flow condition

Based on Sichardt's formula and the highest K-value, the calculated zone of influence (Lo = Ro/2) is provided in Appendix E.

4.3 Stormwater

Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. Therefore, the dewatering rates at the Site should also include removing stormwater from the excavation.

A 15 mm precipitation event was utilized for estimating the stormwater volume. The calculation for the stormwater volume is included in Appendix E.

During precipitation events greater than 15 mm (ex: 100-year storm), measures should be taken by the contractor to retain stormwater onsite in a safe manner to not exceed the allowable water taking and discharge limits, as necessary. It is noted that a two (2) year storm event over a 24-hour period is approximately 57 mm, which would correspond to approximately 20 m^3 of water from direct precipitation.

4.4 Results of Construction Dewatering Rate Estimate

For this assessment, it was assumed that the proposed construction plans include an excavation with shoring /trench boxes. Based on the assumptions provided in this report, the results of the dewatering rate estimate can be summarized as follows (Table 4.2):

Table 4.2: Summary of Construction Dewatering Rate Estimates

Excavation Area	Dewatering Rate including Stormwater Collection + Safety Factor (1.5) m^3/day	Distance of Influence (m)
100 m of Sewer Alignment	40	3

Note: It is assumed that a maximum length of 100 m of the trench excavation will be kept open during the construction phase

This peak dewatering flow rate does not account for flow from utility beddings and variations in hydrogeological properties beyond those encountered during this investigation. Localized dewatering may be required for pits (manhole pits) if they extend deeper than dewatering target which is not considered to be part of this assessment.

Based on the soil conditions, clayey silt till, unless sand seams embedded in this deposit are encountered at locations other than where drilling occurred, then the majority of construction water will be rainwater.

It is noted that the maximum flow estimate calculated with a high K value, provides a conservative estimate to account for higher than expected flow rates during the construction dewatering. Short-term (construction) dewatering calculations are presented in Appendix E.

No changes to the dewatering rates are expected due to preferred alternatives.

During construction phase, any groundwater including stormwater is expected to be controlled by pumping from local sumps excavated in the low areas.

Please note that the contractor id responsible to ensure that dry conditions are always maintained within the excavation.

4.5 Construction MECP Water Taking Permit

In accordance with the Ontario Water Resources Act, if the water taking for the construction dewatering is more than 50 m^3/day but less than 400 m^3/day, then an online registration in the Environmental Activity and Sector Registry (EASR) with MECP will be required. If groundwater dewatering rates on-Site exceed 400 m^3/day, a Category 3 Permit to Take Water (PTTW) will be required from the MECP.

It is recognized that the maximum flow estimate equation calculated with a high K-value, provides a conservative estimate to account for higher than expected flow rates during the construction dewatering. Based on the dewatering estimate of approximately 40 m^3/day for 100 m stretch of excavation, an EASR will not be required to facilitate the construction dewatering program for the Site.

5 Environmental Impact

5.1 Surface Water Features

The Site is within the Etobicoke Creek watershed. No surface water features exist onsite. The nearest surface water features are two seasonal 1st order streams of Etobicoke Creek, located approximately 10 -20 meters south of the Site boundary. Etobicoke Creek is located approximately 400 m southwest and Spring Creek, a main branch of Etobicoke Creek is located approximately 400 m northeast of the Site boundary. Lake Ontario is approximately 15 km from the Site boundary to the southeast.

Due to the limited extent of zone of influence and the distance of the nearest surface water feature, no impacts to surface water features are expected during construction activities.

5.2 Groundwater Sources

Well Records from the MECP Water Well Record (WWR) Database were reviewed to determine the number of water supply wells present within a 500 m radius of the Site boundaries. Given that the dewatering zone of influence is less than 5 m from the dewatering area, no dewatering related impact is expected on the water wells in the area.

5.3 Geotechnical Considerations

The water taking should not have unacceptable interference on soils and surrounding engineering and underground structures (buildings, foundations, utilities etc.). A letter related to geotechnical issues as it pertains to the Site is required to be completed under a separate cover.

5.4 Groundwater Quality

It is our understanding that the potential discharge from the dewatering system during the construction will be directed to the municipal sewer system. As such, the quality of groundwater discharge is required to conform the City of Mississauga / Regional Municipality of Peel Sewer Use By-Law.

For the short-term dewatering system (construction phase), it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed both, Sanitary and Storm Sewer Use By-Law limits. To control the concentration of TSS and associated metals, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to the applicable sewer system. The specifications of the treatment system will need to be adjusted to the reported water quality results by the treatment contractor/process engineer.

Construction dewatering may induce migration of contaminants within the zone of influence and beyond due to changing hydraulic gradients, hydrogeological conditions beyond Site boundaries and preferential pathways in utility beddings etc. The water quality sampling conducted as part of this assessment was conducted under static conditions. As a result. monitoring may be required during dewatering activities (short term) to monitor potential migration, and this should be performed more frequently during early dewatering stages.

It is noted that an agreement to discharge to the City of Mississauga / Regional Municipality of Peel will be required prior to discharging dewatering effluent.

The Environmental Site Assessment Report(s) shall be reviewed for more information on the groundwater quality conditions at the Site.

5.5 Well Decommissioning

In conformance with Regulation 903 of the Ontario Water Resources Act, the installation and eventual decommissioning of any dewatering system wells or monitoring wells must be completed by a licensed well contractor. This will be required for all wells that are no longer in use.

6 Conclusions and Recommendations

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

- When compared to the City of Mississauga Sanitary and Combined Sewer Discharge Criteria (Table 1) no parameter exceedances were reported.
- The following parameters exceeded the City of Mississauga Storm Sewer Discharge Criteria (Table 2): Total Suspended Solids and Total Manganese..
- Based on the assumptions outlined in this report, the estimated peak dewatering pumping rate for proposed construction activities is approximately 40 m^3/day. As the dewatering flow rate estimate is less than 50 m^3/day, no EASR registration or permit application will be required to facilitate the construction dewatering program for the Site. Based on the soil conditions, clayey silt till, unless sand seams embedded in this deposit are encountered at locations other than where drilling occurred, then the majority of construction water will be rainwater.
- The construction dewatering volumes is based on the assumptions outlined in this report. Any variations in hydrogeological conditions beyond those encountered as part of this preliminary investigation may significantly influence the discharge volumes.
- A letter related to geotechnical issues as it pertains to the Site is required to be completed under a separate cover.
- It is noted that an agreement to discharge to the City of Mississauga / Regional Municipality of Peel will be required prior to discharging dewatering effluent.
- In conformance with Regulation 903 of the Ontario Water Resources Act, the installation and eventual decommissioning of any dewatering system wells or monitoring wells must be completed by a licensed well contractor. This will be required for all wells that are no longer in use.

The conclusions and recommendations provided above should be reviewed in conjunction with the entirety of the report. They assume that the present design concept described throughout the report will proceed to construction. This report is solely intended for the construction dewatering assessment. Any changes to the design concept may result in a modification to the recommendations provided in this report.

7 Limitations

This report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the study area. The conclusions and recommendations presented within this report reflect Site conditions existing at the time of the assessment. EXP must be contacted immediately if any unforeseen Site conditions are experienced during construction activities. This will allow EXP to review the new findings and provide appropriate recommendations to allow the construction to proceed in a timely and cost-effective manner.

Our undertaking at EXP, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience/engineering profession. No other warranty or representation, either expressed or implied, is included or intended in this report.

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

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

Sincerely,

EXP Services Inc.

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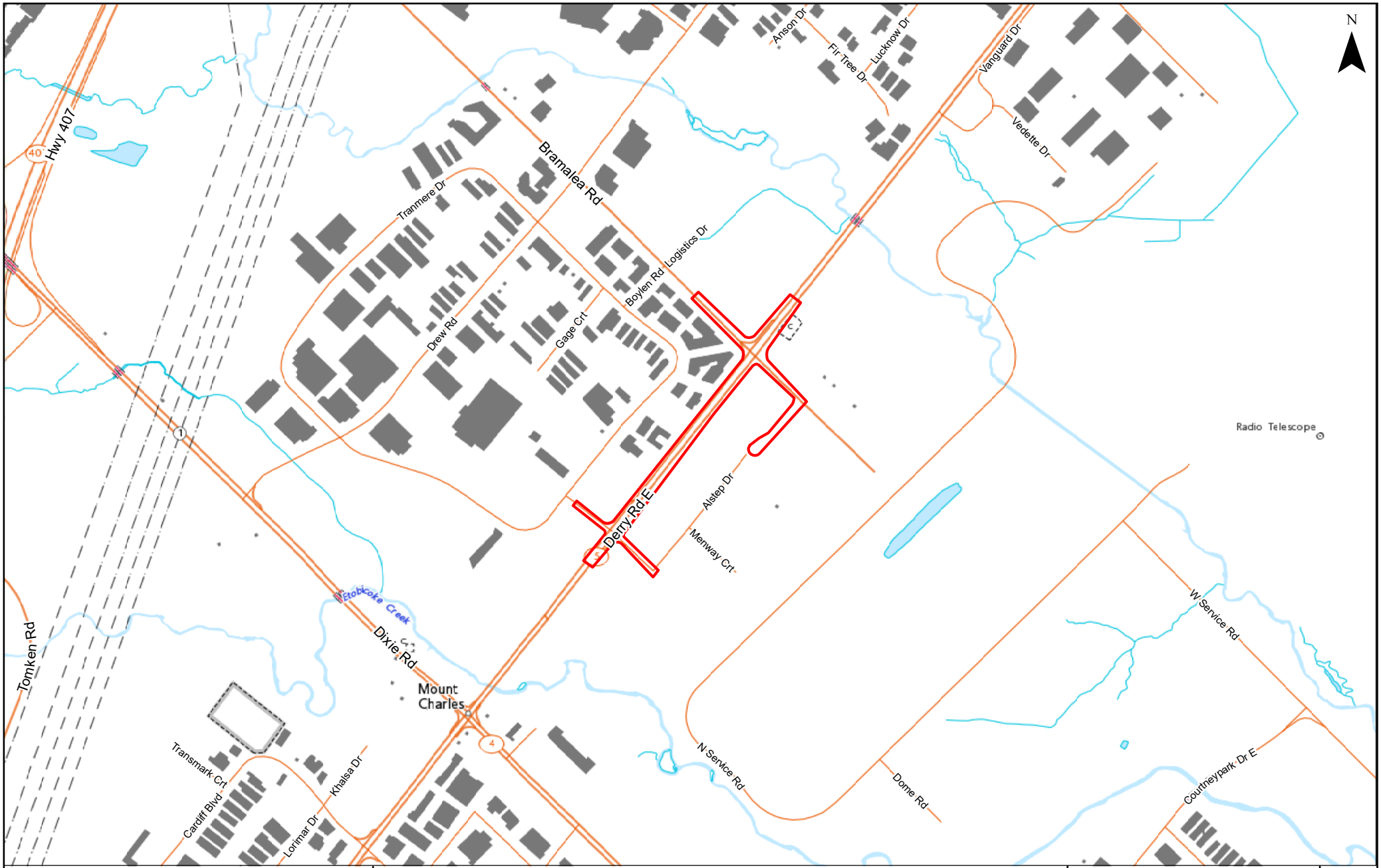
Figures



SCALE:

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LEGEND:

APPROXIMATE SITE BOUNDARY

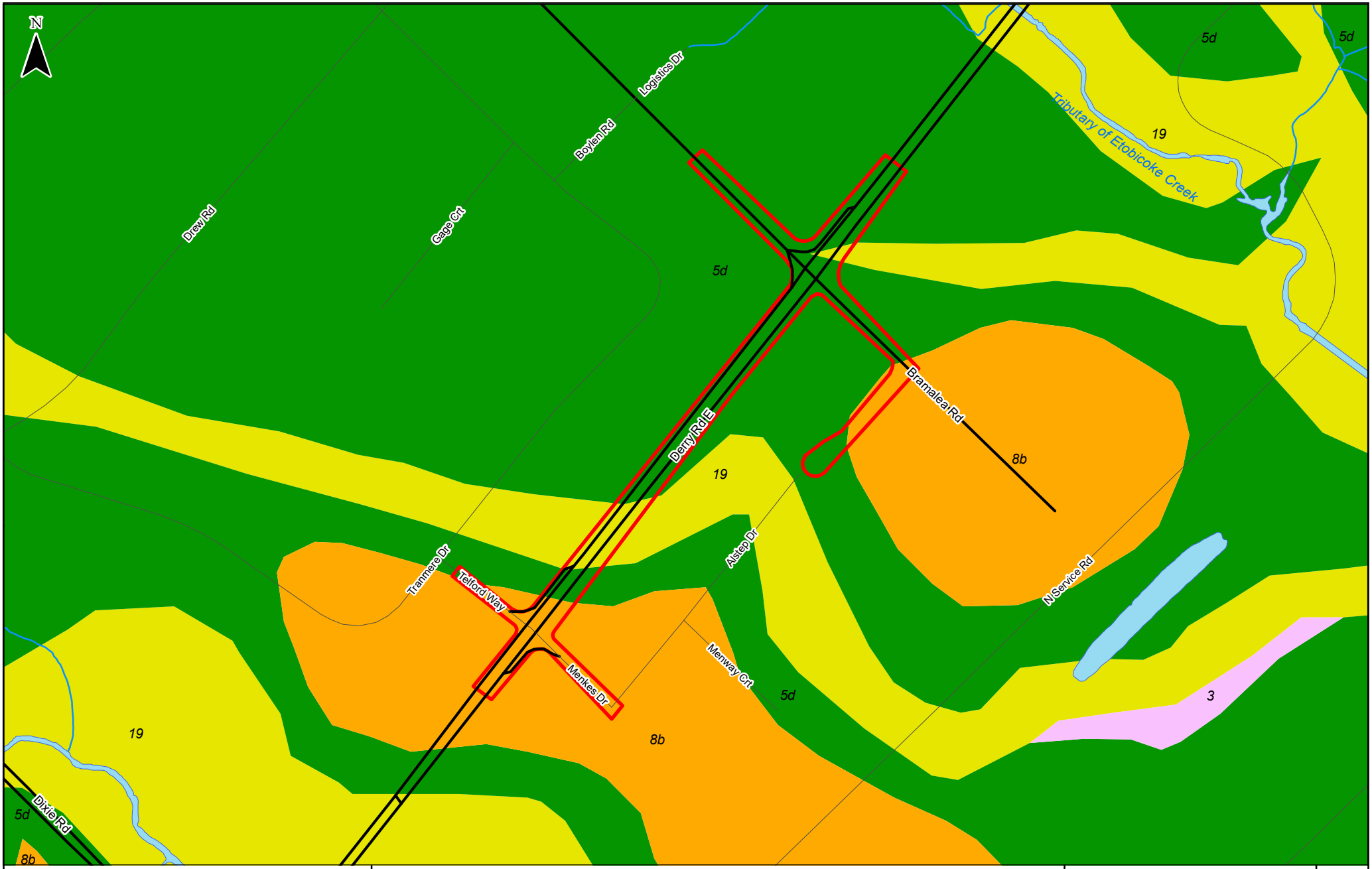
SITE LOCATION PLAN

FIGURE: 1

HYDROGEOLOGICAL INVESTIGATION
BOMBARDIER AEROSPACE PROJECT
PART OF DERRY ROAD EAST BETWEEN TELFORD WAY, MENKES DRIVE, AND BRAMALEA ROAD
MISSISSAUGA, ONTARIO

DRAWN BY:	CHECKED BY:
AC	JS

PROJECT NUMBER: STR-02018572-00 DATE: JUNE 2020



SCALE:

0 100 200 300 400 500 m

SOURCE:

BASED ON ONTARIO GEOLOGICAL SURVEY DATA PUBLISHED IN 2010

DRAWN BY:	CHECKED BY:
AC	JS

LEGEND:

- APPROXIMATE SITE BOUNDARY
- 19: MODERN ALLUVIAL DEPOSITS
- 8B: INTERBEDDED FLOW TILL, RAINOUT DEPOSITS AND SILT AND CLAY
- 5D: GLACIOLACUSTRINE-DERIVED SILTY TO CLAYEY TILL
- 3: PALEOZOIC BEDROCK

SURFICIAL GEOLOGY

FIGURE: 2

HYDROGEOLOGICAL INVESTIGATION
BOMBARDIER AEROSPACE PROJECT
PART OF DERRY ROAD EAST BETWEEN TELFORD WAY, MENKES DRIVE, AND BRAMALEA ROAD
MISSISSAUGA, ONTARIO

PROJECT NUMBER: STR-02018572-00 DATE: JUNE 2020

SCALE:
0 100 200 300 400 500 m

SOURCE:
BASED ON GOOGLE EARTH IMAGERY DATED 2018, AVAILABLE WELL RECORD INFORMATION AS OF SEPTEMBER 2017

exp.

DRAWN BY:	CHECKED BY:
AC	JS

LEGEND:
- MONITORING WELL / TEST HOLE
- WATER SUPPLY WELL
- ABANDONED WELL
- UNCLASSIFIED / UNFINISHED WELL
- APPROXIMATE SITE BOUNDARY
- 500 m ZONE

MECP WATER WELL RECORDS MAP

FIGURE: 3

HYDROGEOLOGICAL INVESTIGATION
BOMBARDIER AEROSPACE PROJECT
PART OF DERRY ROAD EAST BETWEEN TELFORD WAY, MENKES DRIVE, AND BRAMALEA ROAD
MISSISSAUGA, ONTARIO

PROJECT NUMBER: STR-02018572-00 | DATE: JUNE 2020

SCALE:

0 60 120 180 240 300 m

LEGEND:

- BOREHOLE
- BOREHOLE / MONITORING WELL
- CROSS SECTION AXIS
- APPROXIMATE SITE BOUNDARY

exp.

DRAWN BY:	CHECKED BY:
AC	JS

BOREHOLE / MONITORING WELL LOCATION PLAN

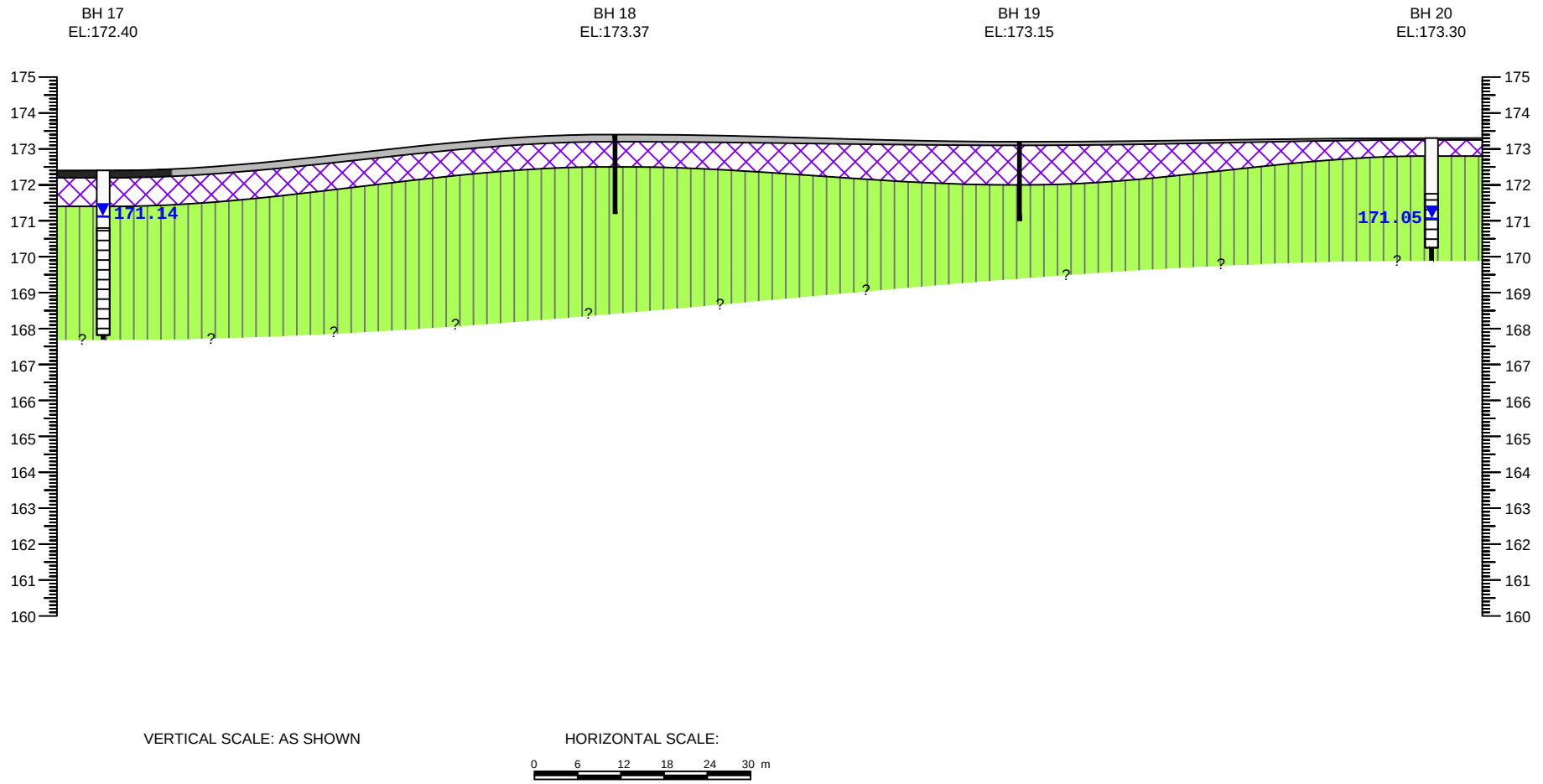
FIGURE: 4

HYDROGEOLOGICAL INVESTIGATION
BOMBARDIER AEROSPACE PROJECT
PART OF DERRY ROAD EAST BETWEEN TELFORD WAY, MENKES DRIVE, AND BRAMALEA ROAD
MISSISSAUGA, ONTARIO

PROJECT NUMBER: STR-02018572-00 DATE: JUNE 2020

A
SOUTHWEST

A'
NORTHEAST



VERTICAL SCALE: AS SHOWN

HORIZONTAL SCALE:

0 6 12 18 24 30 m

EXP Services Inc.
t: +1.905.793.9800 | f: +1.905.793.0641
1595 Clark Boulevard
Brampton, ON L6T 4V1
Canada
www.exp.com

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• INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

LEGEND:

- ASPHALT
- TOPSOIL
- FILL
- CLAYEY SILT TILL
- GROUNDWATER ELEVATION (MAY 19, 2020)

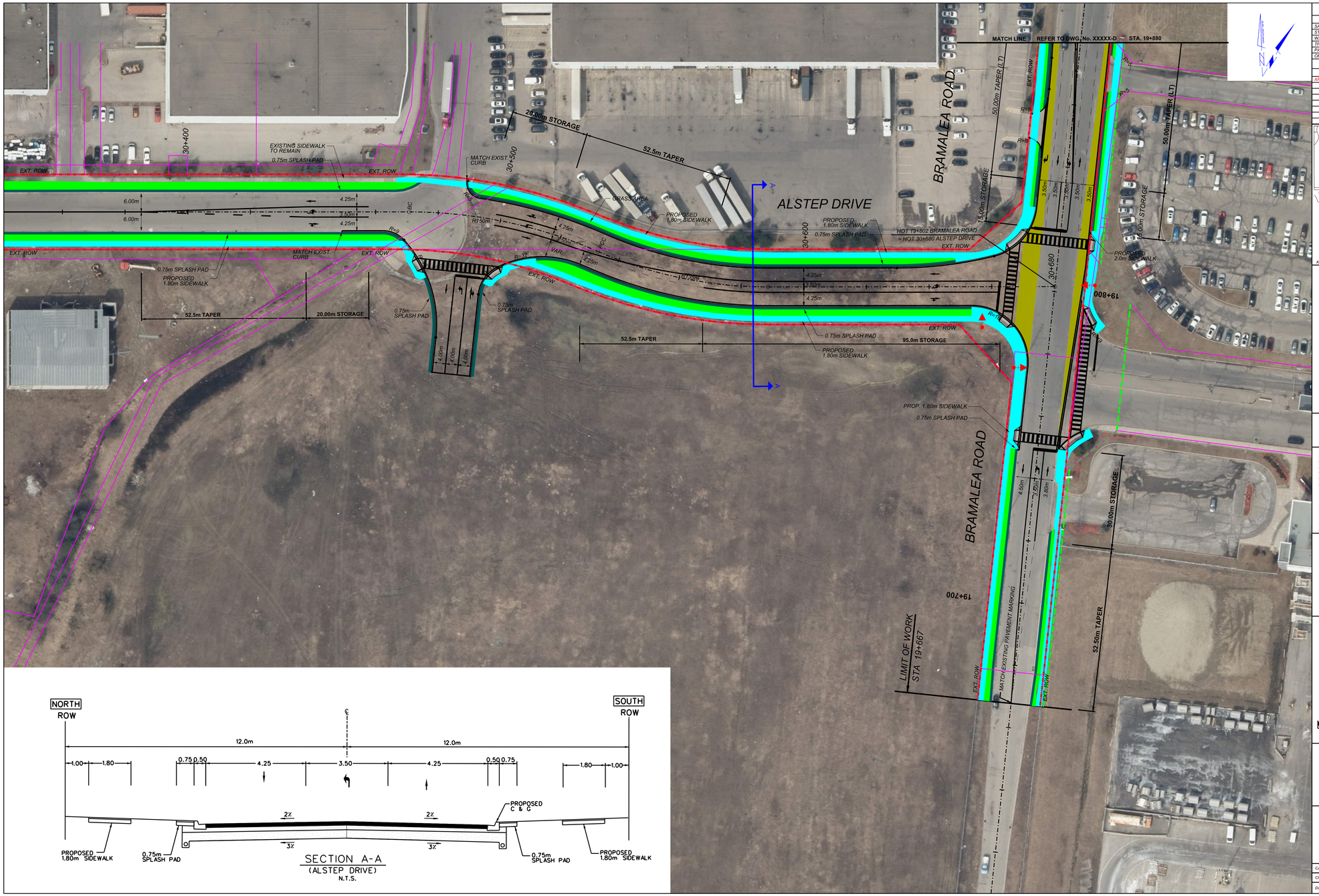
TITLE AND LOCATION:

CROSS SECTION A-A'
HYDROGEOLOGICAL INVESTIGATION
BOMBARDIER AEROSPACE PROJECT
PART OF DERRY ROAD EAST BETWEEN
TELFORD WAY, MENKES DRIVE, AND
BRAMLEA ROAD
MISSISSAUGA, ONTARIO

PROJECT NO.:	DWN.:
STR-02018572-00	JA
SCALE: AS NOTED	CK: JS
DATE: JUNE 2020	FIG. NO.: 5

X:\2000000\2018572\20185720-00HG Investigation\JUNE 2020\STR-02018572-00.dwg

Attachment 1 – Preferred Options

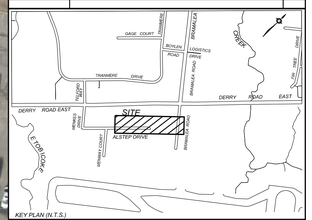


SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS	MAY 00, 2020	X.X	GAS MAINS	MAY 00, 2020	X.X
STORM SEWERS	MAY 00, 2020	X.X	BELL U/G CABLE	MAY 00, 2020	X.X
WATERMAINS	MAY 00, 2020	X.X	HYDRO U/G CABLE	MAY 00, 2020	X.X
TRANSIT	MAY 00, 2020	X.X	HYDRO ONE	MAY 00, 2020	X.X
PARKS & REC.	MAY 00, 2020	X.X	CTV	MAY 00, 2020	X.X
ONT. CLEAN WATER	MAY 00, 2020	X.X	COMMUNIC. CABLES	MAY 00, 2020	X.X

REVISIONS

DATE	DETAILS	INIT.
APRIL 2021		M.P.



LEGEND

- MEDIAN REMOVAL
- ROAD WIDENING
- PROPOSED SIDEWALK
- PROPOSED MULTI-USE TRAIL
- SPLASH PAD
- PROPOSED MEDIAN
- GRASS AREA
- PARCEL FABRIC
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY

BOMBARDIER exp.

General Notes

All Driveways Are ASPHALT Unless Otherwise Noted
All Water And Sanitary Service Locations Are Approximate And Must Be Located Accurately In The Field
All Horizontal And Vertical Bends Are In Degrees
All Pipes Size In mm
20C Existing Water Service, Size In mm
WS25 Proposed Water Service, Size In mm
B.M. No. Elev.
Description
Location
The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction. Location Of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

Designed by _____ Chkd. _____ Approved by _____

10m 0 10 20 30m HORIZONTAL SCALE

Region of Peel
working with you

ALSTEP DRIVE

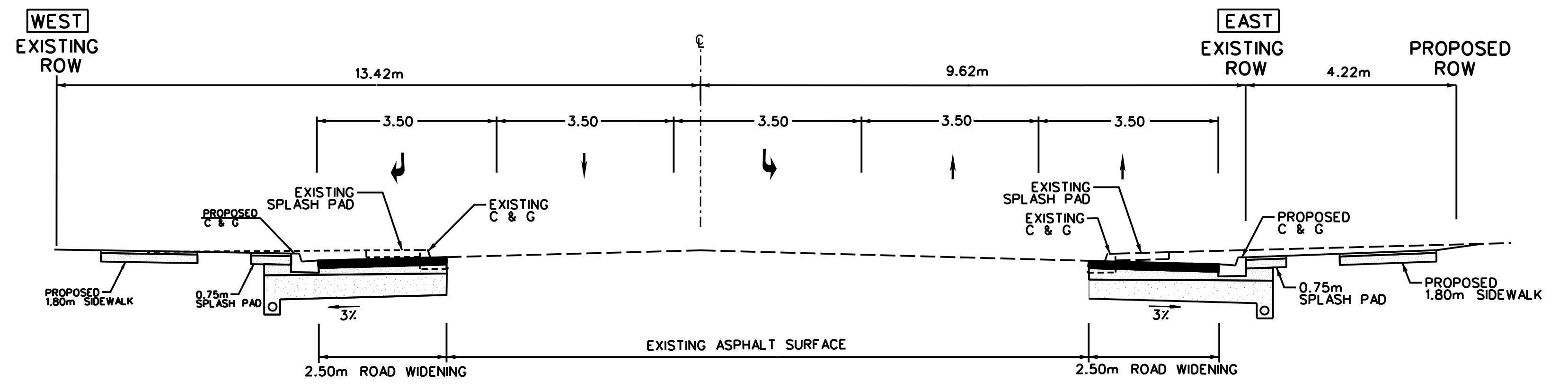
ALSTEP DRIVE & BRAMALEA ROAD

ALTERNATIVE 3

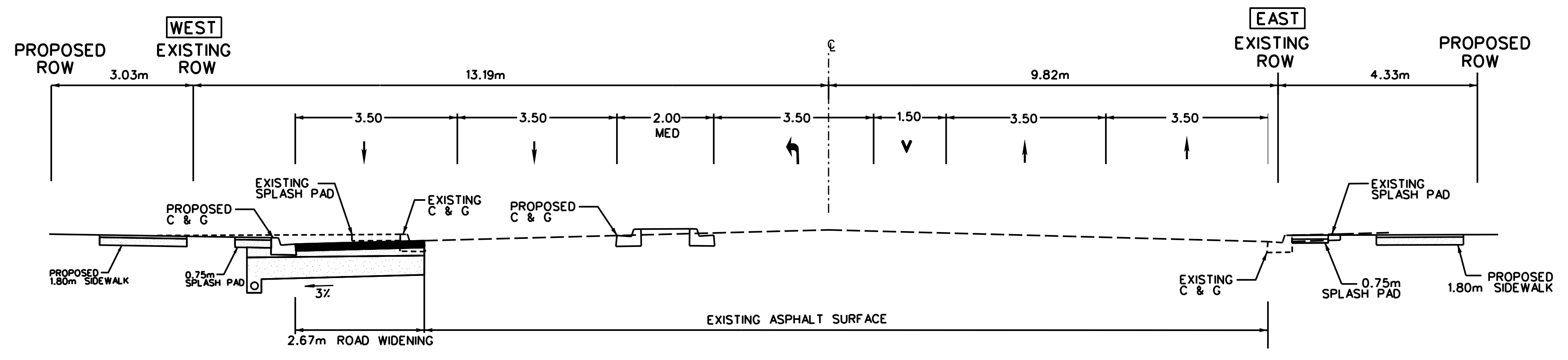
EXTEND ALSTEP WITH 3 - LANE SIGNALIZED INTERSECTION AT BRAMALE ROAD

CAD Area	X-XX	Area	X-XX
Checked by	C.G.	Drawn by	K.S.
Date	JUNE 2021	Sheet	X of X

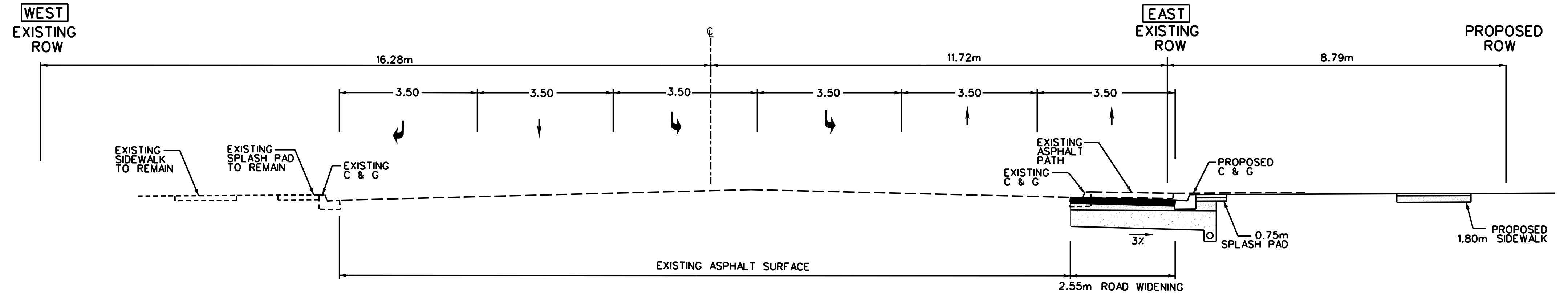
Project No. XX-XXXX
Plan No. **XXXXX-D**



SECTION A-A
(BRAMALEA ROAD)
N.T.S.



SECTION B-B
(BRAMALEA ROAD)
N.T.S.



SECTION C-C
(BRAMALEA ROAD)
N.T.S.

KEY PLAN (N.T.S.)

LEGEND

- MEDIAN REMOVAL
- ROAD WIDENING
- PROPOSED SIDEWALK
- PROPOSED MULTI-USE TRAIL
- SPLASH PAD
- PROPOSED MEDIAN
- GRASS AREA
- PARCEL FABRIC
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY

BOMBARDIER exp.

General Notes

All Driveways Are ASPHALT Unless Otherwise Noted

All Water And Sanitary Service Locations Are Approximate And Must Be Located Accurately In The Field

All Horizontal And Vertical Bends Are In Degrees

All Pipes Size In mm

20C Existing Water Service, Size In mm

WS25 Proposed Water Service, Size In mm

B.M. No. Elev.
Description
Location

The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction. Location Of Existing Utilities Approximate Only, To Be Verified In Field By Contractor.

10m 0 10 20 30m HORIZONTAL SCALE

Region of Peel
working with you

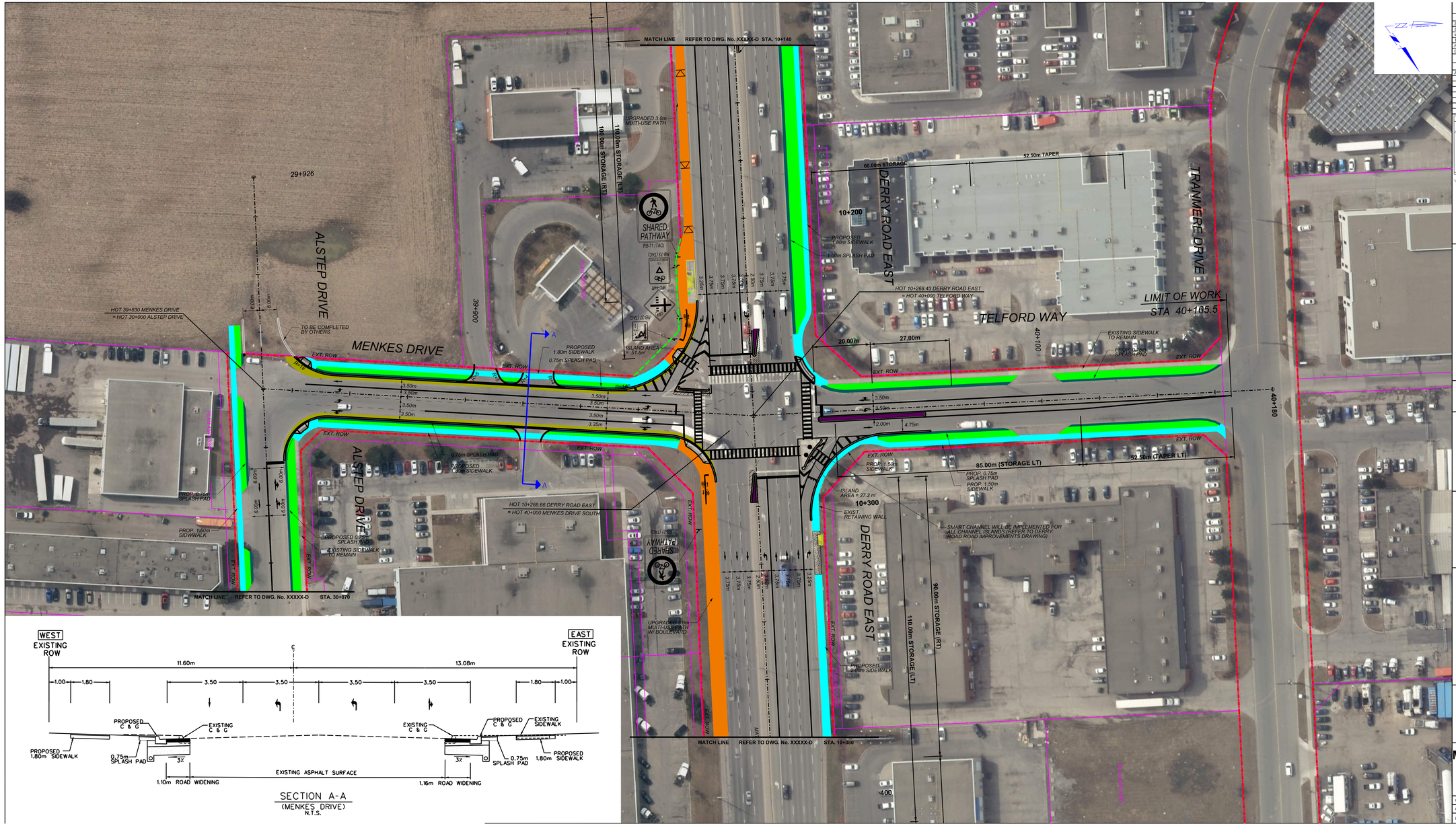
BRAMALEA ROAD

DERRY ROAD EAST & BRAMALEA ROAD

ALTERNATIVE 4

MODIFY INTERSECTION USING HYBRID APPROACH

CAD Area	X-XX	Area	X-XX	Project No.	XX-XXXX
Checked by	C.G.	Drawn by	K.S.	Plan No.	XXXXX-D
Date	JUNE 2021	Sheet	X of X		



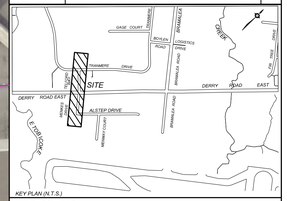
SECTION A-A
(MENKES DRIVE)
N.T.S.

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS	MAY 00, 2020	X.X	GAS MAINS	MAY 00, 2020	X.X
STORM SEWERS	MAY 00, 2020	X.X	BELL U/G CABLE	MAY 00, 2020	X.X
WATERMAINS	MAY 00, 2020	X.X	HYDRO U/G CABLE	MAY 00, 2020	X.X
TRANSIT	MAY 00, 2020	X.X	HYDRO ONE	MAY 00, 2020	X.X
PARKS & REC.	MAY 00, 2020	X.X	CTV	MAY 00, 2020	X.X
ONT. CLEAN WATER	MAY 00, 2020	X.X	COMMUNIC. CABLES	MAY 00, 2020	X.X

REVISIONS

DATE	DETAILS	INIT.
APRIL 2021		M.F.



LEGEND

- MEDIAN REMOVAL
- ROAD WIDENING
- PROPOSED SIDEWALK
- PROPOSED MULTI-USE TRAIL
- SPLASH PAD
- PROPOSED MEDIAN
- GRASS AREA
- PARCEL FABRIC
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY

BOMBARDIER

exp.

General Notes

All Driveways Are ASPHALT Unless Otherwise Noted
All Water And Sanitary Service Locations Are Approximate And Must Be Located Accurately In The Field
All Horizontal And Vertical Bends Are In Degrees
All Pipes Size In mm
20C Existing Water Service, Size In mm
W325 Proposed Water Service, Size In mm
B.M. No. Elev.
Description
Location
The Contractor Is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction. Location Of Existing Utilities Approximate Only. To Be Verified In Field By Contractor.

Designed by _____ Chkd _____

Approved by _____

10m 0 10 20 30m
HORIZONTAL SCALE

Region of Peel
working with you

MENKES DRIVE/TELFORD WAY

DERRY ROAD & MENKES DRIVE / TELFORD WAY

ALTERNATIVE 2

WIDEN MENKES DRIVE / TELFORD WAY TO BOTH SIDES

CAD Area	X-XX	Area	X-XX
Checked by	C.G.	Drawn by	K.S.
Date	JUNE 2021	Sheet	X of X

Project No. XX-XXXX

Plan No. XXXXX-D

Appendix A – MECP WWR Summary Table

Appendix A
MECP Water Wells within 50 m of Site Centroid

Off-Site												
BH ID	WELL ID	DATE	EAST83	NORTH83	ELEVATION (m ASL)	STREET	CITY	DISTANCE FROM SITE CENTROID (m)	WATER FOUND (m BGS)	1st USE	2nd USE	FINAL STATUS
10317230	4902388	8/12/1961	607722	4837510	173.3			30.9	14.3	Not Used		Abandoned-Quality
10317236	4902394	9/5/1959	606777	4836994	171.7			451.5	16.8	Livestock	Domestic	Water Supply
10317237	4902395	7/9/1960	607143	4837362	174.6			82.2	21.3	Livestock	Domestic	Water Supply
10317238	4902396	10/12/1959	607395	4837719	174.0			226.1	18.3	Livestock	Domestic	Water Supply
10317239	4902397	10/21/1959	606849	4837102	174.0			362.9	7.3	Livestock	Domestic	Water Supply
10317240	4902398	7/1/1960	607078	4837384	174.7			143.8	21.3	Livestock	Domestic	Water Supply
10317241	4902399	7/15/1960	607211	4837345	174.6			83.2	18.3	Livestock	Domestic	Water Supply
11323672	4909939	8/9/2004	607000	4837150	175.6	1890 ALSTEP DR	BRAMPTON	213.9	3.0	Not Used		Observation Wells
1001944966	7117401		607542	4836742	172.6	6767 DEVAND DRIVE		348.4		Monitoring and Test Hole		Monitoring and Test Hole
1001944969	7117402		607619	4836918	173.0	6767 DEVAND		250.7		Monitoring and Test Hole		Monitoring and Test Hole
1002926827	7138468	12/7/2009	608003	4837277	171.9	GTAA(AIRPORT)	Mississauga	305.4		Monitoring		Observation Wells
1002926830	7138469	12/17/2009	607949	4837212	172.1	GTAA (AIRPORT)	Mississauga	310.4		Monitoring and Test Hole		Monitoring and Test Hole
1002926833	7138470	12/17/2009	608018	4837255	172.1	GTAA	Mississauga	331.7		Monitoring and Test Hole		Monitoring and Test Hole
1002926836	7138471	12/17/2009	608086	4837259	169.4	GTAA	Mississauga	379.1		Monitoring and Test Hole		Monitoring and Test Hole
1003100554	7147722	6/9/2010	607296	4837883	174.6	7170 TRANMORE DRIVE	MISSISSAUGA	238.3		Test Hole		Test Hole
1004706682	7216076	12/23/2013	606744	4837226	176.0	7785 TRANMERE DRIVE	MISSISSAUGA	439.4		Monitoring and Test Hole		Monitoring and Test Hole
1004706685	7216077	12/23/2013	606718	4837248	176.1	7785 TRANMERE DRIVE	MISSISSAUGA	463.1		Monitoring and Test Hole		Monitoring and Test Hole
1005320058	7239404	2/19/2015	606957	4837327	175.9	7840 TRANMERE DR	Mississauga	227.5		Test Hole		
1006038590	7264368	5/13/2016	607426	4837507	174.5	7013 TRANMERE DR.	MISSISSAUGA	284.9	3.1	Monitoring		Observation Wells
1006293315	7275371	10/14/2016	607301	4837134	175.3	1700 DERRY RD EAST	Mississauga	24.1		Monitoring and Test Hole		Test Hole
1006293318	7275372	10/14/2016	607294	4837146	175.1	1700 DERRY RD EAST	Mississauga	10.9		Monitoring and Test Hole		Test Hole
1006293321	7275373	10/14/2016	607293	4837150	175.0	1700 DERRY RD EAST	Mississauga	7.5		Test Hole	Municipal	Observation Wells
1006293402	7275400	10/19/2016	607321	4837155	174.7	1700 DERRY RD EAST	Mississauga	11.1		Monitoring and Test Hole		Abandoned-Other
1006293405	7275401	10/14/2016	607315	4837143	175.0	1700 DERRY RD EAST	Mississauga	23.7		Monitoring and Test Hole		Abandoned-Other
1006379341	7284898	3/6/2017	607150	4837897	176.2	7210 TRANMERE RD	Mississauga	383.7		Test Hole	Monitoring	Monitoring and Test Hole
1006379344	7284899	3/6/2017	607165	4837889	176.0	7210 TRANMERE RD	Mississauga	368.8		Test Hole	Monitoring	Monitoring and Test Hole
11555360	4910126	11/23/2005	607259	4838101	177.0	7225 BRAMALEA RD	MISSISSAUGA	340.4		Not Used		Observation Wells
11767167	7044681	5/26/2007	606861	4837591	176.2	7830 TRANMERE RD	TORONTO	442.9		Not Used		Observation Wells
1002918863	7137711	9/1/2009	607294	4836930	175.7	1700 DERRY RD.	Mississauga	185.3		Monitoring		Test Hole
1003247301	7137711	9/1/2009	607265	4836942	176.2	1700 DERRY RD.	Mississauga	156.9		Monitoring		Test Hole
1003247310	7137711	9/1/2009	607274	4836930	175.8	1700 DERRY RD.	Mississauga	170.4		Monitoring		Test Hole

Off-Site												
BH ID	WELL ID	DATE	EAST83	NORTH83	ELEVATION (m ASL)	STREET	CITY	DISTANCE FROM SITE CENTROID (m)	WATER FOUND (m BGS)	1st USE	2nd USE	FINAL STATUS
1003247319	7137711	9/1/2009	607294	4836944	176.1	1700 DERRY RD.	Mississauga	162.4		Monitoring		Test Hole
1003247328	7137711	9/1/2009	607271	4836935	176.0	1700 DERRY RD.	Mississauga	164.9		Monitoring		Test Hole
1001832986	7112779	9/12/2008	607456	4838128	176.0	2025 LOGISTICS DR.	MISSISSAUGA	231.0				Abandoned-Other
1001832989	7112780	9/12/2008	607456	4838123	176.0	2025 LOGISTICS	MISSISSAUGA	226.5				Abandoned-Other
1001944972	7117403	12/19/2008	607643	4837442	171.6	6767 DEVAND DRIVE		61.4				Monitoring and Test Hole
1004202114	7191316	10/23/2012	607254	4837668	175.2	1900 GAGE COURT	Mississauga	306.3				Observation Wells
11760859	7035399	7/18/2006	607723	4837355	171.4	1890 ALSTEP DRIVE	MISSISSAUGA	78.5				Abandoned-Other
11760860	7035400	9/18/2006	607717	4837363	171.3	1890 ALSTEP DRIVE	MISSISSAUGA	68.0				Abandoned-Other
11327667	6928698	2/20/2005	606709	4837236	176.7	147 WEST BEAVER CREEK	RICHMOND HILL	473.6				
1004197605	7188751	5/23/2012	607318	4837812	174.3			232.9				
1005183651	7230284	7/29/2014	606857	4837542	175.8			415.0				
1005329946	7240471	3/30/2015	606785	4837383	176.0			407.7				
1006376978	7284544	3/7/2017	607291	4837146	175.1			8.6				

Appendix B – Borehole Logs

Notes on Sample Descriptions and Soil Types — Drawing 1A

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by **exp** also follow the same system. Others may use different classification systems; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

EQUIVALENT GRAIN DIAMETER IN MILLIMETERS

CLAY (PLASTIC) TO	FINE	MEDIUM	COARSE	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of

till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

4. Excerpt from “OHSA Regulations for Construction Projects,” Part III, Section 226:

- **Soil Types**

Type 1 Soil

a) is hard, very dense and only able to be penetrated with difficulty by a small sharp object;
b) has a low natural moisture content and a high degree of internal strength;
c) has no signs of water seepage; and
d) can be excavated only by mechanical equipment.

Type 2 Soil

a) is very stiff, dense and can be penetrated with moderate difficulty by a small sharp object;
b) has a low to medium natural moisture content and a medium degree of internal strength; and
c) has a damp appearance after it is excavated.

Type 3 Soil

a) is stiff to firm and compact to loose in consistency or is previously excavated soil;
b) exhibits signs of surface cracking;
c) exhibits signs of water seepage;
d) if it is dry, may run easily into a well-defined conical pile; and
e) has a low degree of internal strength.

Type 4 Soil

a) is soft to very soft and very loose in consistency, very sensitive and upon disturbance is significantly reduced in natural strength;
b) runs easily or flows, unless it is completely supported before excavating procedures;
c) has almost no internal strength;
d) is wet or muddy; and
e) exerts substantial fluid pressure on its supporting system.

O. Reg. 213/91, s. 226

Log of Borehole BH1

Project No. STR-02018572-00 Drawing No. 2

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 29, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
			174.41	0
		~ 100 mm TOPSOIL	~174.3	
		FILL: clayey silt, trace sand, trace gravel, trace rootlets, brown, moist		
			~173.3	1
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
			~172.4	2
		END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	1.5

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH2

Project No. STR-02018572-00 | Drawing No. 3

Project: Geotechnical Investigation and Pavement Analysis | Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 29, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m	Depth (m)
~ 190 mm ASPHALT	173.98	0
	~173.8	
FILL: sand and gravel, trace silt, brown, moist		
	~173.0	1
CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
	~172.0	2
END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Sample
Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH3

Project No. STR-02018572-00 Drawing No. 4

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 27, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
			175.18	0
		~ 130 mm ASPHALT	~175.1	
		FILL: sand and gravel, trace silt, brown, moist		
			~174.0	1
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
			~173.2	2
		END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Sample
Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH4

Project No. STR-02018572-00 Drawing No. 5

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 27, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m	Depth (m)
~ 155 mm ASPHALT	175.57	0
	~175.4	
FILL: sand and gravel, trace silt, brown, moist		
	~174.4	1
CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
	~173.6	2
END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH5

Project No. STR-02018572-00 | Drawing No. 6

Project: Geotechnical Investigation and Pavement Analysis | Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 27, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~ 150 mm ASPHALT	173.33	0
		~173.2		
		FILL: sand and gravel, trace silt, brown, moist		
		~172.2		1
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
		~171.3		2
		END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH6

Project No. STR-02018572-00 Drawing No. 7

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 27, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~ 135 mm ASPHALT	173.55	0
		~173.4		
		FILL: sand and gravel, trace silt, brown, moist		
		~172.4		1
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
		~171.5		2
		END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH7

Project No. STR-02018572-00 Drawing No. 8

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 29, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test S_v

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~ 150 mm ASPHALT	174.39	0
		~174.2		
		FILL: sand and gravel, trace silt, brown, moist		
		~173.5		1
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
		~172.4		2
		END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Sample
Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH8

Project No. STR-02018572-00 Drawing No. 9

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 29, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
			174.52	0
		~ 100 mm TOPSOIL	~174.4	
		FILL: clayey silt, trace sand, trace gravel, trace rootlets, brown, moist		
			~173.5	1
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
			~172.5	2
		END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	1.4

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH9

Project No. STR-02018572-00 Drawing No. 10

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 29, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit —○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~ 160 mm ASPHALT	174.35	0
		FILL: sand and gravel, trace silt, brown, moist	~174.2	
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist	~173.4	1
		END OF BOREHOLE	~172.3	2

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Sample
Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH10

Project No. STR-02018572-00 Drawing No. 11

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 29, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~ 190 mm ASPHALT	175.29	0
		FILL: sand and gravel, trace silt, frequent clayey silt inclusions, brown, moist	~175.1	
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist	~174.6	1
		END OF BOREHOLE	~173.3	2

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH11

Project No. STR-02018572-00 | Drawing No. 12

Project: Geotechnical Investigation and Pavement Analysis | Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 24, 2020

Drill Type: CME 75 - Truck Mount

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) 20 40 60 80 / Shear Strength 100 200 kPa	Combustible Vapour Reading (ppm) 25 50 75 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 10 20 30	Sample	Natural Unit Weight kN/m³
		~ 50 mm TOPSOIL	173.61	0				
		~173.6						
		FILL: clayey silt, trace sand, trace gravel, trace rootlets, dark brown to brown, moist, loose			9	×		19.2
		~173.1						
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist, very stiff to hard		1	23	×		21.7
					40	×		22.2
		~171.5		2				
		END OF BOREHOLE						

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	1.5

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH12

Project No. STR-02018572-00 | Drawing No. 13

Project: Geotechnical Investigation and Pavement Analysis | Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 27, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~ 250 mm ASPHALT	173.27	0
		FILL: sand and gravel, trace silt, brown, moist	~173.0	
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist	~172.3	1
		END OF BOREHOLE	~171.3	2

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Sample
Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH13

Project No. STR-02018572-00 | Drawing No. 14

Project: Geotechnical Investigation and Pavement Analysis | Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 24, 2020

Drill Type: CME 75 - Truck Mount

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~ 200 mm TOPSOIL	173.17	0				
			~173.0					
		FILL: clayey silt, trace sand, trace gravel, trace rootlets, black to brown, moist, loose			7	×		
				1	8	×		
			~171.6					
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist, hard			19	×		21.9
			~171.0	2				
		END OF BOREHOLE						

SPT (N Value): 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	1.5

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH14

Project No. STR-02018572-00 | Drawing No. 15

Project: Geotechnical Investigation and Pavement Analysis | Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 24, 2020

Drill Type: CME 75 - Truck Mount

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Sample	Natural Unit Weight kN/m³
		~ 150 mm TOPSOIL	173.98	0				
			~173.8					
		FILL: clayey silt, trace sand, trace gravel, trace rootlets, dark brown to brown, moist, compact			11			22.4
			~173.4					
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist, hard		1	38			22.4
					66 / 280mm			21.0
			~172.0					
		END OF BOREHOLE						

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	1.5

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

exp.

Log of Borehole BH15

Project No. STR-02018572-00 Drawing No. 16

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 24, 2020

Drill Type: CME 75 - Truck Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m	Depth (m)	Natural Unit Weight kN/m³
	173.09		
~ 50 mm TOPSOIL	~173.0	0	
FILL: clayey silt, trace sand, trace gravel, trace rootlets, dark brown to brown, moist, loose			20.1
CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist, very stiff to hard	~172.2	1	21.7
	~171.0	2	22.4
END OF BOREHOLE			

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

7
22
30

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	1.4

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH16

Project No. STR-02018572-00 Drawing No. 17

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 27, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~ 170 mm ASPHALT	173.07	0
		FILL: sand and gravel, trace silt, brown, moist	~172.9	
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist	~172.1	1
		END OF BOREHOLE	~171.1	2

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30
Sample
Natural Unit Weight kN/m³

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open

Log of Borehole BH17

Project No. STR-02018572-00 | Drawing No. 18

Project: Geotechnical Investigation and Pavement Analysis | Sheet No. 1 of 1

Location: Mississauga, Ontario

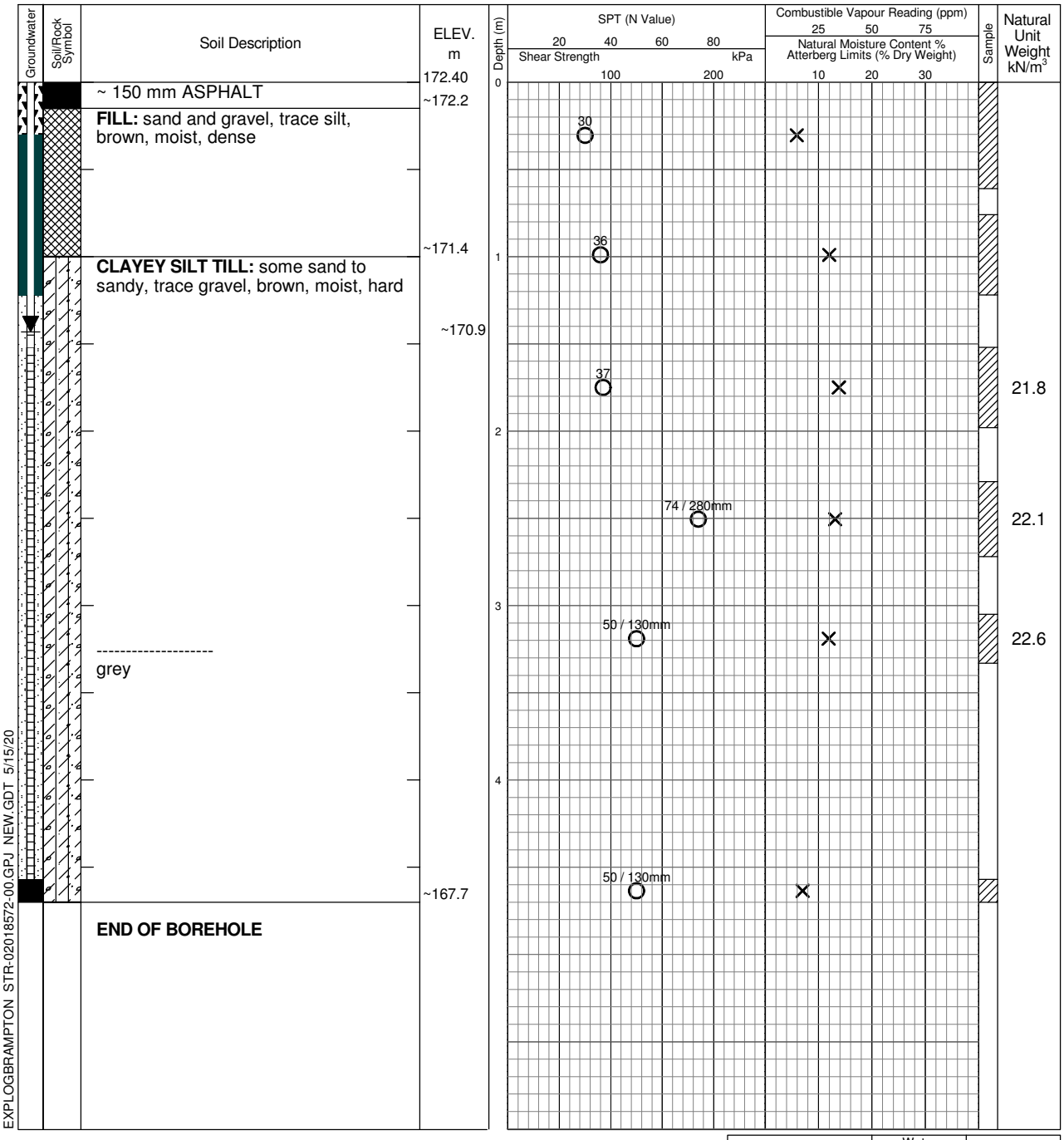
Date Drilled: Apr. 24, 2020

Drill Type: CME 75 - Truck Mount

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ——
Shelby Tube ■
Field Vane Test S

Combustible Vapour Reading □
Natural Moisture ×
Plastic and Liquid Limit ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Penetrometer ▲



Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	4.6
Apr. 28, 2020	1.28	-
May 12, 2020	1.45	-

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/15/20

Log of Borehole BH18

Project No. STR-02018572-00 Drawing No. 19

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 27, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Groundwater	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)
		~ 150 mm TOPSOIL	173.37	0
		FILL: clayey silt, trace sand, trace gravel, trace rootlets, brown, moist	~173.2	
		CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist	~172.5	1
		END OF BOREHOLE	~171.2	2

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa

Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Sample

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	1.4

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH19

Project No. STR-02018572-00 Drawing No. 20

Project: Geotechnical Investigation and Pavement Analysis Sheet No. 1 of 1

Location: Mississauga, Ontario

Date Drilled: Apr. 27, 2020

Drill Type: Auger Drill - Solid

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m	Depth (m)
	173.15	0
~ 100 mm TOPSOIL	~173.1	
FILL: clayey silt, trace sand, trace gravel, trace rootlets, brown, moist		
	~172.0	1
CLAYEY SILT TILL: some sand to sandy, trace gravel, brown, moist		
	~171.0	2
END OF BOREHOLE		

SPT (N Value): 20 40 60 80
Shear Strength: 100 200 kPa
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Natural Unit Weight kN/m³

Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	1.5

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/7/20

Log of Borehole BH20

Project No. STR-02018572-00 | Drawing No. 21

Project: Geotechnical Investigation and Pavement Analysis | Sheet No. 1 of 1

Location: Mississauga, Ontario

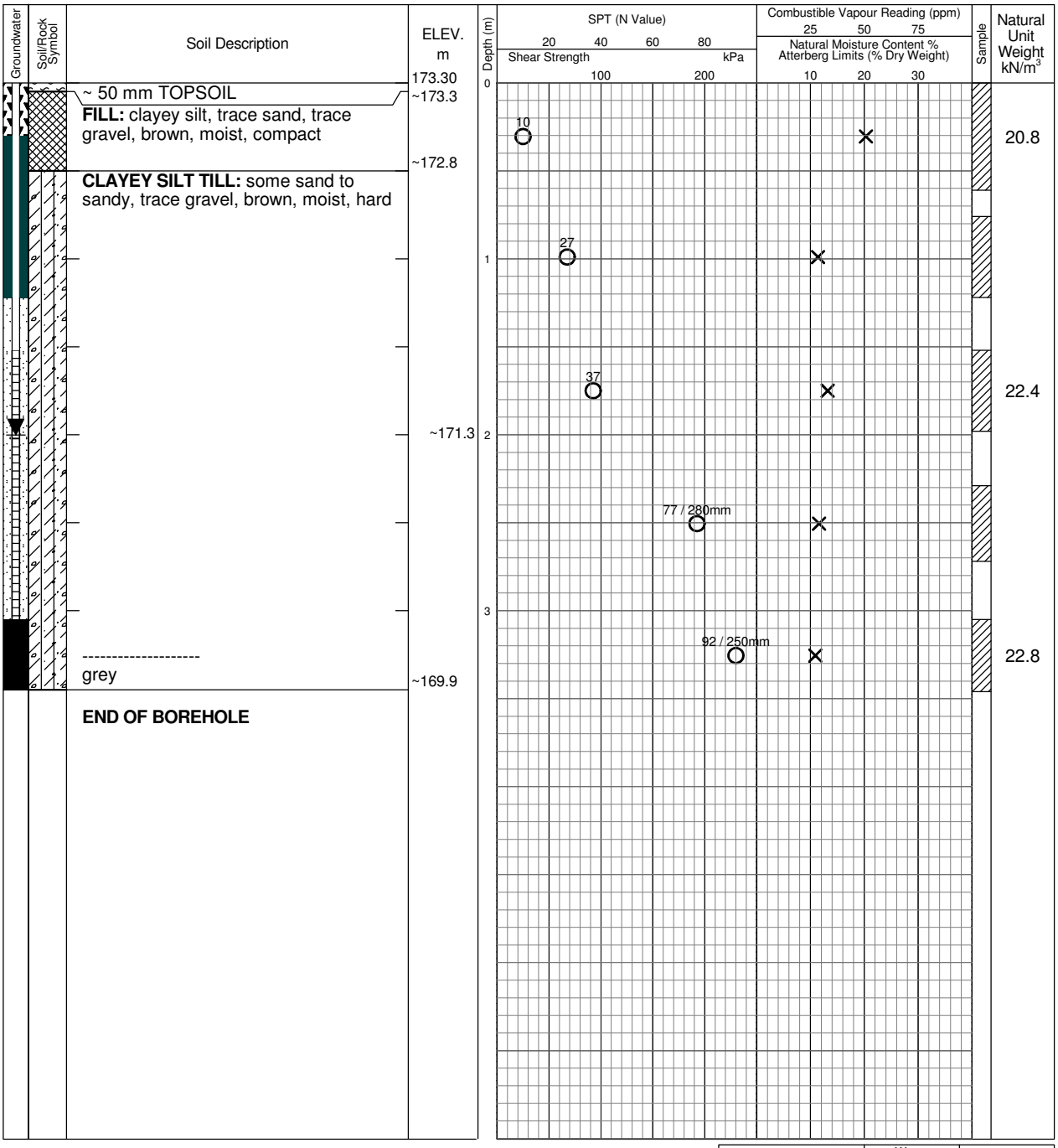
Date Drilled: Apr. 24, 2020

Drill Type: CME 75 - Truck Mount

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

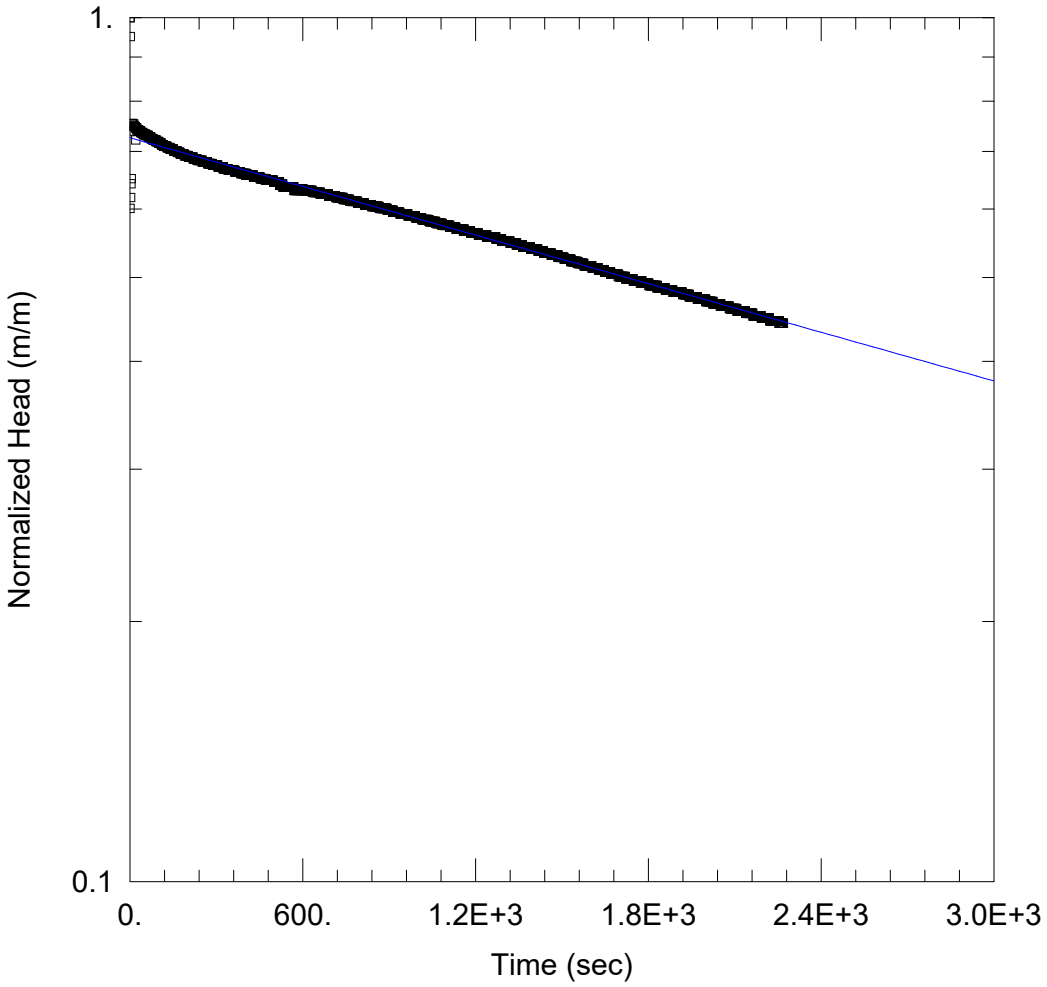
Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



Elapsed Time	Water Level (m)	Hole Open to (m)
0n completion	dry	open
Apr. 28, 2020	dry	-
May 12, 2020	2.02	-

EXPLOGBRAMPTON STR-02018572-00.GPJ NEW.GDT 5/15/20

Appendix C – SWRT Procedures and Results



WELL TEST ANALYSIS

Data Set:
Date: 06/05/20 Time: 15:22:58

PROJECT INFORMATION

Company: EXP Services Inc.
Client: BAP-OSW Project
Project: BRM-02018572-00
Location: Mississauga ON
Test Well: BH/MW17
Test Date: May 19, 2020

AQUIFER DATA

Saturated Thickness: 3.24 m Anisotropy Ratio (Kz/Kr): 1.

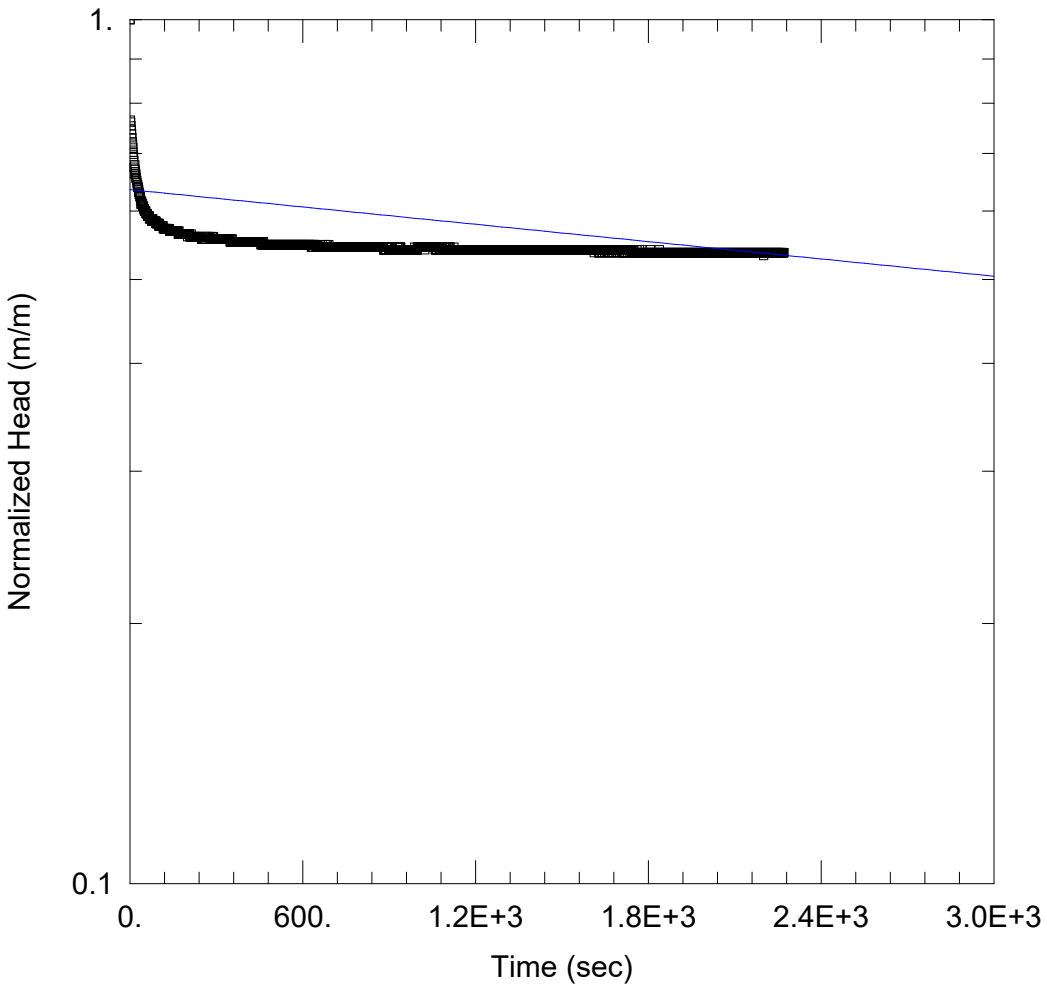
WELL DATA (BH/MW 17)

Initial Displacement: 1.023 m
Total Well Penetration Depth: 3.24 m
Casing Radius: 0.025 m
Static Water Column Height: 3.24 m
Screen Length: 3. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.233E-7 m/sec y0 = 0.7424 m



WELL TEST ANALYSIS

Data Set: I:\...\MW BH 20.aqt
Date: 06/05/20 Time: 16:00:46

PROJECT INFORMATION

Company: EXP Services Inc.
Client: BAP-OSW Project
Project: BRM-02018572-00
Location: Mississauga ON
Test Well: BH/MW20
Test Date: May 19, 2020

AQUIFER DATA

Saturated Thickness: 0.85 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW 20)

Initial Displacement: 0.765 m
Total Well Penetration Depth: 1.5 m
Casing Radius: 0.025 m
Static Water Column Height: 0.85 m
Screen Length: 1.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

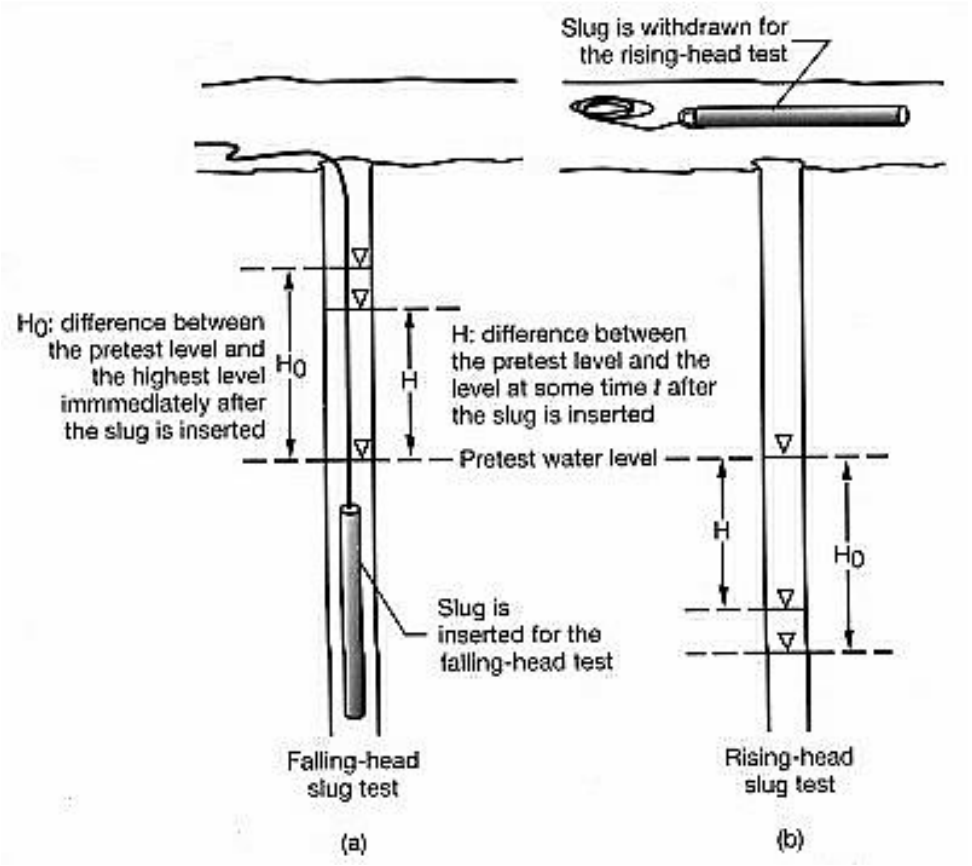
K = 1.499E-7 m/sec y0 = 0.4861 m

Single Well Response Test Procedure

A Single Well Response Test (SWRT), also known as a bail test or a slug test, is conducted in order to determine the saturated hydraulic conductivity (K) of an aquifer. The method of the SWRT is to characterize the change of groundwater level in a well or borehole over time.

In order to ensure consistency and repeatability, all **exp** employees are to follow the procedure outlined in this document when conducting SWRTs.

The figure below depicts a schematic of a slug and bail test and the respective water level changes.



Initials ___

Slug Test Procedure

Equipment Required

- Copy of a signed health and safety plan
- Copy of the work program
- PPE as required by Site-Specific HASP
- Copy of the monitoring well location plan/site plan
- Waterproof pen and bound field note book
- SWRT field data Entry form
- Disposable gloves
- Duct tape
- Deionized water
- Alconox (phosphate free detergent)
- Spray bottles
- Electronic water level meter and spare batteries
- Solid PVC or stainless steel slug of known volume or clean water
- String (nylon)
- Water pressure transducer (data logger) and baro-logger
- Watch or stop watch with second hand
- Plastic sheeting

Testing Procedure

1. Remove cap from well and collect static water level
2. Remove waterra tubing/bailer and place in garbage bag. Record static water level measurement again.
3. Lower the slug into the well and record the dynamic water level.
4. Record the drawdown (for the slug test) at set five (5) second intervals for the first five (5) minutes, then reduce to every one (1) minute.
5. Continue recording the drawdown until 95% recovery is reached. To calculate this value: Find the difference between the dynamic water level and the static water level, then multiply by 95% (.95). Add the resulting value to the dynamic water level.

   (Static Water Level – Dynamic Water Level).95 + Static Water Level = 95% Recovery Value
6. Once complete, replace the waterra tubing/bailer and re-secure the well cap.

Note: If the well is deep, more than one slug may be inserted by attaching the slugs to a series.

Slugs must be washed with methanol, then lab grade soap, and then rinsed with de-ionized water after each use.

Based on the recorded observations, the hydraulic conductivity (in m/s) of the aquifer will be determined. In order to determine the hydraulic conductivity; the well diameter, radius of the borehole and length of the screen will also be required.

Bail Test Procedure

Equipment Required

- 20 L (5 gal) Graduated pail
- Stop watch or watch with seconds
- Garbage bags
- Water level meter
- Field sheets/log book
- Latex Gloves
- Bailer and Rope

Procedure

1. Remove cap from well and collect static water level.
2. If using a **bailer**:
    a. Affix the rope to the bailer.
    b. Remove the waterra tubing and place in garbage bag
    c. Record static water level measurement again.
    d. Record how much water was removed by either counting the number of full bailers or emptying removed water into a container.
    e. Quickly lower the bailer into the well and remove.
    f. Continue this process until the water level will reduce no further.
    g. Record the dynamic water level.
3. If using **waterra** to bail the water:
    a. Pump the water into graduated bucket until the water level will reduce no further.
    b. Record how much water has been removed.
    c. Record the dynamic water level.
4. Record the recovery at set five (5) second intervals for the first (5) minutes, then reduce to every one (1) minute.
5. Continue recording the drawdown/recovery until 95% recovery is reached.
6. Once complete, replace any waterra tubing that may have been removed from the well and re-secure the well cap.

Appendix D – Laboratory Certificates of Analysis

Your P.O. #: BRM-ENV
Your Project #: STR-02018572-00
Site Location: BAP-03W
Your C.O.C. #: 762762-59-01

Attention: Jay Samarakkody

exp Services Inc
1595 Clark Blvd
Brampton, ON
CANADA L6T 4V1

Report Date: 2020/05/27
Report #: R6188390
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0C1405
Received: 2020/05/19, 19:52

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
ABN Compounds in Water by GC/MS	1	2020/05/20	2020/05/21	CAM SOP-00301	EPA 8270 m
Carbonaceous BOD	1	2020/05/21	2020/05/26	CAM SOP-00427	SM 23 5210B m
Total Cyanide	1	2020/05/22	2020/05/22	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2020/05/22	2020/05/22	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2020/05/22	2020/05/22	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2020/05/26	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2020/05/19	CAM SOP-00552	MOE LSB E3371
Total Nonylphenol in Liquids by HPLC	1	2020/05/22	2020/05/23	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC	1	2020/05/22	2020/05/23	CAM SOP-00313	BV Labs Method
Animal and Vegetable Oil and Grease	1	N/A	2020/05/23	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2020/05/23	2020/05/23	CAM SOP-00326	EPA1664B m,SM5520B m
Polychlorinated Biphenyl in Water	1	2020/05/21	2020/05/22	CAM SOP-00309	EPA 8082A m
pH	1	2020/05/22	2020/05/22	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2020/05/21	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2020/05/22	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2020/05/22	2020/05/25	CAM SOP-00938	OMOE E3516 m
Mineral/Synthetic O & G (TPH Heavy Oil) (1)	1	2020/05/23	2020/05/23	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2020/05/25	2020/05/25	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2020/05/22	CAM SOP-00228	EPA 8260C m

Remarks:

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

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

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and

Your P.O. #: BRM-ENV
Your Project #: STR-02018572-00
Site Location: BAP-03W
Your C.O.C. #: 762762-59-01

Attention: Jay Samarakkody

exp Services Inc
1595 Clark Blvd
Brampton, ON
CANADA L6T 4V1

Report Date: 2020/05/27
Report #: R6188390
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0C1405
Received: 2020/05/19, 19:52

use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

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

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

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

BV Labs Job #: C0C1405
Report Date: 2020/05/27

exp Services Inc
Client Project #: STR-02018572-00
Site Location: BAP-03W
Your P.O. #: BRM-ENV
Sampler Initials: JM

PEEL SANITARY & STORM PKG (53-2010)

BV Labs ID				MQV480			MQV480		
Sampling Date				2020/05/19 17:45			2020/05/19 17:45		
COC Number				762762-59-01			762762-59-01		
	UNITS	Criteria	Criteria-2	BH/MW-17	RDL	QC Batch	BH/MW-17 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Total Animal/Vegetable Oil and Grease	mg/L	150	-	ND	0.50	6730296			
Inorganics									
Total Carbonaceous BOD	mg/L	300	15	ND	2	6734087			
Fluoride (F-)	mg/L	10	-	ND	0.10	6736882			
Total Kjeldahl Nitrogen (TKN)	mg/L	100	1	0.77	0.10	6738449			
pH	pH	5.5:10.0	6.0:9.0	7.50		6736891			
Phenols-4AAP	mg/L	1	0.008	ND	0.0010	6733885			
Total Suspended Solids	mg/L	350	15	**16**	10	6741746			
Dissolved Sulphate (SO4)	mg/L	1500	-	260	1.0	6736858			
Total Cyanide (CN)	mg/L	2	0.02	ND	0.0050	6737472			
Petroleum Hydrocarbons									
Total Oil & Grease	mg/L	-	-	ND	0.50	6740677			
Total Oil & Grease Mineral/Synthetic	mg/L	15	-	ND	0.50	6740678			
Miscellaneous Parameters									
Nonylphenol Ethoxylate (Total)	mg/L	0.2	-	ND	0.025	6736728			
Nonylphenol (Total)	mg/L	0.02	-	ND	0.001	6736724			
Metals									
Mercury (Hg)	mg/L	0.01	0.0004	ND	0.00010	6737782	ND	0.00010	6737782
Total Aluminum (Al)	ug/L	50000	-	100	5.0	6746231			
Total Antimony (Sb)	ug/L	5000	-	ND	0.50	6746231			
Total Arsenic (As)	ug/L	1000	20	ND	1.0	6746231			
Total Cadmium (Cd)	ug/L	700	8	ND	0.10	6746231			
Total Chromium (Cr)	ug/L	5000	80	ND	5.0	6746231			
Total Cobalt (Co)	ug/L	5000	-	1.6	0.50	6746231			

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

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The Regional Municipality of Peel Sanitary Sewer Discharge. By-Law Number 53-2010.
Criteria-2: The Regional Municipality of Peel Storm Sewer Discharge. By-Law Number 53-2010.
ND = Not detected

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

BV Labs Job #: C0C1405
Report Date: 2020/05/27

exp Services Inc
Client Project #: STR-02018572-00
Site Location: BAP-03W
Your P.O. #: BRM-ENV
Sampler Initials: JM

PEEL SANITARY & STORM PKG (53-2010)

BV Labs ID				MQV480			MQV480		
Sampling Date				2020/05/19 17:45			2020/05/19 17:45		
COC Number				762762-59-01			762762-59-01		
	UNITS	Criteria	Criteria-2	BH/MW-17	RDL	QC Batch	BH/MW-17 Lab-Dup	RDL	QC Batch
Total Copper (Cu)	ug/L	3000	50	ND	1.0	6746231			
Total Lead (Pb)	ug/L	3000	120	ND	0.50	6746231			
Total Manganese (Mn)	ug/L	5000	50	**330**	2.0	6746231			
Total Molybdenum (Mo)	ug/L	5000	-	1.4	0.50	6746231			
Total Nickel (Ni)	ug/L	3000	80	4.0	1.0	6746231			
Total Phosphorus (P)	ug/L	10000	-	ND	100	6746231			
Total Selenium (Se)	ug/L	1000	20	ND	2.0	6746231			
Total Silver (Ag)	ug/L	5000	120	ND	0.10	6746231			
Total Tin (Sn)	ug/L	5000	-	ND	1.0	6746231			
Total Titanium (Ti)	ug/L	5000	-	5.9	5.0	6746231			
Total Zinc (Zn)	ug/L	3000	40	7.1	5.0	6746231			
Semivolatile Organics									
Bis(2-ethylhexyl)phthalate	ug/L	12	8.8	ND	2.0	6732775			
Di-N-butyl phthalate	ug/L	80	15	ND	2.0	6732775			
Volatile Organics									
Benzene	ug/L	10	2	ND	0.40	6732300			
Chloroform	ug/L	40	2	ND	0.40	6732300			
1,2-Dichlorobenzene	ug/L	50	5.6	ND	0.80	6732300			
1,4-Dichlorobenzene	ug/L	80	6.8	ND	0.80	6732300			
cis-1,2-Dichloroethylene	ug/L	4000	5.6	ND	1.0	6732300			
trans-1,3-Dichloropropene	ug/L	140	5.6	ND	0.80	6732300			
Ethylbenzene	ug/L	160	2	ND	0.40	6732300			
Methylene Chloride(Dichloromethane)	ug/L	2000	5.2	ND	4.0	6732300			
Methyl Ethyl Ketone (2-Butanone)	ug/L	8000	-	ND	20	6732300			
Styrene	ug/L	200	-	ND	0.80	6732300			

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

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The Regional Municipality of Peel Sanitary Sewer Discharge. By-Law Number 53-2010.
Criteria-2: The Regional Municipality of Peel Storm Sewer Discharge. By-Law Number 53-2010.
ND = Not detected

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

BV Labs Job #: C0C1405
Report Date: 2020/05/27

exp Services Inc
Client Project #: STR-02018572-00
Site Location: BAP-03W
Your P.O. #: BRM-ENV
Sampler Initials: JM

PEEL SANITARY & STORM PKG (53-2010)

BV Labs ID				MQV480			MQV480		
Sampling Date				2020/05/19 17:45			2020/05/19 17:45		
COC Number				762762-59-01			762762-59-01		
	UNITS	Criteria	Criteria-2	BH/MW-17	RDL	QC Batch	BH/MW-17 Lab-Dup	RDL	QC Batch
1,1,2,2-Tetrachloroethane	ug/L	1400	17	ND	0.80	6732300			
Tetrachloroethylene	ug/L	1000	4.4	ND	0.40	6732300			
Toluene	ug/L	270	2	ND	0.40	6732300			
Trichloroethylene	ug/L	400	8	ND	0.40	6732300			
p+m-Xylene	ug/L	-	-	ND	0.40	6732300			
o-Xylene	ug/L	-	-	ND	0.40	6732300			
Total Xylenes	ug/L	1400	4.4	ND	0.40	6732300			
PCBs									
Total PCB	ug/L	1	0.4	ND	0.05	6734000	ND	0.05	6734000
Microbiological									
Escherichia coli	CFU/100mL	-	200	<10	10	6731505			
Surrogate Recovery (%)									
2,4,6-Tribromophenol	%	-	-	66		6732775			
2-Fluorobiphenyl	%	-	-	44		6732775			
2-Fluorophenol	%	-	-	21		6732775			
D14-Terphenyl	%	-	-	106		6732775			
D5-Nitrobenzene	%	-	-	48		6732775			
D5-Phenol	%	-	-	16		6732775			
Decachlorobiphenyl	%	-	-	119		6734000	96		6734000
4-Bromofluorobenzene	%	-	-	93		6732300			
D4-1,2-Dichloroethane	%	-	-	102		6732300			
D8-Toluene	%	-	-	97		6732300			

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

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The Regional Municipality of Peel Sanitary Sewer Discharge. By-Law Number 53-2010.
Criteria-2: The Regional Municipality of Peel Storm Sewer Discharge. By-Law Number 53-2010.
ND = Not detected

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

BV Labs Job #: C0C1405
Report Date: 2020/05/27

exp Services Inc
Client Project #: STR-02018572-00
Site Location: BAP-03W
Your P.O. #: BRM-ENV
Sampler Initials: JM

TEST SUMMARY

BV Labs ID: MQV480
Sample ID: BH/MW-17
Matrix: Water

Collected: 2020/05/19
Shipped:
Received: 2020/05/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
ABN Compounds in Water by GC/MS	GC/MS	6732775	2020/05/20	2020/05/21	Kathy Horvat
Carbonaceous BOD	DO	6734087	2020/05/21	2020/05/26	Frank Zhang
Total Cyanide	SKAL/CN	6737472	2020/05/22	2020/05/22	Louise Harding
Fluoride	ISE	6736882	2020/05/22	2020/05/22	Surinder Rai
Mercury in Water by CVAA	CV/AA	6737782	2020/05/22	2020/05/22	Meghaben Patel
Total Metals Analysis by ICPMS	ICP/MS	6746231	N/A	2020/05/26	Azita Fazaeli
E.coli, (CFU/100mL)	PL	6731505	N/A	2020/05/19	Ranju Chaudhari
Total Nonylphenol in Liquids by HPLC	LC/FLU	6736724	2020/05/22	2020/05/23	Tonghui (Jenny) Chen
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	6736728	2020/05/22	2020/05/23	Tonghui (Jenny) Chen
Animal and Vegetable Oil and Grease	BAL	6730296	N/A	2020/05/23	Automated Statchk
Total Oil and Grease	BAL	6740677	2020/05/23	2020/05/23	Khushboo Kapoor
Polychlorinated Biphenyl in Water	GC/ECD	6734000	2020/05/21	2020/05/22	Sarah Huang
pH	AT	6736891	2020/05/22	2020/05/22	Surinder Rai
Phenols (4AAP)	TECH/PHEN	6733885	N/A	2020/05/21	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	6736858	N/A	2020/05/22	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	6738449	2020/05/22	2020/05/25	Rajni Tyagi
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	6740678	2020/05/23	2020/05/23	Khushboo Kapoor
Total Suspended Solids	BAL	6741746	2020/05/25	2020/05/25	Massarat Jan
Volatile Organic Compounds in Water	GC/MS	6732300	N/A	2020/05/22	Rebecca McClean

BV Labs ID: MQV480 Dup
Sample ID: BH/MW-17
Matrix: Water

Collected: 2020/05/19
Shipped:
Received: 2020/05/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury in Water by CVAA	CV/AA	6737782	2020/05/22	2020/05/22	Meghaben Patel
Polychlorinated Biphenyl in Water	GC/ECD	6734000	2020/05/21	2020/05/22	Sarah Huang

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BV Labs Job #: C0C1405
Report Date: 2020/05/27

exp Services Inc
Client Project #: STR-02018572-00
Site Location: BAP-03W
Your P.O. #: BRM-ENV
Sampler Initials: JM

GENERAL COMMENTS

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

Package 1	7.3°C

Sample MQV480 [BH/MW-17] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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

BV Labs Job #: C0C1405
Report Date: 2020/05/27

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: STR-02018572-00
Site Location: BAP-03W
Your P.O. #: BRM-ENV
Sampler Initials: JM

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6732300	4-Bromofluorobenzene	2020/05/21	101	70 - 130	99	70 - 130	96	%				
6732300	D4-1,2-Dichloroethane	2020/05/21	110	70 - 130	99	70 - 130	100	%				
6732300	D8-Toluene	2020/05/21	107	70 - 130	101	70 - 130	98	%				
6732775	2,4,6-Tribromophenol	2020/05/21	88	10 - 130	96	10 - 130	78	%				
6732775	2-Fluorobiphenyl	2020/05/21	48	30 - 130	77	30 - 130	82	%				
6732775	2-Fluorophenol	2020/05/21	29	10 - 130	50	10 - 130	40	%				
6732775	D14-Terphenyl	2020/05/21	90	30 - 130	94	30 - 130	95	%				
6732775	D5-Nitrobenzene	2020/05/21	49	30 - 130	77	30 - 130	72	%				
6732775	D5-Phenol	2020/05/21	19	10 - 130	33	10 - 130	29	%				
6734000	Decachlorobiphenyl	2020/05/22	98	60 - 130	102	60 - 130	104	%				
6732300	1,1,2,2-Tetrachloroethane	2020/05/21	126	70 - 130	104	70 - 130	ND, RDL=0.40	ug/L	NC	30		
6732300	1,2-Dichlorobenzene	2020/05/21	92	70 - 130	89	70 - 130	ND, RDL=0.40	ug/L	NC	30		
6732300	1,4-Dichlorobenzene	2020/05/21	96	70 - 130	94	70 - 130	ND, RDL=0.40	ug/L	NC	30		
6732300	Benzene	2020/05/21	100	70 - 130	95	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6732300	Chloroform	2020/05/21	96	70 - 130	92	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6732300	cis-1,2-Dichloroethylene	2020/05/21	95	70 - 130	90	70 - 130	ND, RDL=0.50	ug/L	NC	30		
6732300	Ethylbenzene	2020/05/21	88	70 - 130	89	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6732300	Methyl Ethyl Ketone (2-Butanone)	2020/05/21	130	60 - 140	101	60 - 140	ND, RDL=10	ug/L	NC	30		
6732300	Methylene Chloride(Dichloromethane)	2020/05/21	116	70 - 130	92	70 - 130	ND, RDL=2.0	ug/L	NC	30		
6732300	o-Xylene	2020/05/21	91	70 - 130	90	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6732300	p+m-Xylene	2020/05/21	99	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6732300	Styrene	2020/05/21	95	70 - 130	91	70 - 130	ND, RDL=0.40	ug/L	NC	30		
6732300	Tetrachloroethylene	2020/05/21	90	70 - 130	86	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6732300	Toluene	2020/05/21	100	70 - 130	90	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6732300	Total Xylenes	2020/05/21					ND, RDL=0.20	ug/L	NC	30		
6732300	trans-1,3-Dichloropropene	2020/05/21	116	70 - 130	106	70 - 130	ND, RDL=0.40	ug/L	NC	30		
6732300	Trichloroethylene	2020/05/21	100	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
6732775	Bis(2-ethylhexyl)phthalate	2020/05/21	86	30 - 130	91	30 - 130	ND, RDL=2.0	ug/L	NC	40		
6732775	Di-N-butyl phthalate	2020/05/21	94	30 - 130	99	30 - 130	ND, RDL=2.0	ug/L	NC	40		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6733885	Phenols-4AAP	2020/05/21	96	80 - 120	98	80 - 120	ND, RDL=0.0010	mg/L	18	20		
6734000	Total PCB	2020/05/22	91	60 - 130	99	60 - 130	ND, RDL=0.05	ug/L	NC	40		
6734087	Total Carbonaceous BOD	2020/05/26					ND,RDL=2	mg/L	2.4	30	106	85 - 115
6736724	Nonylphenol (Total)	2020/05/23	119	50 - 130	193 (1)	50 - 130	ND, RDL=0.001	mg/L	NC	40		
6736728	Nonylphenol Ethoxylate (Total)	2020/05/23	93	50 - 130	91	50 - 130	ND, RDL=0.025	mg/L	NC	40		
6736858	Dissolved Sulphate (SO4)	2020/05/22	NC	75 - 125	102	80 - 120	ND, RDL=1.0	mg/L	2.8	20		
6736882	Fluoride (F-)	2020/05/22	93	80 - 120	99	80 - 120	ND, RDL=0.10	mg/L	NC	20		
6736891	pH	2020/05/22			102	98 - 103			0.26	N/A		
6737472	Total Cyanide (CN)	2020/05/22	97	80 - 120	95	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
6737782	Mercury (Hg)	2020/05/22	105	75 - 125	92	80 - 120	ND, RDL=0.00010	mg/L	NC	20		
6738449	Total Kjeldahl Nitrogen (TKN)	2020/05/25	NC	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	0.76	20	94	80 - 120
6740677	Total Oil & Grease	2020/05/23			98	85 - 115	ND, RDL=0.50	mg/L	2.6	25		
6740678	Total Oil & Grease Mineral/Synthetic	2020/05/23			95	85 - 115	ND, RDL=0.50	mg/L	3.2	25		
6741746	Total Suspended Solids	2020/05/25					ND, RDL=10	mg/L	2.9	25	99	85 - 115
6746231	Total Aluminum (Al)	2020/05/26	114	80 - 120	101	80 - 120	ND, RDL=5.0	ug/L				
6746231	Total Antimony (Sb)	2020/05/26	100	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L				
6746231	Total Arsenic (As)	2020/05/26	100	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L				
6746231	Total Cadmium (Cd)	2020/05/26	99	80 - 120	97	80 - 120	ND, RDL=0.10	ug/L				
6746231	Total Chromium (Cr)	2020/05/26	99	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L				
6746231	Total Cobalt (Co)	2020/05/26	98	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L				
6746231	Total Copper (Cu)	2020/05/26	101	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L				
6746231	Total Lead (Pb)	2020/05/26	94	80 - 120	94	80 - 120	ND, RDL=0.50	ug/L				
6746231	Total Manganese (Mn)	2020/05/26	94	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L				
6746231	Total Molybdenum (Mo)	2020/05/26	101	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L				
6746231	Total Nickel (Ni)	2020/05/26	97	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L				
6746231	Total Phosphorus (P)	2020/05/26	106	80 - 120	105	80 - 120	ND, RDL=100	ug/L				

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6746231	Total Selenium (Se)	2020/05/26	109	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L				
6746231	Total Silver (Ag)	2020/05/26	97	80 - 120	96	80 - 120	ND, RDL=0.10	ug/L				
6746231	Total Tin (Sn)	2020/05/26	94	80 - 120	92	80 - 120	ND, RDL=1.0	ug/L				
6746231	Total Titanium (Ti)	2020/05/26	91	80 - 120	92	80 - 120	ND, RDL=5.0	ug/L				
6746231	Total Zinc (Zn)	2020/05/26	101	80 - 120	105	80 - 120	ND, RDL=5.0	ug/L				

N/A = Not Applicable

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

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

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

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

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

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

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

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

(1) The recovery was above the upper control limit. This may represent a high bias in some results for this specific analyte. For results that were not detected (ND), this potential bias has no impact.

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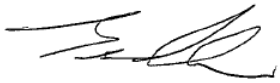
BV Labs Job #: C0C1405
Report Date: 2020/05/27

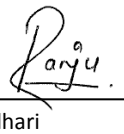
exp Services Inc
Client Project #: STR-02018572-00
Site Location: BAP-03W
Your P.O. #: BRM-ENV
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

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



Brad Newman, Scientific Service Specialist



Ranju Chaudhari

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

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BV Labs Job #: C0C1405
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Sampler Initials: JM

Exceedance Summary Table – Peel Region Sanitary 2010

Result Exceedances

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

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

Exceedance Summary Table – Peel Region Storm 2010

Result Exceedances

Sample ID	BV Labs ID	Parameter	Criteria	Result	DL	UNITS
BH/MW-17	MQV480-10	Total Manganese (Mn)	50	330	2.0	ug/L
BH/MW-17	MQV480-06	Total Suspended Solids	15	16	10	mg/L

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

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MICRO

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Page of

CHAIN OF CUSTODY RECORD

INVOICE TO:		*REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#30554 exp Services Inc	Company Name:	EXP SERVICES INC.	Quotation #:	B91717 STREAM-2	BV Labs Job #:	Bottle Order #:
Attention:	Central Services	Attention:	JAY SAMARAKKODY	P.O. #:	BRM-ENV		762762
Address:	1595 Clark Blvd	Address:	JAY.SAMARAKKODY JQ EXP.COM	Project:	STR-0201572-00	COC #:	Project Manager:
	Brampton ON L6T 4V1		JASNEEL.MAHAL	Project Name:	BAP-OSW	C#762762-59-01	Christine Gripton
Tel:	(905) 793-9800 Fax: (905) 793-0641	Tel:	Fax:	Site #:			
Email:	Karen.Burke@exp.com; Luizza.Jose@exp.com; AP@e	Email:	TOMSON.HECKY@EXP.COM	Sampled By:	JM		

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

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

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

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	PEEL Limits Sanitary & Storm Sewer Package								# of Bottles	Comments
1		BH/MW-17	20/05/19	5.45PM	GW	NO	X								18	* PROVIDE COC ON REPORT. * REGULAR 5DAY TAT.
2																
3																
4																
5																
6																
7																
8																
9																
10																

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

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

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

19-May-20 19:52
Christine Gripton
C0C1405
KVG ENV-844

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
JASNEEL MAHAL	20/05/19	7.45PM	KVG KWAN SEVARSVEN.	2020/05/19	19:52	

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	4/11/7	Present	✓	
		Intact	✓	

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

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

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

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

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

Appendix E – Construction Flow Rate Calculations

APPENDIX E: Construction Dewatering Calculations

Bombardier Aerospace Project (Off-Site Work), Mississauga, Ontario
BRM-02018572-00

Table E-1: Flow all Sides of the Excavation

Parameters	Symbols	Unit	Value
Ground Elevation	-	mASL	172.4 - 173.4
Highest Groundwater Elevation	-	mASL	172.3
Lowest sewer invert Elevation		mASL	168.8
Dewatered Elevation Target	-	mASL	167.8
Top of the Water-Bearing Zone	-	mASL	172.3
Base of the Water-Bearing Zone	-	mASL	164.8
Height of Water Table Above the Base of Water-Bearing Zone	**H**	m	7.5
Height of Dewatering Target Above the Base of Water-Bearing Zone	**h_w**	m	3.0
Hydraulic Conductivity	**K**	m/s	1.50E-07
Length of Excavation	-	m	200.0
Width of Excavation	-	m	2.0
Method to Calculate Radius of Influence	-	-	**Sichardt**
Radius of Influence from Sides of Excavation	**Ro**	m	5.2
Distance to Linear Source from Sides of excavation	**Lo=Ro/2**	m	2.6
Dewatering Flow Rate (unconfined linear flow component)	**Q**	m^3/day	47.3
Factor of Safety	**FS**	-	1.5
Dewatering Flow Rate (multiplied by factor of safety)	**Q.FS**	m^3/day	71.0
Precipitation Event	-	mm/day	15.0
Volume from Precipitation	-	m^3/day	6.0
Dewatering Flow Rate **Without Safety Factor** (including rainwater collection)	-	m^3/day	50.0
Dewatering Flow Rate **With Safety Factor** (including rainwater collection)	-	m^3/day	80.0
Assume 100 m of excavation kept open at any given time		m^3/day	**40.0**

Notes:

mASL - meters above sea level

Analytical Solution for Estimating Plane Flow from an Unconfined Aquifer to a Fully-Penetrating Excavation

$$Q_w = Kx\frac{H^2 - {h_w}^2}{L_o}$$

(Based on the Dupuit Equation)

Where:

Q_w = Flow rate per unit length of excavation (m^3/s)

K = Hydraulic conductivity (m/s)

H = Height of static water table above base of water-bearing zone (m)

h_w = Height of target water level above the base of water-bearing zone (m)

L_o=Distance of Influence (m)

x=Length of excavation (m)