Preliminary Hydrogeological Investigation

Airport Road and Cranston Drive, Caledon East, ON

Client: Triple Crown Line Residential Development c/o DG Group Inc. Concord, ON L4K 4R1

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Project Number: BRM-00235186-E0

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1 Introduction

1.1 Project Description

Exp Services Inc. (**exp**) was retained by Triple Crown Development Inc. c/o DG Group Inc. to prepare a Preliminary Hydrogeological Investigation Report associated with the proposed development located at Airport Road and Cranston Drive, Caledon East, Ontario (hereinafter referred to as the 'Site').

The Site is located on the east side of Airport Road and straddles the intersection with Cranston Drive in Caledon East, Ontario. It is our understanding that the development plan consists of a residential development, including single family dwelling, one (1) storm water management pond, a neighborhood park, and several parkettes. The development will be provided with municipal roads and services, including sewers and watermains. The Site occupies an area of approximately 40 hectares (~100 acres). The Site location plan is shown on Figure 1.

1.2 Project Objectives

The main objectives of the Hydrogeological Investigation are to:

- Establish the local hydrogeological settings within the Site;
- Provide preliminary assessment of construction dewatering flow rates;
- Access groundwater quality; and
- Prepare a Preliminary Hydrogeological Investigation Report.

1.3 Scope of Work

To achieve the investigation objectives, **exp** completed the following scope of work:

- Review available geological and hydrogeological information for the Site;
- Instrument eight (8) geotechnical boreholes with 50 mm diameter monitoring wells to an approximate depth of six (6) meters in addition to the monitoring wells installed as part of the geotechnical investigation;
- Drill five (5) deep boreholes to an approximate depth of twelve (12) meters adjacent to the shallow wells. The five (5) noted wells will be instrumented with 50 mm diameter monitoring wells to form nested wells.
- Develop new and existing monitoring wells installed by **exp** during the Geotechnical Investigations, and conduct Single Well Response Tests (SWRT) on the noted wells to assess the hydraulic conductivity of the saturated water-bearing zones at the Site;
- Complete two (2) rounds of groundwater level measurements in all installed monitoring wells;
- Collect one (1) groundwater sample for the laboratory testing of the Region of Peel Sewer Use By-Law parameters, as well as one (1) groundwater sample of the general chemistry;



- Evaluate the information collected during the field investigation program, including borehole geological information, SWRT results, groundwater level measurements and groundwater water quality data;
- Prepare site plans, geological maps and cross-sections, as well as groundwater contour maps for the Site;
- Provide preliminary estimates for construction dewatering flow rates (Short-Term); and
- Prepare a Preliminary Hydrogeological Investigation Report.

1.4 Review of Previous Reports

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

- *Geotechnical Investigation, Proposed Residential Development,* Airport Road and Cranston Drive, Caledon East, Ontario, prepared for Triple Crown Line Development Inc., **EXP**, May 29, 2016.
- Engineering Drawings, Residential Subdivision, 15717 Airport Road, prepared for the Town of Caledon, Schaeffers \$ Associated Ltd., May 2017.



2 Hydrogeological Setting

2.1 Regional Setting

2.1.1 Regional Physiography

The Site is located within a physiographic region known as the Niagara Escarpment and a landform known as the Till Moraines. The Niagara Escarpment lies to the north of the South Slope and the Till Plains (Drummlinized) landform (Chapman & Putnam, 1984).

The Plain stretches between Georgian Bay in the north and Lake Ontario in the south. The Niagara Escarpment is primarily composed of variety of sediments ranging in size from boulderers to fine-grained deposits.

2.1.2 Regional Geology and Hydrogeology

The surficial (Quaternary) geology can be described as Till consisting of clay to silt derived from glaciolacustrine deposits or shale (Ministry of Northern Development and Mines, 2012). The surficial geology of the Site and surrounding areas is shown on Figure 2.

Bedrock of the region corresponds with the Upper Ordovician age Queenston Formation, primarily composed of shale, siltstone, minor limestone, and sandstone. (Ministry of Northern Development and Mines, 2012).

Regional groundwater flow across the area is expected to be directed south-easterly. Local deviation from the regional groundwater flow path 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

Well Records from the MOECC Water Well Record (WWR) Database were reviewed to determine the number of water wells present within a 500 m radius of the Site boundaries.

The MOECC WWR database indicated one hundred and fifty (50) records within a 500 m radius of the Site.

The database indicated that four (4) records are located within the Site perimeter. Three (3) out of the four (4) are indicated as water supply wells and one (1) is shown as abandoned well located in the southwest of the Site. The rest of the wells are indicated as water supply wells, dewatering wells, and observations wells, as well as monitoring wells and test holes or abandoned wells. All the recorded wells are approximately located at three-hundred fourteen (314) m or greater from the Site centroid.

It should be noted that twenty-four (24) of the total records are indicated as water supply wells and two (2) as dewatering wells. Five (5) out of total water supply wells are defined as livestock and three (3) as municipal wells. The dewatering wells are all defined as unused.

The reported water levels ranged from depths of 0.8 mbgs to 96 mbgs. The properties in the vicinity of the Site are apparently serviced by the municipal water supply.

The locations of the MOECC WWR within 500 m of the Site are shown on Figure 3. A summary of the WWR is included in Appendix A.



2.2 Site Setting

2.2.1 Site Topography

The Site is located within a nonurbanized land use setting.

The topography is considered relatively flat, with an overall gradual east slope towards Innis Lake.

2.2.2 Local Surface Water Features

There are a few natural ponds located east of the Site. The closest and distinctive surface water feature is Innis Lake which is approximately located 240 meters east of the Site. The largest surface water feature near to the Site is Lake Ontario, which is located approximately 40 km south of the Site.

2.2.3 Local Geology and Hydrogeology

Based on the results of the Geotechnical Investigations, a brief description of the general surficial geology at the Site, in order of depth, is summarized in the following sections. The borehole/monitoring well location plan is shown on Figure 4 and the borehole logs are presented in Appendix B. The inferred geological cross-sections are presented in Figures 5A and 5B.

Top Soil/ Ploughed Soil

A surficial layer of topsoil 75 to 450 mm thick was encountered in all Boreholes. However, given use of the property for agricultural purposes disturbed (ploughed) soil should be expected to typical ploughing depths of up to 600 to 800 mm.

It should be noted that topsoil and disturbed (ploughed) soil measurements were carried out at the borehole locations only and could differ at other locations on the site. Consequently, topsoil and disturbed (ploughed) soil quantities should not be established from the information provided at the borehole locations. If required, a more detailed test pit program should be carried out to more accurately quantify the amount of topsoil and disturbed (ploughed) soil disturbed (ploughed) soil to be removed for construction purposes.

Fill

Fill underlies the topsoil in Boreholes 1, 7, 9 to 11, 15 to 17, 23 to 27, 31 to 33, 36, 38, 43 to 46, 49 to 52, 56 to 58, 60, 61 and 65. Fill was not encountered in Boreholes 66 and 67 drilled at the toes of the slopes off the south-central and northeastern portions of the property. The fill extends to depths of approximately 1.0 to 4.1 m (~Elevation 292.5 to 310.2 m). Typically the thickness of fill ranged from approximately 1.0 to 2.2 m except in Boreholes 10, 27, 43 and 58 where the fill extends to approximately 4.1 m depth. The fill typically comprises various combinations of brown sand, sandy silt and clayey silt with trace gravel. Locally, topsoil stained pockets, rock fragments and rootlets were observed in the fill. Moisture contents in the fill ranged from approximately 10 to 27 %.

Native Soils

The native soils were intersected below the topsoil or fill at all borehole locations. The native soils comprise sand, silty sand, clayey silt, clayey silt till, sandy silt till, sand and gravel and peat and exist in various



thicknesses, sequences, degrees of compactness and consistencies depending on location. Moisture contents in the native soils were recorded as follows:

- Sand/Silty Sand approximately 3 to 23 %
- Clayey Silt approximately 13 to 24 %
- Clayey Silt Till approximately 11 to 26 %
- Sandy Silt Till approximately 6 to 26 %
- Sand and Gravel approximately 10 to 12 %
- Peat approximately 270 and 450 %

Peat

Peat was encountered locally in Boreholes 16 and 24 in the southeastern portion of the site.

Wet Sand

Wet sand was interpreted to be present in boreholes in the northern and southern portions of the site.



3 Background

3.1 Monitoring Well Details

The monitoring well network installed on Site as part of the Geotechnical Investigation (**exp**, 2017) consists of the following:

- A total of nineteen (19) boreholes are instrumented with 50 mm diameter monitoring wells where five (5) of them are in a nested configuration. In overall, twenty-four (24) monitoring wells are installed at the Site, including fifteen (15) shallow, two (2) intermediate, and seven (7) deep.
- Fourteen (14) out of nineteen (19) boreholes are instrumented with individual monitoring wells, including ten (10) shallow, two (2) intermediate, and two (2) deep wells. The shallow monitoring wells include BH20, BH23, BH25, BH36, BH39, BH41, BH56, BH61, BH66, and BH67. The intermediate wells include BH2 and BH6. The deep wells include BH7 and BH 59. The maximum depths of completion for the shallow, intermediate, and deep wells are approximately 6, 8, and 18 mbgs, respectively.

Five (5) out of nineteen (19) boreholes are instrumented with nested monitoring wells where one shallow (S) and one deep (D) are installed at each of the noted locations. The nested monitoring wells include BH8 (S and D), BH18 (S and D), BH47 (S and D), BH51 (S and D), and BH64 (S and D). The depths of completion for the shallow and deep wells are approximately 6 and 12 mbgs, respectively. The monitoring well locations are shown on Figure 4 and borehole completion logs are presented in Appendix B.

3.2 Water Level Monitoring

Static groundwater level measurements were recorded for the monitoring wells as part of the Hydrogeological Investigations on May 24, and May 26, 2017. A summary of all static water level data as it relates to the geodetic survey is summarized in Table 1 (enclosed).

Based on the recorded data, the stabilized shallow groundwater elevations ranged from 283.42 masl (0.74 meter above ground surface) at BH66 to 304.17 masl (5.86 mbgs) at BH51-S on May 24 and 26 ,2017, respectively. Seven (7) out of ten (10) shallow wells installed in a nested configuration are indicated as dry wells in both monitoring events. These include BH-8S, BH23, BH56, BH61, BH64-S, and BH67.

In contrast, the stabilized deep groundwater elevations ranged from 284.78 masl (10.43 mbgs) at BH8-D to 300.04 masl (12.24 mbgs) at BH-64-D on May 26 and 24, respectively.

Based on the groundwater elevations measured in the nested wells, the groundwater flow is suggested to have a downward gradient from shallow to deep water-bearing zones.

The interpreted shallow and deep groundwater flow maps are presented in Figure 6 and Figure 7, respectively. Based on the obtained water level measurements on May 26, 2017, the inferred directions of groundwater flows in both shallow and deep water-bearing zones are interpreted to be approximately east towards Innis Lake



3.3 Hydraulic Conductivity Testing

Eleven (11) Single Well Response Tests (SWRT's) were completed on monitoring wells, including BH2, BH6, BH7, BH8-D, BH18-D, BH20, BH25, BH47-S, BH47-D, BH64-D, BH66 on May 26 and 29 of 2017.

The static water level within the monitoring well was measured prior to the start of testing. In advance of performing SWRT, the monitoring well underwent development to remove fine grained sediments introduced into the screen following the well construction. The development process involved purging of the monitoring well to induce the flow of fresh formation water through the screen. The monitoring well was later permitted to fully recover prior to performing SWRT.

Hydraulic conductivity value was calculated from the SWRT data as per the Hvorslev solution included in the AQTESOLV Pro Version 4.50.002 software package. The semi-log plot for drawdown versus time is included in Appendix C.

A summary of the hydraulic conductivity (K) value estimated from the SWRT is provided in Table 3-2.

Monitoring Well ID	Well Depth (mbgs)	Screened Interval (mbgs)	Formation Screened	Estimated Hydraulic Conductivity (m/s)
BH2	8.96	5.96 - 8.96	Silty Sand	7.5 x 10⁻⁵
BH6	7.60	4.6 - 7.6	Silty Sand	1 x 10 ⁻⁶
BH7	15.26	12.26 - 15.26	Silty Sand	4.5 x 10 ⁻⁷
BH8-D	12.12	9.12 - 12.12	Silty Sand	3.1 x 10 ⁻⁶
BH18-D	12.23	9.23 -12.23	Silty Sand	8.7 x 10 ⁻⁶
BH20	6.00	3 - 6	Sandy Silt Till/ Silty Sand	2.3 x 10 ⁻⁷
BH25	5.01	2.01 – 5.01	Sandy Silt Till/ Silty Sand	3.7 x 10 ⁻⁷
BH47-S	6.27	3.27 – 6.27	Clayey Silt Till / Sand and Gravel	2.2 x 10 ⁻⁷
BH47-D	11.63	8.63 – 11.63	Sandy Silt Till/ Silty Sand	3.3 x 10 ⁻⁷
BH64-D	12.37	9.37 – 12.37	Sandy Silt Till	1 x 10 ⁻⁷
BH-66	6.10	3.1 – 6.1	Clayey Silt	1.1 x 10 ⁻⁷
		Highest estimated K-value	9	7.5 x 10 ⁻⁵
	Geon	netric mean of the estimated	K-values	7.8 x 10 ⁻⁷

Table 3-2: Summary of Hydraulic Conductivity Testing

SWRT provides estimates of K for the geological formation in the immediate zone surrounding the well screen. As shown in Table 3-2, the highest K-value is estimated to be 7.5 x 10^{-5} m/s and the geometric mean of the K-values is estimated to be 7.8 x 10^{-7} m/s.



3.4 Groundwater Quality

To assess the suitability for discharge of pumped groundwater to the Regional Municipality of Peel Sanitary and Storm Sewers during dewatering activities, one (1) groundwater sample was collected from monitoring well BH41 on May 26, 2017, using a bailer. Prior to collecting the water sample, approximately three (3) standing well volumes of groundwater were purged from the noted well.

The sample was collected unfiltered and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required. Dedicated nitrile gloves were used during sample handling. The groundwater samples were submitted to an independent laboratory named Maxxam Analytics Inc., in Mississauga, Ontario, for analysis.

For assessment purposes, the analytical results were compared to the Limits for Sanitary and Combined Sewers Discharge, as well as Limits for Storm Sewer Discharge of the Regional Municipality of Peel Codes.

A summary of the analytical results and the laboratory Certificate of Analysis (CofA) are enclosed in Appendix D. The laboratory CofA shows that all parameters were detected at concentrations below the Sanitary and Combined Sewer By-Law limits (Table 1).

The laboratory analytical results also show that the concentrations of Total Suspended Solids (TSS), Total Manganese (Mn), and Total Zinc (Zn) exceed the Storm Sewer Discharge criteria. Analytical results for the filtered water sample collected from the noted monitoring well also show that the concentration of Dissolved Manganese (Mn) exceeds the Storm Sewer Discharge criteria. A summary of the pertinent results is provided in Table 3-3. It should be noted that elevated concentration of TSS are reflective of suspended sediments in the water well and not to actual groundwater.

Table 3-3 below provides a summary of exceedances of the sewer use By-Law.



Parameter	The Peel Region Sanitary and Combined Sewer Discharge Limit	The Peel Region Storm Sewer Discharge Limit	Concentration
Total Suspended Solids (TSS) (mg/L)	350	15	110
Total Manganese (Mn) (μg/L)			1600
Dissolved Manganese (Mn) (µg/L)	5000	50	61
Total Zinc (Zn) (μg/L)	3000	40	98

Table 3-3: Summary of Analytical Results

Notes:

Bold indicates concentration exceeds the Storm Sewer limits.

It should also be noted that, during construction, it is anticipated that TSS levels and associated contaminants (for example Metals), in the pumped groundwater may remain above the by-Law limits. Therefore, 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.

Approval to discharge water to municipal sewer system during construction will be required from the Regional Municipality of Peel prior to any discharge.

If treatment systems are considered, the specifications of the treatment system(s) will need to be provided/adjusted by the treatment specialist/process engineer during the pre-design and commissioning stage of the system.



4 Construction Dewatering Assessment

4.1 Construction Dewatering Rate Assumptions

It is our understanding that the development plan consists of a residential development, including single family dwelling, one (1) storm water management pond, a neighborhood park, and several parkettes. The development will be provided with municipal roads and services, including sewers and watermains.

The Geotechnical Investigation indicates that the sewer and watermain invert levels have not yet been determined at the time of the investigation, but they are expected to extend to the typical depths of approximately 6 m below existing grades on the southern portion of the site and up to approximately 10 m below existing grades on the north portion of the site. Based on the results of the noted investigation, excavation will generally be carried out within the fill material and into the native deposits of sandy silt till, clayey silt till and silty sand.

A proposed stormwater management pond is being considered for the southeastern corner of the site. Based on a supplied engineering drawing, the base elevation of the pond is anticipated to be set at an approximate elevation of 295.5 masl.

Exp should be retained to review the assumptions outlined in this section should the proposed shoring design change.

Table 4-1 presents the assumptions used to calculate the dewatering rate. Calculations for the construction dewatering assessment are included in Appendix E.



	Input Parameter	Assumption	Notes
	Southern Portion of the Proposed Residential Development	305 masl	
Surface elevation	Northern Portion of the Proposed Residential Development	310 masl	Approximate average of the surface elevations
	Stormwater Management Pond	304 masl	
	Southern Portion of the Proposed Residential Development	298 masl	Based on the Geotechnical Investigation report, the maximum depth of excavation for the southern and porthern portions of the
Lowest excavation elevation	Northern Portion of the Proposed Residential Development	300 masl	development are 6 and 10 mbgs, respectively.
	Stormwater Management Pond	295 masl	Based on the engineering drawing
Static	Proposed Residential Development	304.2 masl	Highest obtained groundwater elevations.
groundwater elevation	Stormwater Management Pond	293.2 masl	Based on the water level measurement at BH2 on May 2017
Dewatered	Southern Portion of the Proposed Residential Development	297 masl	Assumed to be approx. 1.0 m below the
target	Northern Portion of the Proposed Residential Development	299 masl	lowest excavation elevation
Excavation	Proposed Residential Development	60 m x 5 m	Based on the Geotechnical Investigation report.
Area	Stormwater Management Pond	100 m x 50 m	Based on the engineering drawings.
Estim	ated K value for the tested water-bearing zone	7.5 x 10 ⁻⁵ m/s	Highest K value estimated for the silty sand unit

Table 4-1: Dewatering Estimate Assumptions for the Construction of the Sewer Services

It should be noted that groundwater elevation (293.2 masl) in the area of the proposed stormwater management pond is approximately two (2) meters below the proposed depth of excavation (295.5 masl). Therefore, based on the groundwater level information collected no groundwater dewatering is expected at this location and only stormwater management will be required for the SWM pond. However, some minor seepage from perched water and precipitation should be expected.



4.2 Radius of Influence During Construction

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

It is noted that in steady state conditions, the radius of influence of pumping extends until boundary flow conditions are reached and provide sufficient water inputs to the aquifer, such as recharge from surface water bodies. It is noted that the Sichardt's model is unable to precisely estimate the actual radius of influence by pumping. On the other hand, the noted empirical equation was primarily developed for the coarse grained (sand and gravel) aquifers, and as such, it can only generate more conservative values for other types of aquifers.

The Ro of pumping based on the Sichardt formula is described as follows:

$$R_0 = 3000 \times (H - h) \times \sqrt{K}$$

Where:

H = Water level above the base of the aquifer prior to dewatering

- h = water level at the equivalent radius of the excavation
- K = Hydraulic Conductivity in m/sec

Based on the Sichardt empirical model and the highest K value, the estimated radius of influence (Ro) for the radial flow and the distance to line source (Lo = Ro/2) for the linear flow are presented in Table 4-2. The estimated values are presented in Appendix E.

	Location	Ro (m)	Lo (m)
	Southern Portion of the Proposed Residential Development	186	93
Excavation	Northern Portion of the Proposed Residential	134	67

Table 4-2 Estimated Radius of Influence and Distance to Line Source



4.2.1 **Dewatering Flow Rate Estimate**

Flow from aquifer

The Dupuit equation for steady state conditions for linear flow to one side of an excavation in an unconfined aquifer resting on a horizontal impervious surface was used to obtain a flow rate estimate while dewatering is expressed as follows:

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

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where:	
Qw	= Rate of pumping (m ³ /sec)
Х	= Length of excavation in m
K	= Hydraulic conductivity (m/sec)
Н	= Head beyond the influence of pumping (static groundwater elevation) (m)
h	= Head above base of aquifer at the excavation (m)
Lo	= Distance of Influence (m)

It is expected that the initial dewatering rate will be higher in order to remove groundwater from aquifer.

The dewatering rates are expected to decrease once the target water level is achieved in the excavation footprint as groundwater will have been removed, locally from storage resulting in lower seepage rates into the excavation.

Rainfall

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

A 10 mm rain event was utilized for the estimate. Given that the total areas of the excavations is, the estimated maximum volume of direct rainwater to be collected in the excavation for the services and stormwater management pond is approximately 3 and 50 m³/event, respectively. In the event of significant precipitation events, the excavation may need to be dewatered over the course of a day or more before safe work conditions can resumed.

4.3 Results of Construction Dewatering Rate Estimate

Based on the assumptions provided in this report, the results of the dewatering rate estimate can be summarized as follows:

	Location	Dewatering Flow Rate (m³/day)	Notes				
Excavation	Southern Portion of the Proposed Residential Development	465	The estimated dewatering flow is based on a single hydraulic conductivity measurement.				

Table 5 Summary of Dewatering Flow Rate Estimate



Location	Dewatering Flow Rate (m³/day)	Notes
Northern Portion of the Proposed Residential Development	340	

The maximum flow estimate is based on a single measurement for hydraulic conductivity, and as such it provides only a preliminary estimate of expected flow rates during the construction dewatering. These peak dewatering flow rates include a factor of safety of two (2) to account for some accumulation of precipitation, seasonal fluctuations in the groundwater table, some flow from beddings of existing sewers, and variation in hydrogeological properties beyond those encountered during the course of this study. This peak dewatering flow rate also provides additional capacity for the dewatering contractor.

It is imperative to note that the contractors are solely responsible to ensure dry conditions are maintained within the excavation zone during the construction process at all costs. Safety measures must be taken into account when planning for pit construction, especially during the wet seasons. In the events of heavy rainfalls or snow melting seasons, it is advised to implement an appropriate drainage system to divert the storm water runoffs and maintain the excavation zone free of water at all time.

4.4 MOECC Water Taking Permit

In accordance with the Ontario Water Resources Act, if the water taking will be more than 50 m³/day but less than 400 m³/day, the construction water taking can be registered under the Environmental Activity and Sector Registry (EASR) registration process.

The expected dewatering rates for the proposed constructions is estimated to be approximately 465 m³/day. As such, a Permit to Take Water (PTTW) is required to facilitate the construction dewatering program for the Site. A maximum peak flow rate of 500 m³/day will be submitted for the permit to allow for the dewatering contractor sufficient capacity to lower the groundwater table during the construction activities.



5 Conclusions and Recommendations

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

- The laboratory CofA shows that all parameters were detected at concentrations below the Sanitary
 and Combined Sewer By-Law limits (Table 1). However, the laboratory analytical results show that
 the concentrations of Total Suspended Solids (TSS), Total Manganese (Mn), and Total Zinc (Zn)
 exceed the Storm Sewer Discharge criteria. Analytical results for the filtered water sample collected
 from the noted monitoring well show that the concentration of Dissolved Manganese (Mn) exceeds
 the Storm Sewer Discharge criteria.
- Based on the assumptions outlined in this report, the estimated high dewatering flow rate for the
 proposed excavations in the southern and northern portions of the proposed residential
 development, are estimated to be 465 and 335 m³/day, respectively, using a factor of safety of two
 (2) to account for accumulation of some precipitation, seasonal fluctuations in the groundwater
 table, flow from beddings of existing sewers, and variation in hydrogeological properties beyond
 those encountered during the course of this study.
- To allow for the dewatering contractor sufficient capacity to manage water inside the excavation during construction, it is recommended that a PTTW be submitted for water taking of approximately 500 m³/day.
- The construction dewatering volumes estimated should be considered as potential peak volumes and may decline or vary subject to reaching steady state conditions, accumulation of precipitation, seasonal fluctuations in the groundwater table, flow from beddings of existing sewers, variation in hydrogeological properties beyond those encountered during the course of this study, and construction sequence.
- It should be noted that, during construction and in post construction, it is anticipated that TSS levels and associated contaminants (for example, Total Metals) in the pumped groundwater may remain elevated and may continue to exceed the By-Law limits. Therefore, it is recommended that a suitable treatment method be implemented during construction dewatering activities.
- If treatment systems are considered for construction and/or for permanent discharge of the subdrain system, the specifications of the treatment system(s) will need to be provided/adjusted by the treatment specialist/process engineer during the pre-design and commissioning stage of the system.
- It is noted that an agreement to discharge to the Region 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.

It should be noted that the comments and recommendations in this report are based on the assumption that the present design concept described throughout the report will proceed to construction and that the report should be reviewed in its entirety. Any changes to the design concept may result in a modification to the recommendations provided in this report.



6 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 the dewatering 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.

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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,

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7 References

Cashman and Preene (2013) Groundwater Lowering in Construction, 2nd Edition.

J.P. Powers, A.B. Corwin, P.C. Schmall, and W.E. Kaeck (2007). Construction Dewatering and Groundwater Control, Third Edition.

Ontario Ministry of the Environment (April, 2008). *Technical Guidance Document for Hydrogeological Studies in Support of Category 3 Applications for Permit to Take Water.*

Geotechnical Investigation, Proposed Residential Development, Airport Road and Cranston Drive, Caledon East, Ontario, prepared for Triple Crown Line Development Inc., **EXP**, May 29, 2016.

Engineering Drawings, Residential Subdivision, 15717 Airport Road, prepared for the Town of Caledon, Schaeffers \$ Associated Ltd., May 2017.



Triple Crown Line Residential Development Airport Road and Cranston Drive, ON Preliminary Hydrogeological Investigation BRM-00235186-E0 June 14, 2017

Figures





Approximate Site Boundary				
exp Services Inc.	PROJECT TITLE:	DRAWING TITLE:	PROJECT No.: BRM-00235186-E0	DWN: AC
1595 Clark Boulevard Brampton, ON, LET 4V1	HYDROGEOLOGICAL INVESTIGATION AIRPORT ROAD AND CRANSTON DRIVE	SITE LOCATION PLAN	SCALE: AS NOTED	CHKD: PS
Fibre: +1.905.793.0641	CALEDON EAST, ONTARIO		date: JUNE 2017	DWG. No.: 1

Van de	Interesting to the second seco			N INST OF O
Legend Approximate Site Boundary 7: Glaciofluvial deposits 19: Modern alluvial deposits 5d: Glaciolacustrine-derived	d silty to clayey till	0 50 100	200 300	400 500
exp Services Inc. 1595 Clark Boulevard Brampton, ON, L&T 4V1 Phone: +1.905.793.9800 Fax: +1.905.793.0641	PROJECT TITLE: HYDROGEOLOGICAL INVESTIGATION AIRPORT ROAD AND CRANSTON DRIVE CALEDON EAST, ONTARIO	DRAWING TITLE:	PROJECT No: BRM-00235186-E0 SCALE: AS NOTED DATE: JUNE 2017	DWE: AC CHKD: PS DWG. No: 2







X:DRAWINGS\235000\235100\235186\235186A\HG INVESTIGATION\MAY 25 2017\BRM-00235186-E0.dwg







Triple Crown Line Residential Development Airport Road and Cranston Drive, ON Preliminary Hydrogeological Investigation BRM-00235186-E0 June 14, 2017

Appendix A: MOECC WWR Summary Table



						On-Site				
WELL ID	EASTING	NORTHING	BOREHOLE ID	DATE COMPLETED	STREET	СІТҮ	DISTANCE TO SITE CENTROID (m)	WATER FOUND (m)	USE DESCRIPTION	FINAL STATUS
4900030	592048	4857169	10314878	11/6/1964				12.5	Livestock	Water Supply
4900031	591630	4857603	10314879	5/2/1961				18.9	Livestock	Water Supply
4903339	591635	4857643	10318176	11/1/1969				54.3	Livestock	Water Supply
4910197	591794	4857734	11555431	5/8/2006	15717 AIRPORT RD	CALDEDON EAST				Abandoned-Other
						Off-Site				
WELL ID	EASTING	NORTHING	BOREHOLE ID	DATE COMPLETED	STREET	СІТҮ	DISTANCE TO SITE CENTROID (m)	WATER FOUND (m)	USE DESCRIPTION	FINAL STATUS
4900029	592134	4857045	10314877	10/29/1960			670	11.6	Livestock	Water Supply
4900032	591172	4857921	10314880	1/25/1959			797	14.0	Not Used	Test Hole
4900033	592340	4858419	10314881	8/1/1967			841	5.8	Domestic	Water Supply
4900036	591555	4857643	10314884	4/18/1960			380	1.2	Not Used	Test Hole
4900037	591485	4857693	10314885	4/5/1960			448	4.3	Not Used	Test Hole
4900668	592261	4856760	10315516	11/1/1959			981	14.0	Domestic	Water Supply
4900669	592185	4856809	10315517	12/8/1962			911	10.4	Domestic	Water Supply
4900670	591527	4857206	10315518	11/9/1955			627	14.9	Domestic	Water Supply
4900671	591290	4857451	10315519	12/11/1956			683	16.5	Domestic	Water Supply
4900672	591250	4857365	10315520	11/26/1957			753	11.3	Domestic	Water Supply
4900673	591470	4857512	10315521	10/6/1959			493	16.5	Domestic	Water Supply
4903051	592115	4857173	10317892	10/17/1968			543	17.4	Livestock	Water Supply
4903141	592215	4856733	10317981	6/28/1968			992	6.1	Domestic	Water Supply
4903383	592195	4856703	10318219	11/5/1969			1016	11.9	Domestic	Water Supply
4904257	591240	4857923	10319045	8/16/1972			733	13.4	Municipal	Water Supply
4904330	592149	4856719	10319118	11/3/1973			989	16.8	Domestic	Water Supply
4905141	592115	4856773	10319897	6/14/1977			929	11.0	Domestic	Water Supply
4905179	591615	4857413	10319934	6/29/1977			417	14.9	Domestic	Water Supply
4906763	592475	4858507	10321324	31946			986	24.4	Domestic	Water Supply
4907475	592372	4856814	10322034	11/17/1990			975	96.0	Domestic	Water Supply
4907901	591238	4857863	10322460	8/19/1994			717	12.8	Not Used	Observation Wells
4907902	591238	4857863	10322461	8/19/1994			717	12.2	Not Used	Observation Wells
4907959	591239	4857864	10322518	9/26/1994			716	12.5	Not Used	Dewatering
4907960	591238	4857863	10322519	8/31/1994			717	12.5	Not Used	Dewatering
4908542	592139	4856947	10323077	11/29/1999			765	5.5	Domestic	Water Supply
4908579	592452	4858432	10323114	3/6/2000			911	63.4	Domestic	Water Supply
4908881	592161	4857899	10520801	11/27/2001			314		Domestic	Abandoned-Other
4910104	591415	4858187	11555338	7/25/2005	ROBERT CARSON DR	EAST CALEDON	721	11.0	Not Used	Observation Wells
4910105	591304	4858150	11555339	7/28/2005	ROBERT CARSON DR	EAST CALEDON	782	36.6	Not Used	Observation Wells
4910106	591304	4858150	11555340	7/28/2005	ROBERT CRASON DR	EAST CALEDON	782	10.4	Not Used	Observation Wells
4910121	591224	4857939	11555355	2/15/2006	AIRPORT ROAD @ CENTERVILLE CREEK	CALEDON EAST	753	0.8	Not Used	Abandoned-Other
4910205	591412	4858181	11555439	5/23/2006	ROBERT CARSON DR	CALEDON EAST	719	8.0	Not Used	Abandoned-Other
4910206	591412	4858188	11555440	5/23/2006	ROBERT CARSON DR	CALEDON EAST	724	6.0	Not Used	Abandoned-Other
4910208	591412	4858181	11555442	5/23/2006	ROBERT CARSON DR	CALEDON EAST	719	8.0	Not Used	Abandoned-Other
4910209	591414	4858185	11555443	5/23/2006	ROBERT CARSON DR	CALEDON EAST	721	6.0	Not Used	Abandoned-Other
4910303	591316	4857985	11694184	8/31/2006	AIRPORT ROAD & MOUNTCREST RD	CALEDON EAST	686		Not Used	Observation Wells
4910304	591209	4857867	11694185	8/31/2006	AIRPORT ROAD @ S. OF EMMA ST	CALEDON EAST	746		Not Used	Observation Wells
7045718	591415	4858187	11768157	7/25/2005	ROBERT CARSON DR	EAST CALEDON	721	38.4	Not Used	Observation Wells
7048527	592292	4858611	23048527	7/18/2007	15831 INNIS LAKE RD	CALEDON	994	4.3	Domestic	Water Supply
7154738	591264	4857888	1003411130	3/9/2010			698			
4905642	591417	4858178	1003446000	5/24/1979			714	32.6	Municipal	Water Supply
7186062	591088	4857863	1004141210	8/21/2012	8 EMMA ST	CALEDON	863			Abandoned-Other
7208933	591141	4858018	1004591960	9/13/2013	15955 AIRPORT RD.	Caledon	859		Monitoring and Test Hole	Monitoring and Test Hole
7243785	591252	4857876	1005445690	6/26/2015	AIRPORT RD & MONTENEST RD	CALEDON EAST	707		Municipal	Abandoned-Other
7243809	591260	4857889	1005445860	6/15/2015	AIRPORT RD & MOUNTCREST RD	CALEDON EAST	703		Monitoring	Abandoned-Other
7243810	591264	4857888	1005445860	6/15/2015	AIRPORT RD. & MOUNTCREST RD	CALEDON EAST	698		Monitoring	Abandoned-Other

Triple Crown Line Residential Development Airport Road and Cranston Drive, ON Preliminary Hydrogeological Investigation BRM-00235186-E0 June 14, 2017

Appendix B: Borehole Logs



roject: .ocation:	Geotechnical Investigation	on Drive									. 5	Sheet	No	<u>1</u> c	of <u>1</u>
)ata Drillad:	April 26, 2017		_	Auger Sa	ample			[\triangleleft	Comb	ustible Va	apour R	eading		
orill Type	CME 55-Track		_	SPT (N)	Value Cone	Test		0	2	Plastic	and Liq	uid Limi	t		-0
)atum:	Geodetic		_	Shelby T Field Var	ube ne Tes	t		l	s	Vndra % Stra Penet	ain at Fai rometer	kial at lure		⊕	
Soil/Rock	Soil Description	ELEV. m	Depth (m)	2 Shear S	:0 Strengtł	SPT (N 40	l Valu 60	e))	80 kPa	Combu Na Atter	ustible Vap 25 Itural Mois berg Limit	oour Rea 50 ture Cor s (% Dr	ading (ppm 75 ntent % y Weight)	Sample	Natura Unit Weigh
~125 FILL grave mois	5 mm Topsoil over : Sandy silt, trace clay, trace el, clayey silt pockets, brown, t	300.85	0	Ŏ		100			200		10	20	30		
_		_	1	6								×			21.0
SAN	DY SILT TILL: Trace gravel,	~298.9	2	ó							>	(20.4
mois	st to wet, compact to loose.		3								×				21.5
0 10 2 10 0 10		_		Ô								*			21.3
0 d 0 d		~296.1	4	Ž											
SILT brow	Y SAND: Medium grained, /n, moist, very dense.	_	5												
		_	6						84 O		×				
		-	7												
		~292.8				46 Ö				×					
END	OF BOREHOLE.														
										Elange			Vater	Но	le Onen
										Time	letion	1	Level (m) Drv	t	o (m)



roject: Geotechnical Investigation ocation: Airport Road and Cranston Drive								eet No	of				
ato Drillod:	April 27, 2017		_	Auger Sa	mple		[Combus	tible Vapo	our Reading]
Date Drilled: <u>April 27, 2017</u>		- SPT (N) Value O ☑ Dynamic Cone Test						Plastic a	ic and Liquid Limit			~ 0	
Drill Type: CIVIE 55- I rack Datum: Geodetic		_	Shelby Ti Field Van	ube le Test	Cat	l	s	Undraine % Strain Penetror	d Triaxial at at Failure neter		€	•	
Soil/Rock Symbol	Soil Description ELI		Depth (m)	2 Shear S	0 trength	6PT (N Va 40	ilue) 60	80 kPa	Combusti 25 Natur Atterbe	ble Vapou 50 al Moistur rg Limits (r Reading (ppm) 75 e Content % % Dry Weight)	Sample	Natura Unit Weigh
~12 SAN trace shal	5 mm Topsoil over IDY SILT TILL: Fine sand seams, e gravel, occasional boulder and e fragments, brown, moist, pact.	300.99	0	Ô 10						× ×			21.5
a a a a a Beco	oming dense to very dense.	_ _~298.9	2	12 O	31					×			21.6
0		_	3		0		69 O		×	× · · ·			22.2 22.5
SILT mois	T Y SAND: Fine grained, brown, st, very dense.	~297.0	4					80					
Becr	oming compact, wet.	~295.4	5										
	oming donce maint		7		29 O					*			
	O OF BOREHOLE.	~292.9				47 O			×				
									Elapsed Time		Water Level	Ho	ole Open to (m)

oject No.	BRM-00235186-D0											Drawing No.			5					
oject:	Geotechnical Investigatio	n Drive													:	She	et N	0	1	of _
	Allport Road and Cransie	Dribnie																		
- ate Drilled:	April 27, 2017		-	Auge	er Sa	mple				_			Corr Natu	nbust ural N	tible V /loistu	/apou ire	ur Rea	ding		
Drill Type: CME 55-Track				 SPT (N) Value Dynamic Cone Tes 		t				Plastic and Liqu Undrained Triax			quid L axial a	uid Limit xial at		— 	-0			
atum:	Geodetic		_	Shell Field	oy Ti Var	ube 1e Te	st				s		% S Pen	train etror	at Fa neter	ilure				
ymbol	Soil Description	ELEV.	pth (m)	Ch	2	0	SP ⁻ 40	Г (N \	/alue 60	e) I	80	kDa	Com	bustil 25 Natur	ble Va al Moi	sture	Readir 7 Conter	ng (ppm 75 nt %) (Natu Un Wei
ഗ് പ്പം ~100 r	mm Topsoil over	296.65	o De	Sne	ear s	streng	100)			200	кра	Au	10	g Lim	20	3 Diy Vi		s	kN/i
SAND brown	Y SILT TILL: Trace gravel, , wet, loose.			Ô												×				
				5																
			1														×			
		-		3																10
,		~294.6	2	\square																10
graine	SAND: Fine to medium d, brown, moist, loose.	_		7										×						
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			3	4											x					
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의 것이 2016년—		_	4																	
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Becon	ning wet, compact.	_~291.7	5																	
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		000.4			Č	5										X				
END C	OF BOREHOLE.	~290.1																		
													Elap Tin	ised ne			Wat	ter rel	Ho	le Op to (m)
P.												0	n Con	nplet	ion		Dr	y		5.79
roject No.	BRM-00235186-D0								Drav	ving No.	4	6 . 1								
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roject: ocation:	Airport Road and Cranstor	n Drive							SI	neet No		of _1								
			_					Combus	tible Var	our Reading	Г]								
ate Drilled:	May 2, 2017		_	Auger Sample SPT (N) Value				Natural N	Aoisture	d Limit	×									
orill Type:	CME 55-Track		_	Dynamic Cone T Shelby Tube	Test			Undraine % Strain	ed Triaxi at Failu	al at	€									
atum:	Geodetic		_	Field Vane Test		s		Penetror	neter											
Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	20 Shear Strength	SPT (N V 40	alue) 60 80 200	kPa	Combusti 25 Natur Atterbe	ble Vapo 5 al Moistu rg Limits 2	ur Reading (ppm) 0 75 Ire Content % (% Dry Weight) 0 30	Sample	Natura Unit Weigł kN/m								
~300 SAN) mm Topsoil over DY SILT TILL: Fine sand seams,		0	3 0					×		V									
Left Left Left Left Left Left Left Left	e gravel, trace clay, brown, wet, pact.	_									K									
0 0		_	1	- 12 O					×		V	20.								
<i>v a</i>																				
0 a				O O					×		V	21.								
Beco	oming moist, compact to dense.	~299.2	2																	
o e		-							×			22								
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0 0																				
Beco	oming wet.	~295.7																		
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SILT	Y SAND: Fine grained, brown,	~294.2	7																	
	r pocreis, moisi, very dense.	-				65														
		~293.2				Ó		×			V									
END	OF BOREHOLE.																			
								Elapsed Time		Water Level	Но	ble Ope to (m)								
							On	Comple	tion	Dry		8.07								
•ex	D.																			

Project: Location:	Geotechnical Investigation Airport Road and Cranstor	n Drive					S	heet No.	1	
Date Drilled: Drill Type: Datum:	May 2, 2017 CME 55-Track Geodetic		– Auger – SPT (f – Dynan – Shelby – Field \	Sample N) Value nic Cone Test / Tube /ane Test		Co Na Pl Ur % Pe	ombustible Va atural Moisture astic and Liqu ndrained Triax Strain at Failu enetrometer	pour Reading d id Limit ial at ure	× × €	
Poloudination of the second se	Soil Description D mm Topsoil over DY SILT TILL : Fine sand seams, e gravel, occasional boulder ments, brown, moist to wet, loose.	ELEV. m 298.04	Image: state sta	SPT (1	Value) 60 80 200	KPa /	mbustible Vap	Dur Reading (ppm 10 75 Ure Content % (% Dry Weight) 20 30	Sample	Natu Uni kN/n 21. 21. 22.
SILT reddi	Y SAND: Fine grained, brown to ish brown, moist, dense.		6	44 6	9	×	×			
	OF BOREHOLE.	~289.9		37 			×			
*ex	p.		_] [On Co May ⁷ May ⁷	apsed Time ompletion 15, 2017 19, 2017	Water Level (m) Dry 7.58 7.55	Hc	le Ope to (m) 8.07



Log of Borehole 7

BRM-00235186-D0

Project No.







Project No. BRM-00235186-D0 Log of Borehole 8D Drawing No. 9

roject: Geotechnical Investigation	on																_		Sh	nee	t N	о.		2	of _2
ŭ .		Ê				5	SPT	(N	Valu	le)					С	omb	usti	ble V	apo	ur R	eadir	ng (p	opm)	a	Natura
Soil Description	ELEV.	pth (I	Oha	2	0		40		6	0		80		D-	-	N	atur	al Mo	oistu	re C	onte	nt %	at)		Unit
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	~285.0	10																							
Becoming wet, compact.								-																	
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Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion May 15, 2017 May 19, 2017	10.53 10.49 10.49	12.65



roject: ocation:	Geotechnical Investigation Airport Road and Cranston	n Drive				\$	Sheet No.	1_0	of <u>1</u>
ate Drilled: rill Type: atum:	April 26, 2017 CME 55-Track Geodetic			Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Combustible V Natural Moistu Plastic and Liq Undrained Tria % Strain at Fai Penetrometer	apour Reading re uid Limit H xial at lure	× •	
oil/Rock Symbol	Soil Description	ELEV.	epth (m)	SPT (N 20 40 Shear Strength	Value) 60 80 kP	Combustible Va 25 Natural Mois a Atterberg Limi	bour Reading (ppm) 50 75 ture Content % ts (% Dry Weight)	Sample	Natura Unit Weigh
	5 mm Topsoil over :: Silty sand to sandy silt, trace el, clayey silt pockets, brown, st. IDY SILT TILL: Fine sand seams, e gravel, occasional boulder ments, brown, oxidized fissures, st, compact. TY SAND: Fine to medium hed, scattered gravel, brown, st. OF BOREHOLE.	302.38 	0 1 2 3 4 5 6						21.8 18.3 21.7 22.0

Pro Pro	ject No. ject: ation:	Geotechnical Investigation	n n Drive												Dra	awing Sheet	j No t No	1	of <u>1</u>
Dat	e Drilleo			_	Auge	er Sa	ample					3		Comb Natura	ustible V al Moistu	apour I re	Reading	□ ×]
Dril	Type:	CME 55-Track		_	SPT Dyna	(N) ' amic	Value Cone	e Tes	t		OB	2		Plastic Undra	c and Liq ined Tria	uid Lim xial at	nit	H	-0
Dat	um:	Geodetic		_	Shell Field	by T Var	ube ne Te	st			Į	S		% Stra Penet	ain at Fai rometer	ilure		€ ▲	•
roundwater	Soll/Rock Symbol	Soil Description	ELEV. m	Depth (m)	Sh	2 ear S	0 Streng	SP ⁻ 40 th	T (N V	/alue 60)	80 kF	a	Combu Na Atter	istible Va 25 tural Mois berg Limi 10	pour Re 50 sture Co ts (% D	eading (ppm 75 ontent % ry Weight) 30	Sample	Natur Unit Weigl kN/m
	FI 	150 mm Topsoil over LL: Sandy silt, trace gravel, trace ay, scattered rock fragments, brown, oist.	302.16	0	ð ð		28								×	× · · · · · · · · · · · · · · · · · · ·			19.7 21.9 22.6
XXXXXXXXXXXXXXXX - 4 - 4 - 4 - 4 - 4 - 4	La gr 	ayer of dark brown silt, sand and avel. ANDY SILT TILL: Fine sand seams and layers, trace gravel, moist, loose dense.		3	⁷ O										×				22.
а. 		ND OF BOREHOLE.		6				39 0							×.				
				_										Elapse	ed		Water	н	le Ope

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roject No.	BRM-00235186-D0	-			Dr	awing No		13
roject:	Geotechnical Investigation					Sheet No	<u>1</u>	of
ocation:		Drive						
ate Drilled [.]	April 27 2017		-	Auger Sample	Combustible V Natural Moistu	apour Reading]
ill Type:	CME 55-Track		_	SPT (N) Value O	Plastic and Lic	uid Limit	۲.	—O
atum:	Geodetic		_	Shelby Tube	% Strain at Fa	ilure	€ ▲)
		T	_	S				·
'Rock mbol	Soil Description	ELEV.	oth (m)	SPT (N Value) 20 40 60 80	Combustible Va 25 Natural Moi	50 75 sture Content %) mple	Natu Un
<u>``</u> @`\$`	mm Tanacil aver	m 301.37	o Dep	Shear Strength 100 200	kPa Atterberg Lim	ts (% Dry Weight)	Sa Sa	kN/i
∼200 SANE	DY SILT TILL: Fine sand seams,			5 Ö	×			
frage	ments, brown, moist, compact.							
e e		-	1	Ö	×			22
2 4		_		10				
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Sand	and gravel layer ~225 mm thick.	~298.9		Ö	*			22
<i>•</i>		_	3					
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Find s	sand layers.	~297.4	4					
o c	· · · · · · · · · · · · · · · · · · ·	_		27				
• •			5	ð	*			21
0 0								
	SAND: Fine grained, brown,	~295.8						
	, dense.	_	6	35				
		~294.8		Ö		×		20
END	OF BOREHOLE.							
					Elapsed Time	Water Level	Hc	ole Op

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roject: ocation:	Geotechnical Investigation	Drive								S	heet N	 lo	<u>1</u> a	of _
ate Drilled: rill Type: atum:	May 2, 2017 CME 55-Track Geodetic		_	Auger Sa SPT (N) Dynamic Shelby T Field Va	ample Value Cone Te ube ne Test	st	0		Combus Natural Plastic a Undrain % Strair Penetro	tible Va Moisture and Liqu ed Triax n at Failu meter	pour Rea id Limit ial at ire	ading		-0
Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	2 Shear S	SF 20 4 Strength	PT (N Val	lue) 60	80 kPa 200	Combust 25 Natu Atterbe	ible Vapo 5 5 ral Moist erg Limits	our Read 0 ure Conte 6 (% Dry \	ing (ppm 75 ent % Weight) 30	Sample (Natu Un Weie kN/i
-300 FILL grav mois) mm Topsoil over : Sandy silt to clayey silt, trace el, brown, topsoil stained pockets, . t to wet.	297.44	0	Ô Ô						×	×			21 21
SAN 	DY SILT TILL: Fine sand seams, gravel, trace clay, brown, moist, e to very dense.	~295.2	2		30 Ö	51				*				
sear	Y SAND: Fine grained, silt ns, brown, moist, dense to very se.	~293.3	4		50	(for 130)			×					22
	· · ·	~290.8	5			44 O				*				21
END	OF BOREHOLE.	~290.0												
									Elapsed		Wa	ater	Но	le Op

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roject: ocation:	Geotechnical Investigation Airport Road and Cranston	Drive					Sheet N	0.	1_c	
ate Drilled: Irill Type: Patum:	May 2, 2017 CME 55-Track Geodetic		- ; - ; - ; - ;	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Combus Natural Plastic a Undrain % Strair Penetro	ttible Vapour Rea Moisture and Liquid Limit ed Triaxial at a at Failure meter	ding 	×	-0
voluming souther compared comp	Soil Description The main of	ELEV. m 294.85 ~292.7 ~290.9 ~290.9	(m)	SPT (N 20 40 Shear Strength 100 3 6 10 29 10 10 29 10 10 10 10 10 10 10 10 10 10	Value) 60 80 200	KPa	ible Vapour Readi	ng (ppm) 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Sample	Natu Uni Weic kN/r
END	DY SILT TILL: Medium grained I seams, trace gravel, brown, wet, e. OF BOREHOLE.	~288.3	6	31 0						
*ex	þ.	<u> </u>	. 1	++++		Elapsed Time	Wa Lev (r tion Dr	ter /el n) Y		ie Ope to (m) 6.55

oject No. B	<u>RM-00235186-D0</u>	•				Draw	ing No.		10
oject: <u>G</u> ocation: <u>A</u>	eotecnnical Investigation irport Road and Cranstor	n Drive				Sh	eet No	<u> </u>	of
_			-		Corr	nbustible Vap	our Reading		
ate Drilled: \underline{M}	lay 3, 2017		-	Auger Sample X SPT (N) Value Image: Complexity of the second sec	Natu Plas	ural Moisture itic and Liquid	Limit		-0
ill Type: <u>C</u>	ME 55-Track		-	Dynamic Cone Test Shelby Tube	Und % S	rained Triaxia train at Failur	ll at e	\oplus	ı
atum: <u>G</u>			_	Field Vane Test	Pen	etrometer			
Symbol	Soil Description	ELEV. m 299.46	 Depth (m) 	SPT (N Value) 20 40 60 80 Shear Strength 100 200	Com kPa Att	bustible Vapou 25 50 Vatural Moistur erberg Limits 10 20	re Content % % Dry Weight) 30	Sample	Natu Ur Wei kN/
~250 mi FILL: Sa _rootlets,	m Topsoil over andy silt to clayey silt, trace , trace gravel, brown, moist.	_	U	Ő		×			
-		_	>5	00b for 12		*			20
SANDY	SILT TILL: Fine sand seams,	~297.3	2	26		****			20
fragmen moist, c	its, brown, oxidized partings, ompact to dense.	_	3	45					22
e 14 2 4 2 6		_	4						
0 1 4 0 1 4 0 1 4 0 1 4 0 1 4 0 1 4 0 1 4		_	5	26		×			22
Becomir	ng wet, compact.	~293.9	3						
	BOREHOLE.	~292.9	6	22 O		×			21
					Elap Tin	sed ne	Water Level	Ho	le Op to (m)
5 .					On Com	pletion	6.10		6.55



roject No.	BRM-00235186-D0 Geotechnical Investigation									Dra	awing Sheet	No No.	 1 (18 of [/]
ocation:	Airport Road and Cranston	n Drive								-			<u> </u>	
			_						Comb	ustible V	anour Re	adina		
ate Drilled:	April 26, 2017		_	Auger Samp SPT (N) Val	ble				Natur	al Moistu	re	ading	×	
rill Type:	CME 55-Track		_	Dynamic Co	ne Test	-			Undra	ined Tria	uid Limit xial at			-0 ,
atum:	Geodetic		_	Field Vane	e Test		s		% Str Penel	ain at Fai rometer	lure			
			_		SPT (N	l Value'			Comb	ustible Va	pour Rea	ding (ppm)	Natu
oil/Roch Symbol	Soil Description	ELEV.	epth (m	20 Shear Stre	40 nath	60	80	kPa	Na Atte	25 atural Mois berg Limi	50 sture Con ts (% Dry	75 tent % Weight)	Sample	Un Wei
∞ ∞ ~225	5 mm Topsoil over	302.81	Ŭ 0		100		200			10	20	30		kN/
FILL	: Sandy silt to clayey silt, trace el. brown, moist.			Ô						>	<			
	-,,			7										
		~301 5	1	Ó							×			19
SAN	DY SILT TILL: Fine sand seams,			15										
boul	der fragments, brown, oxidized kets, moist, compact.			Ö						×				22
	····, ····	7	2		20									
		-			Ĵ					*				22
0 e		_	3											
o a				Ć	8 D				×					22
o o		1												
Beco	oming dense.	~298.8	4											
a a	-													
a a					43 O					×				22
0 a		-	5											
° °		-~297.2												
SILT mois	Y SAND: Fine grained, brown, st, very dense.		6											
		~296.5	0		50 for	150mm)	1			X				
END	OF BOREHOLE.													
									Elaps	ed	N L	/ater evel	Но	le Op



BRM-00235186-D0 Log of Borehole 18D Drawing No. 19

Pr	oject	No. BRM-00235186-D0	0									-						Dra	awii	ng N	lo.			19
Pr	oiect:	Geotechnical Investigation	on															S	She	et N	lo.	2	2	of 2
ater	, *-			e l	T	_	_	_	SF	PT (N	l Va	lue)				Com	bustit	ole Va	pour	Read	ing (p	pm)		Natural
awpur	il/Roc ymbo	Soil Description	ELEV.	pth (n			20	<u>! </u>	4	0	(60	80)	_	1	25 Natura	al Mois	50 sture	Conte	75 ent %	,	ample	Unit
Grot	SS		292.71	De		inear	r St	reng	tn 10	00			20	кР 0	'a	Au	erber 10	g Limi	20 20	5 Dry V	30	π)	ű	kN/m ³
					Ħ	#	#	#																
		_	_		H	₽	₽	-																
					Ħ		Ħ	3	2															
ΙĦ		_	-	11	Ē		Ħ	#)									>	4		+			
					Ħ		+	#																
Ë		—	~291.0		Ħ	#	#	#											+	+++	++-			
		Becoming wet, compact.			F	₽	Ħ	₽																
Ľ.		_	1	12	Ë	Ħ	Ħ	Ħ											#					
R			~200.1		Ħ			$\overset{26}{O}$										×	:					
22		END OF BOREHOLE.	~290.1				+	-															4	-
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3					Ħ		H	#	$\left \right $					ļ									-	
																Elap	sed		Τ	Wa	ater	Τ	Нс	ole Open
																Tir	ne		\perp	(r	n)			to (m)



Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion May 15, 2017 May 19, 2017	11.58 11.46 11.34	12.19



oject No. \underline{B}	<u>RM-00235186-D0</u>	U					Dra	wing No.	4	20
roject: <u>G</u> ocation: A	sectechnical investigation	Drive					S	sheet No	1	of _
ate Drilled: A	pril 27, 2017		_	Auger Sample			Combustible Va Natural Moisture	apour Reading e	×	
rill Type: C	ME 55-Track		-	Dynamic Cone Test			Plastic and Liqu Undrained Triax	uid Limit kial at		0)
atum: <u>G</u>	Geodetic		-	Field Vane Test	s		Penetrometer	ure		
Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N V 20 40 Shear Strength 100	alue) 60 80 200	kPa	Combustible Vap 25 Natural Moist Atterberg Limit	our Reading (ppm 50 75 ture Content % s (% Dry Weight) 20 30	Sample (Natu Ur Wei kN/
~200 m SANDY	m Topsoil over SILT TILL: Fine sand seams,	0	0	6 O				*		
fragmer	avel, occasional boulder nts, brown oxidized pockets partings moist compact									
		_	1	Ő			×			22
a a		-		17						
<i>•</i>		_	2				×		X	
							×			21
0 C										
a a			3	26 O			×			22
a a a	-									
o 'a	-	-	4							
0 a	-	_		20						
o a	-	_	5	Õ			×			22
o a		~294 7								
Becomi	ing wet, dense.	2011								
o d	-		6	42 O			×	(21
END OF	BOREHOLE.	~293.7								
								Water		
							Elapsed Time	Level (m)		to (m)
ovr						Un		5.03		o.79

Contaction: Arport Road and Cranston Unve	Project No. Project:	BRM-00235186-D0 Geotechnical Investigation	<u> </u>				Drav	wing No neet No	2 1_0	1 of _1
SILTY SAND: Fine grained, brown, moist, dense. 	Project: Location: Date Drilled: Drill Type: Datum:	Geotechnical Investigation Airport Road and Cranston May 9, 2017 CME 55-Track Geodetic Soil Description O mm Topsoil over DY SILT TILL: Fine sand seams, e gravel, trace clay, occasional der fragments, brown, moist, loose ense.	ELEV. m 300.12	0 Depth (m)	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test SPT (N Value) 20 40 60 Shear Strength 100 2 4 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	80 KPa 200	Combustible Vap Natural Moisture Plastic and Liqui Undrained Triaxi % Strain at Failu Penetrometer Combustible Vapo 25 5 Natural Moist Atterberg Limits 10 2	beet No		f Natur Unit Weigl kN/m
~293.5	e SILT mois	- Y SAND: Fine grained, brown, t, dense. -	~296.0	3	Ö 30 37		×			
	END	OF BOREHOLE.	_~293.5				×			

oject: cation:	Geotechnical Investigation	n Drive					She	et No	1_of
te Drilled [.]	May 9, 2017			Auger Sample	\boxtimes	Combi Natura	ustible Vapou Il Moisture	r Reading	□ X
ll Type [.]	CME 55-Track		_	SPT (N) Value Dvnamic Cone Test		Plastic	and Liquid L	imit	(
itum:	Geodetic		_	Shelby Tube Field Vane Test	S	% Stra Peneti	in at Failure	ii.	⊕
Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N V 20 40 Shear Strength	alue) 60 80 k	Combu Na Pa Atter	stible Vapour 1 25 50 tural Moisture berg Limits (%	Reading (ppm) 75 Content % Dry Weight) 30	Sample N N N N N
~450 SAN) mm Topsoil over DY SILT TILL: Trace gravel, /n, moist to wet, loose.	298.77	0						
	Y SAND : Stratified fine grained	~297.4	1	Ō.			*		
brow	n, moist, loose to very loose.	_	2	Å			× .		
		_	3	Ö			*		
		_		Ŏ					
		-	4	8					
			5	Θ					
Becc	oming cemented, compact.	_	6	11					
END	OF BOREHOLE.	~292.2							
			_		<u> </u>	Elapse	d	Water Level (m)	Hole C to (r

oject: <u>G</u> ocation: <u>A</u>	Geotechnical Investigation	n Drive								S	heet No). <u>1</u>	_ 0	of _
ate Drilled: \underline{N}	Лау 9, 2017 СМЕ 55-Track		_	Auger Samp SPT (N) Valı Dynamic Cor	le le ne Test				Combu Natural Plastic Undrair	stible Vap Moisture and Liqui ned Triaxi	pour Read : id Limit ial at	ing ┣	×	-0
atum:	Geodetic		_	Shelby Tube Field Vane T	est		S		% Strai Penetro	n at Failu ometer	ire		⊕	
Soil/Rock Symbol	Soil Description	ELEV.	Depth (m)	20 Shear Strer	SPT (40 igth	N Value 60	e) 8	0 kPa	Combus 2 Natu Atterb	tible Vapo 5 5 ural Moistu erg Limits	our Reading 0 75 ure Conten (% Dry We	j (ppm) 5 t % eight)	Sample	Nat U We kN
~300 m SANDY trace gi fragme dense.	m Topsoil over Y SILT TILL: Fine sand seams, ravel, occasional boulder nts, brown, moist, compact to		0	5 10						×				
a a a Becom	ing wet.	 ~301.0	2	25	45 C					×				
		_	3							× ×				
SILTY S	SAND: Fine grained, brown, compact.	~299.1 	4	25 Č						*				
		~296.6	6	26 C						×				
	F BOREHOLE.													
									Elapseo	1	Wate	er er	Hoi	le O

ocation:	Airport Road and Cranstor	n Drive				Sheet No.	1 (of <u>1</u>
ate Drilled: rill Type: atum:	May 8, 2017 CME 55-Track Geodetic		_	Auger Sample SPT (N) Value O	Combustibl Natural Mo Plastic and Undrained % Strain at Penetrome	e Vapour Reading isture Liquid Limit H Triaxial at Failure ter	× (-0
viologiumus ~300 r FILL: S	Soil Description nm Topsoil over Sandy silt to clayey silt, trace	ELEV. m 301.81	o Depth (m)	SPT (N Value) 20 40 60 80 Shear Strength 100 200 5 1 1 1	KPa Combustible 25 Natural Atterberg 10	Vapour Reading (ppm) 50 75 Moisture Content % Limits (% Dry Weight) 20 30	Sample	Natura Unit Weigh kN/m ³
gravel,	, brown to dark brown, moist. Y SILT TILL: Fine sand seams, gravel, trace clay, brown, moist,		1	4 0 14	×	*		22.1
- SILTY moist,	SAND: Fine grained, brown, dense to very dense.	 ~298.9	2	37 60 for 150mm	×	*		22.4
		-	4	58	×			
		_	6	38 Ö	×			
	OF BOREHOLE.	_~295.2						
					Elapsed	Water Level (m)	Ho	le Open to (m)

ojeci	INO.	BRW-00233180-D0												Dra	wing) NO.			5
oject	: n:	Geotechnical Investigation	n Drive											S	Shee	t No.	_1	_ 0	f _1
												Co	ombus	tible Va	apour	Readin	a		
ate D	rilled:	May 8, 2017		_	Auger SPT (N	Samp N) Val	ole ue			1 0	2 2	Na	atural N	Moistur	e uid Lin	nit	, 上	×	
rill Ty	pe:	CME 55-Track		_	Dynam Shelby	nic Co / Tube	ne Te	est	-		_ ■	Ur %	ndraine Strain	ed Triax at Fail	kial at ure	iii.	•	\oplus	0
atum:		Geodetic		_	Field V	/ane 1	Fest			I	s	Pe	enetror	neter				A	
Soil/Rock Symbol		Soil Description	ELEV. m	Depth (m)	Shea	20 ar Stre	SI 4 ngth	PT (N \ 10	Value) 60)	80 kPa		mbusti 25 Natur Atterbe	ble Vap al Mois rg Limit	our Re 50 ture Ce s (% D	eading (75 ontent % ory Weig	ppm) jht)	Sample	Natu Uni Weig kN/r
	~300 FILL _black) mm Topsoil over : Clayey silt, trace gravel, trace k decayed vegetation, brown, wet.	295.53	0	6 0 4									>	20	30			
			_	1	0 7											×			18
	PEA wood loose	T: Fibrous decayed vegetation, d fragments, black, wet, very e.	~293.4 	2	ð													N N N N	9
			_	3	ð												*		2
	SILT grair	Y SAND: Fine to medium ned, grey, wet, loose.	~291.5 ~290.7	4	5													7	
	_ CLA ` grey	YEY SILT TILL: Trace gravel, , moist, stiff.	_	5														2	
0/0/0/	- END	OF BOREHOLE.	~288.9	6	ð									×					22
																Water			
												Ela 1	apsed Time			Level (m)		Hole to	e Ope ⇒ (m)
												On Co	mple	tion		1.52		1	.83

roject No.	BRM-00235186-D0							Drawing	No	2	26
roject:	Geotechnical Investigation	Drive						Sheet	No	<u>1</u> (of <u>1</u>
		Diive									
ate Drilled:	April 26, 2017		_	Auger Sample			Combu Natural	stible Vapour R Moisture	eading		
orill Type:	CME 55-Track			SPT (N) Value Dynamic Cone T	est	0 🛛	Plastic Undrair	and Liquid Limit ned Triaxial at	- I		-0
atum:	Geodetic		_	Shelby Tube Field Vane Test			% Strai Penetro	n at Failure ometer		⊕	۲
		1				S	Combus	tible Vanour Rea	ding (ppm)		
ymbol ymbol	Soil Description	ELEV.	pth (m)	20	SPT (N Val 40 6	ue) 30 80		5 50 Jural Moisture Cor	75 tent %	ample	Natur Unit Weig
ິ ^{ິິທີ} ≪≪≪ ~175 ເ	mm Tonsoil over	303.63	o De	Snear Strengtn	100	кРа 200		0 20	30	ı S	kN/m
FILL:	Silt to clayey silt, trace gravel,			Ő				×			
	-	-	1	Ô				- ×			21.
	_	-									
				Ô				×			20.
SAND	Y SILT TILL: Trace gravel,	~301.5	2								
occas	ional boulder fragments, brown,	-		27 O				×			
	SAND: Modium grained, trace	~300.7								-24	
gravel	, brown, wet, compact.		3	18 O				×			
	-										
		~299.6	4								
* trace	gravel, occasional boulder										
dense	enis, biown, moisi, dense to very _				45			×			22
0	-	-	5								~~
2 4	_										
0 0											
o a	-	-	6			75					
0 0		~297.0				0		×			22.
END	OF BOREHOLE.										
			_				Elansed		Vater	Ho	le Ope
							Time	· L	evel	1	to (m)



*exp.

roject roject:	NO.	Geotechnical Investigation	י ו											Drav S	winę hee	g No t No	·	 1	28 of
ocatio	n:	Airport Road and Cransto	n Drive															<u> </u>	<u> </u>
										_	_	Cor	mbu	stible Va	pour	Readi	ing	E]
ate D	rilled:	May 2, 2017		_	Auger SPT (N	Sample I) Value			(2 Z 2 Z	1 3	Nat Pla	tural	Moisture	id Lin	nit	•	×	
rill Ty	pe:	D-90-Tire		_	Dynam Shelby	ic Cone Tube	Test	t	-		-	Una %	drain Strai	ned Triaxi n at Failu	ial at	inc.		•))
atum:		Geodetic		_	Field V	ane Te	st			s		Per	netro	ometer					•
žo				ĵ			SPT	(N Va	alue)			Con	nbus 2	tible Vapo 5 5	our R	eading 75) (ppm)	Natu
Soil/Rc Symb		Soil Description	m	Depth	Shear	20 r Streng	40 th		60	8	80 kPa	At	Natu tterb	ural Moisti erg Limits	ure C (% E	ontent Dry We	ight)	Samp	Wei kN/
	~150 FILL	0 mm Topsoil over : Clayey silt, trace to some el sand pockets, brown, moist to	301.92	0	ð									×		30			
	wet.				11														
	_		-	1	0									×					
	_		_		5														
	_		_	2										×					19
					6														
	_																		
	_		-	3	4														
	_		_												^				
			~297.9	4															
	grair fragr	ned, widely scattered rock																	
	_nayi	menta, brown, moist, very dense.										98 O	×						
	_		-	5															
	_		_																
	_		_	6															
											85 O		×						
	END	OF BOREHOLE.	~295.3																
						-						Ela Ti	psed	I		Wate Leve	:r ا	Ho	ole Op to (m
												On Cor	mple	etion		(m) 2.13	}		5.18

roject No.	BRM-00235186-D0	U									Dra	wing	g No.		30
roject:	Geotechnical Investigatio	n Drivo									. 8	Shee	t No.	1	of _
ocation:	Aliport Road and Cransid														
ate Drilled [.]	May 9, 2017		_	Auger Sa	nple			\boxtimes		Comb Natura	ustible Va al Moistur	apour e	Reading	⊂ ×]
rill Type [.]	CME 55-Track		_	SPT (N) V	/alue Cone Te	est	0			Plastic	and Liqu	- uid Lin	nit	É	—0
atum:	Geodetic		_	Shelby Tu	be Tost					% Stra	ain at Fail	ure		€)
			_		e rest			S		Feneu	Iometer				•
(Rock mbol	Soil Description	ELEV.	th (m)	20	SI 4	PT (N V: 40	alue) 60	80		Combu	stible Vap 25 tural Mois	our Re 50 ture C	eading (pp 75 ontent %)))) (m(Natu Ur
Soli Soli	~ ~	m 302.68	o Den	Shear St	rength 1	00		200	kPa	Atter	berg Limit	s (% E 20	Dry Weigh 30	i) Sa	kN/
~30	0 mm Topsoil over			²								×			
bou	der fragments, brown, wet, stiff to	-													
	1.	_	1	Ô								×	(
				18 Q							×				
		_	2												1
		_		18 O							×				
6 . 9															1
			3		33 O				>		×				
9 / 9_		_													
		~298.7	4												
f trac	e gravel, brown, wet, very dense.														
							7				×				
0 a		-	5												
0 a		-~297.1													
SIL brov	FY SAND: Fine grained, stratified, vn, moist, dense.														
			6		32										
		~296.1													
	OF BOREHOLE.														
										Elapse	ed		Water Level	Н	ole Op

oject: cation:	Geotechnical Investigation Airport Road and Cransto	n n Drive									S	heet N	0	<u> </u>	of _
te Drilled: ill Type: tum:	May 9, 2017 CME 55-Track Geodetic			Auger Si SPT (N) Dynamic Shelby T Field Va	ample Value : Cone ⁻ -ube ne Test	Test	<u> </u>			Combi Natura Plastic Undrai % Stra Penetr	ustible Va I Moisture and Liqu ned Triax in at Failu rometer	pour Rea d id Limit ial at ure	iding H	× •	;
Symbol	Soil Description	ELEV. m 300.71	o Depth (m)	2 Shear S	20 Strength	SPT (N \ 40 1 100	/alue) 60	80	kPa	Combu Z Nat Atter	stible Vap 25 § tural Moist berg Limits	our Readi 50 ure Conte 5 (% Dry V 20	ng (ppm) 75 nt % Veight) 30	Sample	Na U We kN
~300 FILL grav) mm Topsoil over : Clayey silt to sandy silt, trace el, brown, wet.	~299.3	1									* *			
CLA Sean very	YEY SILT TILL: Fine sand ns, trace gravel, brown, moist, stiff to hard.	-	2		21				>		×	×			
	Y SAND: Fine grained, silt	_ ~296.7	3		č	4			>		×				
	ns, brown, moist, dense.	_	5		30 Ö						*				
END	OF BOREHOLE.	~294.1	6			41					×				
										Elapse Time	d	Wa Le ^v (n	ter vel 1)	Ho	le C to (r

oject.	Geotechnical Investigation							D	Sheet No	<u> </u>	of
ocation:	Airport Road and Cranstor	n Drive									л
ato Drillod:	 May 9, 2017		_	Auger Samp	le		\boxtimes	Combustible	Vapour Reading		
ill Type	CME 55-Track		_	SPT (N) Valu Dynamic Cor	ue ne Test	<u> </u>		Plastic and L	iquid Limit	Ē	-0
atum:	Geodetic		_	Shelby Tube	est		■ +	% Strain at F		⊕	
			_	· · · · · · · · · · · · ·			5	Combustible	(anous Dooding (an		
Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	20 Shear Strer	SPT 40 igth	(N Value) 60	80 kPa	25 Natural Me Atterberg Lin	50 75 oisture Content % mits (% Dry Weight)	Sample	Na U We kN
~400 FILL	0 mm Topsoil over : Silty sand changing to clayey	302.35	0	Ô	100		200	10	20 30 X		
	AYEY SILT TILL: Fine sand and			6							
	AYEY SILT TILL: Fine sand and t seams, trace gravel, occasional ulder fragments, brown and grey,	~301.0	1								
silt s	LAYEY SILT TILL: Fine sand and It seams, trace gravel, occasional oulder fragments, brown and grey, didized partings, moist, stiff to hard.		2	Ö					×		
		_							*		
		_	3	23							
		_		Ő			Á	×			
Bec	oming grey.	~298.4	4								
× · · · ·		-		23							
9		-	5								
SAN	IDY SILT TILL: Fine sand seams,	~296.8									
	e gravel, grey, moist, compact.	-	6	25				×			
END) OF BOREHOLE.	~295.8									
			_1					Elapsed Time	Water Level	Но	le O

oject:	Geotechnical Investigation						Sheet No					
cation:		1 Drive	_	Auger Samela	X	Combustible Vapour Reading						
te Drilled:	May 9, 2017		_	SPT (N) Value	OØ	Natura Plastic	Moisture and Liquid I	Limit	× (
II Type: tum:	Geodetic	_	Dynamic Cone Test Shelby Tube Field Vane Test		Undraii % Stra Penetr	ned Triaxial in at Failure ometer	at	⊕				
imbol	Soil Description	ELEV.	oth (m)	SPT (N \ 20 40	'alue) 60 80	Combus 2 Nat	tible Vapour 5 50 ural Moisture	Reading (ppm) 75 Content %				
୍ଥିର ଅନ୍ୟ	50 mm Tanaail ayar	m 301.89	o Dep	Shear Strength 100	ki 200	Pa Atterb	erg Limits (%	6 Dry Weight) 30	es vi			
FILL grav	L: Sandy silt to clayey silt, trace vel, brown, wet.	_					*					
SAN san	NDY SILT TILL: Fine sand seams, d and gravel layers, trace gravel,	_~300.8	1	ð			×					
brov	<i>w</i> n, moist, compact.		2	Å.			×					
e e		_		25 O			*					
a a		_	3	18 Ö			×					
Bec	coming grey, occasional boulder	~297.9	4									
a a	incino.	-		15 O			*					
		_	5									
o ''c		-	6	15 O			<					
END	D OF BOREHOLE.	~295.3										
			_			Flansed		Water	Hole (
						Time	tion	Level (m)	to (

te Drilled: II Type: tum: tum:	April 28, 2017 <u>CME 55-Track</u> <u>Geodetic</u> Soil Description <u>Soil Description</u> Topsoil over DY SILT TILL: Fine sand seams ayers, trace gravel, occasional er fragments, brown, moist, act to dense.	ELEV. m 	o Depth (m)	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test SPT (N Valu 20 40 60 Shear Strength 100 5	○ 2	Combustible Va Natural Moisture Plastic and Liqu Undrained Triax % Strain at Failu Penetrometer Combustible Vap 25 5 Natural Moist Atterberg Limits 10 2	pour Reading id Limit ial at ure our Reading (ppm) 50 75 ure Content % \$ (% Dry Weight)	Sample	–O Natura Unit Weigh
xoon bound sources a composition a compositi	Soil Description mm Topsoil over DY SILT TILL: Fine sand seams ayers, trace gravel, occasional er fragments, brown, moist, act to dense.	ELEV. m 303.78	o Depth (m)	SPT (N Valu 20 40 60 Shear Strength 100 5	e) 0 80 kPa 200	Combustible Vap 25 5 Natural Moist Atterberg Limits	our Reading (ppm) 50 75 ure Content % \$ (% Dry Weight)	Sample	Natura Unit Weigh
-250 SAND - and la bould comp	mm Topsoil over DY SILT TILL: Fine sand seams ayers, trace gravel, occasional er fragments, brown, moist, act to dense.		0	5	200	10 4	0 20		KIN/M
s in the second	Y SAND: Fine grained, trace and shale fragments, brown, y very dense. OF BOREHOLE.		1 2 3 4 5 6						22.1



roject No.	BRM-00235186-D0	0					Drav	ving No.		36	
roject:	Geotechnical Investigation		Sł	neet No.	1	of					
ocation:	Airport Road and Cranstor	n Drive									
			_			Combus	stible Vap	our Reading]	
ate Drilled:	May 2, 2017		_	Auger Sample SPT (N) Value		Natural Plastic a	Moisture and Liquid	d Limit	×	: 	
rill Type:	D-90-Tire		_	Dynamic Cone Test		Undrain % Strai	ed Triaxia	al at	⊢ −0		
atum:	Geodetic		_	Field Vane Test		Penetro	meter			L	
<u>*</u> _			e	SPT (N Va	alue)	Combus	tible Vapo	ur Reading (pp	m)	Natu	
Symbo	Soil Description	ELEV. m	epth (n	20 40 Shear Strength	60 80 kPa	Natu Atterbe	al Moistu ral Moistu erg Limits	0 75 ire Content % (% Dry Weight	(Sample	Un Weig	
~150	mm Topsoil over	303.11	0	100	200	10) 20	0 30		KIN/I	
SANI	DY SILT TILL: Fine sand seams, gravel, scattered clayey silt	_		Ŏ			×				
seam	ns, brown, wet, loose to dense.			7							
e a		-	1	0				×		21	
р с		_		27							
0 0				ð			×			20	
0 a_			2								
0 e		_					×			22	
<i>•</i>			3							1	
o a				34 O			×			22	
		-									
e e Booo	ming grov, opposional boulder	_~299.1	4								
■ a fragn	nents.										
o c		-		24			~			22	
o c		_	5								
0 a_		_~297.6									
Beco	oming very dense.										
р <u>а</u>		~296.9	6	50 for 100	mm		×				
END	OF BOREHOLE.										

*exp.

 Elapsed Time
 Water Level (m)
 Hole Open to (m)

 On Completion
 0.91
 0.91

	~										Ela n Co May 1	apsed Time omple	etion		vVat Lev (m 2.4 5.8	er el) 4 8	Ho	le Open to (m) 5.64
															Wet			
END O	F BOREHOLE.	~296.4																
	SAND: Fine to medium d, brown, moist, very dense.	_~297.4	6					65 O										
	-	_	5							1	°		×					21.9
	-	_	4		3	5							×					22.6
ο (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	-	_	3		27 O								*					21.9
SAND trace g	/ SILT TILL: Fine sand seams, ravel, trace clay, brown, moist, ct to very dense.	~301.6	1										×		×			22.0
~225 n FILL: C gravel,	nm Topsoil over Clayey silt, some sand, trace brown, wet.	303.04	0	5 O 4										<u>20</u>				
roundwater Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	Shear	20 Strength	SPT (40	N Val	ue) 50	80	kPa	Co	mbusi 25 Natu Atterbe	tible Va 5 ral Mo erg Lin	apour F 50 isture (hits (%	Readir 7 Conter Dry W	ig (ppm 5 nt % 'eight)	Sample (Natura Unit Weigh
Drill Type: [Datum: [D-90-Tire Geodetic	Dynamic Cone Test Shelby Tube Field Vane Test				_	S		Plastic and Liquid Limit Undrained Triaxial at % Strain at Failure Penetrometer					⊕ ▲				
– Date Drilled: <u>N</u>	May 2, 2017	-	Auger Sample			\boxtimes	Combustible Va Natural Moistur					/apour Reading ure						
Project: <u>C</u> Location: <u>A</u>	oject: Geotechnical Investigation cation: Airport Road and Cranston Drive															Sheet No. <u>1</u>		
Project No.	BRM-00235186-D0									JU Drawing N					No. 37			

[*] exp.

Project No. Project: Location:		<u>DI(W-00233180-D0</u>			L	Drawing No.			39									
		Geotechnical Investigation Airport Road and Cranston Drive												Sh	ieet N	io	<u>1</u> (of _
												0						
ate Dri	illed:	April 26, 2017			Auger	Sample	e				1 7	Nat	ural Moi	e vap sture	our Rea	aing	×	
rill Typ	e:	CME 55-Track		_	Dynam	nic Con	e Te	st	-		-	Plas Unc % S	stic and Irained 1 Strain at	Liquic Friaxia Failur	i Limit al at		œ	-0 ,
atum:		Geodetic		_	Field V	ane Te	est			s	•	Per	ietromet	er	C			
Soil/Rock Symbol		Soil Description	ELEV. m	Depth (m)	Shea	20 r Streng	SF 4 gth	PT (N V 0	alue) 60	8	0 kPa	Com	nbustible 25 Natural M terberg L	Vapor 50 Aoistu	ur Readi) re Conte (% Dry V	ng (ppm) 75 ent % Weight)	Sample	Natu Ur Wei
	~200) mm Topsoil over	304.43	0	4		10	00		2	00		10	20		30		
	_clay, wet.	rock fragments, brown, moist to	_															
	_		_	1	ð								×					22
					ð								×					2
	SAN	DY SILT TILL: Fine sand seams,	~302.3	2														
0 0 0 0	trace fragn	e gravel, occasional boulder nents, brown, moist, compact.	_			19 O							*					2
o a_	_		_	3														
0 0						25 O							×					2
0 0 0 0	_																	
0 4	_		_	4														
	_		-			20												
0 a_	_Black	k sand pockets and oxidized	~299.6	5		ð								×				2'
0 C	20110		000.0															
a a a a	Beco	oming dense.	~298.8															
0 a	-		-	6			4	1										
р с С			~297.8					ر ا					×					22
	END	OF BOREHOLE.																
																+		
				_								Elar	osed		Wa	ater	Нс	le Op
													me	\downarrow	(n	vei n) 03	¹	to (m


Cation: Airport Road and Cranston Drive ate Drilled: April 28, 2017 II Type: CME 55-Track Geodetic Section: Geodetic Section: Content of the section of the	roject No.	<u>BRM-00235186-D0</u> Geotechnical Investigation					Drawing No	o o. 1	41 of
ate Drilles: April 28, 2017 Auger Sample Discrete Constantion Vacour Reading Nature Mossion ature: Geodetic Contestition Vacour Reading Image: Constantion Vacour	ocation:	Airport Road and Cranstor	n Drive						
star Dines. III Type: CME 55-Track startin: Geodetic Set 0 Visue Set 0 Visue	ato Drillod:	April 28, 2017		_	Auger Sample	Comb	ustible Vapour Rea	ling [
stum: Geodetic Field Vane Test Streng if Fallen Field Vane Test Streng if Fallen Field Vane Test Streng if Fallen Field Vane Test Field Vane T	ill Type:	CME 55-Track		_	SPT (N) Value O	Plastic	c and Liquid Limit	⊢ ́	-0
Soil Description ELEV. m SPT (N Vake) 20 40 60 60 70 100 100 100 100 100 100 100 100 100	atum:	Geodetic		_	Shelby Tube Field Vane Test	% Stra Penet	ain at Failure rometer	•	€
-250 mm Topsoil over 304.72 100 200 100 200 - Frace gravel, occasional boulder	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) 20 40 60 80 Shear Strength	Combu Na kPa Atter	ustible Vapour Readir 25 50 7 tural Moisture Conter berg Limits (% Dry W	g (ppm) 5	Natu Un Weig
SILTY SAND: Fine grained, silt seams, brown, moist, very dense. -298.5 END OF BOREHOLE.	~250 i SAND trace of fragmo	mm Topsoil over Y SILT TILL: Fine sand seams, gravel, occasional boulder ents, brown, moist, compact.		0 1 2 3 4	100 200 5 0 16 14 0 19 0 23 0 19 0 19 0 10 10 10 10 10 10 10 10 10		10 20 3		21 21 22 22 22
	seams	SAND: Fine grained, silt s, brown, moist, very dense. DF BOREHOLE.		6	36 50 for 125mm		×		Z

*exp.

oject No.	BRM-00235186-D0	0						Drawing No	·	42	<u>.</u>
oject:	Geotechnical Investigatio	n Drivo						Sheet No	1	_ of	_
ocation:	Allport Road and Cransid	n Drive									
ate Drilled:	May 9, 2017		_	Auger Sample	_	\boxtimes	Combus Natural I	tible Vapour Readi Moisture	ng	□ ×	
rill Type:	CME 55-Track		_	SPT (N) Value Dynamic Cone Test	0		Plastic a Undraine	and Liquid Limit ed Triaxial at	H		С
atum:	Geodetic		_	Shelby Tube Field Vane Test		■ ŧ	% Strain Penetro	n at Failure meter		⊕	
~				SPT	N Value)	0	Combust	ible Vapour Reading	(ppm)	N	latı
Soil/Rock Symbol	Soil Description	ELEV. m 304 21	Depth (m	20 40 Shear Strength 100	60	80 kPa 200	25 Natur Atterbe	ral Moisture Content rrg Limits (% Dry We 20 30	% eight)	N Sample M M	Ur √ei ⟨N/
~300	mm Topsoil over /EY SILT TILL: Fine sand		0	ð				×			
wet, s	is, trace gravel, brown, moist to stiff to very stiff.	-									
		-	1					×			
		_		16							
			2	Ő				×			
6				24						7	
		1		Θ				*		2	
A 1.9		-	3	24				~		7	
9 / 9		-						^		2	
	ming grov, wat stiff	_~300.2	4								
	nning grey, wet, stin.										
0				18 Ö	A			×			
		-	5								
		-									
		-	6	11						77	
		~297.6		Ö	A		2	*			
END	OF BOREHOLE.										
			_]				Elapsed	Wate	r 	Hole C	Op
2.						0	n Comple	(m)	, -	to (r 6.1	_m 10
ά ΟVΙ	n					N	ay 15, 20)17 1.82			

roject No.	BRM-00235186-D0	Ū			Draw	ing No.	43
roject: ocation:	Airport Road and Cransto	n Drive			Sh	eet No.	<u> </u>
			_		Combustible Vap	our Reading	
ate Drilled:	May 9, 2017		Auger Sample - SPT (N) Value	⊠) ⊠	Natural Moisture	Limit L	×
rill Type:	CME 55-Track		Dynamic Cone Test	•	Undrained Triaxia % Strain at Failure	l at e	0
atum:	Geodetic		_ Field Vane Test	s	Penetrometer		
Soil/Rock Symbol	Soil Description	ELEV. m	E SPT (N Value) ± 20 40 60 Shear Strength 20 40 60	80 kPa	Combustible Vapou 25 50 Natural Moistur Atterberg Limits (r Reading (ppm) 75 e Content % % Dry Weight)	Sample Sample We KN
P 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	mm Topsoil over /EY SILT TILL: Fine sand is, trace gravel, occasional ler fragments, brown, oxidized ets, moist, stiff to hard.				×××××		
		_			× *		
		_	4	*	×		
Beco	ming grey.	~297.8 	6				
END	OF BOREHOLE.	~296.8			×		
					Elapsed Time	Water Level	Hole O to (m
2				O	n Completion	1.22	1.2

Project No.	BRM-00235186-D0	90	•					Drawing N	No	4	44
Project:	Geotechnical Investigation							Sheet N	No	1	of _1
ocation:	Airport Road and Cranstol	1 Drive									
ate Drilled [.]	April 28, 2017		_	Auger Sample		\boxtimes	Combustible Natural Mois	∋ Vapour Rea sture	ading	□ ×]
rill Type:	CME 55-Track			SPT (N) Value Dynamic Cone Test		0 🛛	Plastic and	Liquid Limit	ŀ		—0
atum:	Geodetic			Shelby Tube Field Vane Test			% Strain at	Failure		€)
i .			_			S		<u>.</u>			• •
mbol	Soil Description	ELEV.	oth (m)	SPT 20 40	(N Valu	ue) 0 80	25 Natural N	50 Joisture Cont	ing (ppm) 75 ent %	mple	Natu Uni
. <u>9</u> ⊘	mm Tanaail avar	m 306.39	o Dep	Shear Strength		kPa 200	Atterberg L	imits (% Dry)	Weight) 30	Sa	kN/r
FILL:	: Silty sand, fine to medium			Å Ö				×		V	
grey,	moist with wet zones.										
		_	1	Å –				<			
		_									
				Ó			×				
		-	2								1
		_		Ô				- × -			
		_	3								1
				Ő.				×			
		_									
	Y SAND: Fine grained, brown.	~302.4	4								
wet,	compact.										
				25 O				×			
		_	5								
		_~300.8									
	gravel, brown, moist, compact.		6								
0 0				22 Ö				×			21
END	OF BOREHOLE.	~299.8									
			_						ater	_	
							Elapsed Time	Le	evel	Ho	ole Ope to (m)

·́ехр.

roject ocatio	: n:	Geotechnical Investigation Airport Road and Cranstor	n Drive					Sheet No.	<u> </u>	of _1
ate D rill Ty atum:	rilled: pe:	May 8, 2017 CME 75-Marooka Geodetic		_	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Combustible V Natural Moistu Plastic and Lic Undrained Tria % Strain at Fa Penetrometer	/apour Reading ure quid Limit H axial at ailure	× () () () () () () () () () ()	 :
soil/Rock Symbol		Soil Description	ELEV. m	epth (m)	SPT (N 20 40 Shear Strength	Value) 60 80 kP	Combustible Va 25 Natural Moi a Atterberg Lim	apour Reading (ppm) 50 75 isture Content % iits (% Dry Weight)	Sample	Natura Unit Weigh
	~225 FILL clay, 	5 mm Topsoil over : Sandy silt to silty sand, trace brown, moist to wet.	308.19 	0				20 30		4N/m 19.9 21.9
	- SILT - mois	Y SAND: Fine grained, brown, t, compact to dense.	~306.0 	2	39		*			21.6
	 	oming wet, compact.		3	25 O		×			
	_		-	5	14		×	<		21.
	_		_	6	25 O		×	<		
0 0	SAN trace	DY SILT TILL: Fine sand seams, gravel, brown, moist, dense.	~301.2	7	37					
	END	OF BOREHOLE.	~300.1				×			22.:
								Water		
	~~~	5				_	Elapsed Time On Completion	Level (m) Dry	Ho	to (m)

oject: ocation:	Geotechnical Investigation Airport Road and Cranston	Drive					Sheet N	No. <u>1</u>		of _1
ate Drilled: rill Type: atum:	May 8, 2017 CME 75-Marooka Geodetic		_	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		C N P U % P	iombustible Vapour Re latural Moisture lastic and Liquid Limit Indrained Triaxial at 5 Strain at Failure enetrometer	ading  -	× •	O
×operative volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volume volu	Soil Description mm Topsoil over Sandy silt, trace gravel, trace brown, topsoil stained pockets,	ELEV. m 308.82	⊂ Depth (m)	SPT (N 20 40 Shear Strength 100 7	Value) 60 80 200	kPa	ombustible Vapour Reac 25 50 Natural Moisture Cont Atterberg Limits (% Dry 10 20	ling (ppm) 75 ent % Weight) 30	Sample	Natu Uni Weig kN/r
mois	t, loose. - -	_	1	<b>0</b> <b>0</b>			×			21
SILT – grain comp	Y SAND: Fine to medium ed, brown, grey seams, wet, pact.	~306.6	3	14 0 14 0			* *			
	-	_	4	ð			×			
grave	YEY SILT TILL: Silt seams, trace el, brown, wet, stiff.	~303.2	6	12 O			*			20
END	OF BOREHOLE.	_~302.2								
			_			E On C	lapsed Time ( ompletion 2	ater evel m) .89	Ho	le Op to (m) 2.89

roject: ocation:	Geotechnical Investigation Airport Road and Cranstor	n Drive							 				She	eet	No	1	of _1
ate Drilled:	May 8, 2017		-	Auger	Sampl	e			3	) 1	Combu Natura	ustible ' I Moist	Vapo ure	our Re	eading	□ ×	]
rill Type:	CME 75-Marooka		_	SPT (N Dynam	l) Valu ic Con	ie Ie Tes	t	-	2 _	F	Plastic Undrai	and Li ned Tri	quid axial	Limit at		-	-0
atum:	Geodetic		_	Shelby Field V	Tube ane Te	est			S	ſ	% Stra Penetr	in at Fa	ailure	9		4	•
Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	Shear	20 r Stren	SP 40 gth	T (N V	alue) 60	 80 kPa	( a	Combu 2 Nat Attert	stible V 25 cural Mo berg Lin	apou 50 histure nits (9	r Rea e Con % Dry	ding (ppm 75 tent % Weight) 30	Sample (	Natura Unit Weigh kN/m
~330 FILL brow	) mm Topsoil over : Silty sand, clayey silt pockets, n to dark brown, moist.		0	Ō									<b>X</b>				
_		~305.7	1	ð									×				
- SILT   brow	Y SAND: Fine grained, stratified, n, wet, loose.	-	2	ð									×				
		_		Ŏ								>	<b>-</b>				
		_	3	° O									<b>&lt;</b>				
SAN and	DY SILT TILL: Fine sand seams layers, trace gravel, brown, moist, bact to very dense.	~303.1	4														
0 0 0 0		_	5	Ő								×					
0 c		_	6														
0 C		_							85 O		>	¢					
a a		_	7														
e e END	OF BOREHOLE.	~299.0								98 O	×						
			_							E	Elapse Time	d		W	ater evel	н	l ble Oper to (m)

Project No. Project: Location:	BRM-00235186-D0 Geotechnical Investigation Airport Road and Cranstor	n Drive	-							Dra _ S	wing N heet N	o o1	(	18 of _2
Date Drilled: Drill Type: Datum:	May 11, 2017 CME 55 - Rubber Track Geodetic			Auger Sampl SPT (N) Valu Dynamic Cor Shelby Tube Field Vane T	e le le Te est	st	0		Com Natu Plast Undr % St Pene	bustible Va ral Moistum ic and Liqu ained Triax rain at Fail etrometer	ipour Rea e iid Limit iial at ure	iding  -	□ × ⊕	-0
roundwater Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	20 Shear Stren	SF 4 gth	PT (N Va 0	lue) 60	80 kPa	Comb N Atte	oustible Vap 25 atural Moist erberg Limit	our Readi 50 ture Conte s (% Dry V	ng (ppm) 75 nt % Veight)	Sample	Natura Unit Weigh
CLAY seams boulde seams	mm Topsoil over EY SILT TILL: Fine sand s, trace gravel, occasional er fragments, brown, oxidized s and fissures, moist, hard.	303.35	0	ð 11						10 2 X			59 X	⁹ 22.3
		_	2	22 O						×				22.6
		_	3							*				22.3
	ning grey, shale fragments, wet.	~299.4	4							×				23.
			5	25 O						×				
SAND	O AND GRAVEL: Clayey silt b, brown, moist, very dense.		6				72 0			×				
C C C C C C C C C C C C C C C C C C C	Y SILT TILL: Fine sand seams, gravel, trace clay, occasional er fragments, brown, moist,	<u>-</u> ~296.3 _	7											
		_ ~294.7	8			Ö								
• • • • • • • • • • • • • • • • • • •	ning grey, compact.	_	9	22	9					×				23.1
0	Continued Next Page		10						Elaps	sed	Wa	ter	Ho	le Oper
*ex	О.							O M N	Tim n Com lay 15 lay 19	e pletion , 2017 , 2017	(n (11. 10. 10.	n) 73 14 44	1	io (m)

### Log of Borehole 47D BRM-00235186-D0



Pi	oject:	Geotechnical Investigation	า																She	et l	No.		2	of _2_
vater	<u>ас</u> к		EL EV	(m	//				SP	T (N	Val	ue)				Corr	nbust 25	tible Va	apour 50	Read	ding 75	(ppm)	a	Natural
ound	Symb	Soil Description	m	Depth		Shea	20 ar Str	engt	40 h	)	e	60	1	80 kl	Pa	At	Natu terbe	ral Mo erg Lim	isture hits (%	Con 6 Dry	tent Wei	% ght)	Samr	Weight
ۍ H			293.35	10					10	0			2	200			10	)	20		30			kN/m [*]
		SILTY SAND: Fine grained, brown,	~293.3																	+				
			_		H															+			H	
ŀ												1						,		#				
		—	_	11	1					+		ř								+			Ľ	4
					H																			
H		_	~291.7		Ħ															#				
		Becoming wet, dense.																		++				
U		_			É																			_
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25		END OF BOREHOLE.	~290.7																	+			P	4
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Project No.

Geotechnical Investigation

Elapsed Time	Water Level (m)	Hole Open to (m)
On Completion May 15, 2017 May 19, 2017	11.73 10.14 10.44	11.89

Project No. Project: Location:	BRM-00235186-D0 Geotechnical Investigation Airport Road and Cranston	Drive		Dorci			Dra	wing No	4 1_0	8A of <u>1</u>
Date Drilled: Drill Type: Datum:	May 11, 2017 CME 55- Rubber Track Geodetic		_	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test	0		Combustible Va Natural Moistur Plastic and Liqu Undrained Tria % Strain at Fai Penetrometer	apour Reading e uid Limit <b>k</b> kial at ure	⊂ × €	 
Groundwater Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N 20 40 Shear Strength 100	Value) 60	80 kPa 200	Combustible Vap 25 Natural Mois Atterberg Limit	bour Reading (ppm) 50 75 ture Content % (% Dry Weight) 20 30	Sample	Natura Unit Weight kN/m ³
CLA Sean Double Sean Sean Sean Sean Sean Sean Sean Sea	) mm Topsoil over YEY SILT TILL: Fine sand ns, trace gravel, occasional der fragments, brown, oxidized ns and fissures, moist, hard.		1	<b>*</b>		>	×			⁹ 22.3
	-	_	2				×	•		22.6 22.3
	- - pming grey, shale fragments, wet.	~299.4	3	19 Ö			×			23.2
	- 	~297.8	5	25 O			×			
	oc popeliol e	~296.8	6		72 Č	2 2 3	*			
END	OF BOREHOLE.									
			_				Elapsed Time	Water Level	Hc	ble Open to (m)
*ex	p.					O N N	n Completion lay 15, 2017 lay 19, 2017	Dry 3.93 4.37		6.10

oject: cation:	Geotechnical Investigation Airport Road and Cranston	n Drive			She	et No. <u>1</u>	_ of _
te Drilled:	May 8, 2017		- Auger Sample		Combustible Vapou Natural Moisture	r Reading	□ ×
ll Type: tum:	CME 75-Marooka Geodetic		Dynamic Cone Test Shelby Tube		Plastic and Liquid Li Undrained Triaxial a % Strain at Failure Penetrometer	imit –	()
nbol	Soil Description	ELEV.	E 20 40	Value)	Combustible Vapour P 25 50	Reading (ppm) 75	Nat
الم الم الم الم الم	) mm Topsoil over	m 306.06	Shear Strength 0 100	kPa 200	Atterberg Limits (%	30	wei Wei kN/
	el, brown, wet.	_			*		
CLA sean	YEY SILT TILL: Fine sand ns, trace gravel, occasional gravel sets, brown, moist, firm to very	~304.7	4 0 2		×		
Sun.		_			*		
		_		<b>A</b>	×		
SAN trace	DY SILT TILL: Fine sand seams, e gravel, brown, moist, compact.	~302.0	4				
		_	5		×		
		~299.9	6	91			
SILI wide very END	ely scattered gravel, brown, moist, dense.	~299.5					
						Water	
					Elapsed Time	Water Level (m) 2 74	Ho

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oject: cation:	Geotechnical Investigation Airport Road and Cranstor	n Drive				S	heet No	1_of
te Drilled:	May 8, 2017		_	Auger Sample		Combustible Va Natural Moistur	pour Reading	□ ×
ll Type:	CME 75-Marooka		_	Dynamic Cone Test -		Plastic and Liqu Undrained Triax	id Limit ial at	(
tum:	Geodetic		_	Shelby Tube Field Vane Test	S	% Strain at Fail Penetrometer	ure	▲
Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Value) 20 40 60 Shear Strength	80 kPa	Combustible Vap 25 Natural Mois Atterberg Limit	our Reading (ppm) 50 75 ure Content % s (% Dry Weight)	Sample M M
~150 FILL: grave	mm Topsoil over Sandy silt to clayey silt, trace I, brown to dark brown, moist.	309.19	0				× · · · ·	
SANI trace	DY SILT TILL: Fine sand seams, gravel, sand and gravel layer, n moist loose	~308.2	1	- Ô-		×		
	Y SAND: Fine grained, widely	~307.1	2	Ô		×		
to ve	ered gravel, brown, moist, dense ry dense.	_	3	Ö		*		
		_	0	56 O		×		
		_	4					
		_	5			×.		
	ased silt content, becoming wet, a.	~303.6 	6					
END	OF BOREHOLE.	~302.6		Ő		×		
			_			Elapsed	Water Level	Hole C
					0	n Completion	(m) Dry	5.7



### Log of Borehole 51D BRM-00235186-D0

Project No.

Ρ	roject:	Geotechnical Investigation	n														_	S	hee	et N	lo.		2_0	of <u>2</u>
vater	ock		FI EV	(E				SI	PT (N	Valu	ıe)				Co	ombu	ustible 25	e Vap	our F 50	₹eadi	ng (p 75	ppm)	ole	Natural
round	Soil/R Symt	Soil Description	m	Depth	SI	hear	20 Strer	4 ngth	40	6	0	8	10 	кРа		Na Atter	tural berg	Mois Limit	ture ( s (%	Conte Dry V	nt % Neig	ht)	Sam	Weight
0			300.01 ~299.8	10				1	00			20	00				10		20		30			
	0 0	SANDY SILT TILL: Silt seams, trace																			⋕			
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i H	0 0	_	~297.7	12					60	for (	100r	nm					×				$\mp$			
<u> </u>		END OF BOREHOLE.																			-			
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BRM-00235186-D0 Geotechnical Investigation Airport Road and Cranstor	n Drive			Drawing	No	53 of1
May 12, 2017 CME 55 - Rubber Track Geodetic		Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Combustible Vapour F Natural Moisture Plastic and Liquid Linr Undrained Triaxial at % Strain at Failure Penetrometer	Reading	
Soil Description	ELEV. m	E         SPT (N Value)           10         20         40         60           Shear Strength         Shear Strength         Shear Strength	e) 0 80 kPa	Combustible Vapour Re 25 50 Natural Moisture Co Atterberg Limits (% D	ading (ppm) 75 ontent % ry Weight)	Natural
mm Topsoil over Silty sand, trace gravel, trace orown, wet. Y SILT TILL: Fine sand seams, gravel, occasional boulder ents, brown, oxidized pockets, compact. SAND: Fine grained, stratified, , wet, compact.	310.64  ~308.4  ~306.6 			10 20 X X X X X		21.6
		6 26 0 7 21 0		×		
DF BOREHOLE.						
	BRM-00235186-D0 Geotechnical Investigation Airport Road and Cranston May 12, 2017 CME 55 - Rubber Track Geodetic Soil Description mm Topsoil over Silty sand, trace gravel, trace prown, wet. Y SILT TILL: Fine sand seams, gravel, occasional boulder ents, brown, oxidized pockets, compact.	BRM-00235186-D0       Geotechnical Investigation         Airport Road and Cranston Drive         May 12, 2017         CME 55 - Rubber Track         Geodetic         Soil Description         mm Topsoil over         Silty sand, trace gravel, trace         prown, wet.         -         -         -         -         -         -         -         -         Soil Description         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -	BRM-00235186-D0         Geotechnical Investigation         Airport Road and Cranston Drive         May 12, 2017       Auger Sample         CME 55 - Rubber Track       SPT (N) Value         Geodetic       Presented SPT (N) Value         Soil Description       ELEV.         mm Topsoil over       310.64         Silty sand, trace gravel, trace       -308.4         enst, brown, oxidized pockets, compact.       -308.6         SAND: Fine grained, stratified, wet, compact.       -306.6         enst, brown, oxidized pockets, compact.       -302.5	BRM-00235186-D0         Geotechnical Investigation         Airport Road and Cranston Drive         May 12, 2017         CME 55 - Rubber Track         Geodetic         Soll Description         Field Vane Test         Soll Description         Field Vane Test         Soll Description         Field Vane Test         Soll Description         Geodetic	BRM-00235186-D0       Drawing         Geotechnical Investigation       Sheet         Airport Road and Cranston Drive       May 12, 2017         CME 55 - Rubber Track       Oradical Sheet         Geodetic       Sheet         Sol Description       ELEV.         Trace gravel, trace gravel, trace rown, wet.       Sol Description         -306.6       Sheet rown, and ized pockets, compact.       -306.6         -306.7       -306.6         FBOREHOLE.       -302.5	BRM-00235186-D0       Drawing No.

oject:		Geotechnical Investigation	า										Sh	eet N	o	<u>1</u>	of _
ocatio	n:	Airport Road and Cransto	n Drive														
				_	Auger S	ample					Cor	nbustibl	le Vapo	our Rea	ding		
ate Dr	illed:	May 12, 2017		-	SPT (N)	) Value			0	0	Nat Pla:	ural Mo stic and	isture Liquid	Limit	ŀ		-0
rill Typ	be:	CME 55 - Rubber Track		_	Dynami Shelby	c Cone Tube	Test				Uno % S	drained Strain at	Triaxia Failur	l at e		$\oplus$	ŀ
atum:		Geodetic		_	Field Va	ane Tes	t			s	Per	etrome	ter				
oil/Rock symbol		Soil Description	ELEV.	epth (m)	Shear	20 Strengt	SPT 40	(N Val	ue) 60	80	Com	nbustible 25 Natural	Vapou 50 Moistur	r Readir 7 e Conte % Dry W	ng (ppm) 75 nt % (eight)	ample	Natu Un Wei
So.	~100	) mm Topsoil over	310.73	0 D			100			200		10	20		30	0 -//	kN/i
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a .a	loose	9.			6												22
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0 0	_		-		6								,				21
o .	_		~308.6	2									<b>`</b>			4	2
	SILT	<b>Y SAND:</b> Fine grained, ented zones, brown, moist,				24					×						
	comp	pact.														4	
	_		-	3	1	8						,					
	_		_			1						<b>`</b>				4	
	_		~ 306.6	4													
	Becc	oming wet, increased silt content.	-300.0														
	_		-		13												10
	_		_	5										<b>`</b>		4	18
	_		~305.1														
	Becc	oming dense.															
	_			6		31							V				
	_		-				/									4	
	_		_	7													
0 0	SAN	DY SILT TILL: Fine sand seams,	~303.5														
0 0	comp	pact.			15												21
a a	_		-	8												4	2
0 0	_		~302.1														
0 e	Beco	oming moist, very dense.															
	END	OF BOREHOLE.	~301.5	9			50 f	or 80m				×					22
														Wa	ter		
											Elap Ti	ne		Lev (m	vel 1)	Ho 1	to (m)
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Project No. Project: Location:	BRM-00235186-D0 Geotechnical Investigation Airport Road and Cranstor	Drive	' I	Doron		0-	Drav	wing No heet No	! 1	55 of <u>2</u>
Date Drilled: Drill Type: Datum:	May 12, 2017 CME 55 - Rubber Track Geodetic			Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Con Nati Plas Und % S Pen	nbustible Va ural Moisture stic and Liqui rained Triaxi train at Failu etrometer	pour Reading d Limit d ial at ire	×	] O
5roundwater Soi/Rock Symbol	Soil Description	ELEV.	Depth (m)	SPT (N Va 20 40 Shear Strength	lue) 60 80 k	Com Pa At	bustible Vapo 25 5 Natural Moistr terberg Limits	our Reading (ppm) 0 75 ure Content % (% Dry Weight)	Sample	Natura Unit Weigh kN/m ³
<pre></pre>	) mm Topsoil over DY SILT TILL: Fine sand seams, e gravel, brown, moist to wet, pact.		1	100 3 0 11 0 12			10 2 X			21.7
— mois	<b>Y SAND:</b> Fine grained, brown, t, dense.	~309.0	3	40 O		×				
SAN and l dens	DY SILT TILL: Fine sand seams layers, trace gravel, brown, moist, se to very dense.	_~307.2 	4		en C		*			23.1
o Wet o 	sand layer.	~304.9 	6	<b>4</b> 1			×			
		-	8	50 for 130						22.8
0	Continued Nevt Page		9	50 for 100			*	Water		
*ex	P.				_	Elap Tir On Con	ne npletion	Water Level (m) 5.69	Ho	ble Open to (m) 5.79

# BRM-00235186-D0 Log of Borehole 54

oject No.	BRM-00235186-D0	0														Dra	awi	ng N	lo.		5	55
oject:	Geotechnical Investiga	ation									 					S	She	et N	lo.	_2	_ c	of
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Soil/Ri Symt	Soil Description	m	Depth	She	20 ar S	) treng	4 th	)	6	60	 80	kPa	-	Na Atter	tura berg	l Mois Limi	sture ts (%	Conte 6 Dry \	ent % Veigh	t)	Samp	Wei
		301.23	10				10	0			200				10		20		30		H	KIN/
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oject: ocation:	Geotechnical Investigation Airport Road and Cransto	n n Drive				SI	neet No.	<u>1</u> c	of
ate Drilled: ill Type: atum:	May 12, 2017 CME 55 - Rubber Track Geodetic			Auger Sample SPT (N) Value O 🖸 Dynamic Cone Test Shelby Tube Field Vane Test		Combustible Vap Natural Moisture Plastic and Liqui Undrained Triaxi % Strain at Failu Penetrometer	bour Reading d Limit al at re	×	-0
Soil/Rock Symbol	Soil Description	ELEV. m 309 13	Depth (m)	SPT (N Value) 20 40 60 80 Shear Strength 100 200	kPa	Combustible Vapo 25 5 Natural Moistu Atterberg Limits 10 2	our Reading (ppm) 0 75 ure Content % (% Dry Weight) 0 30	Sample	Natu Uni Weiç kN/r
SILT mois – – Becc	Y SAND: Fine grained, brown, t, loose to compact. oming wet, cemented.	~307.7 	1			*	<		
<ul> <li>SAN</li> <li>trace</li> <li>very</li> </ul>	<b>DY SILT TILL:</b> Fine sand seams, gravel, brown, moist, compact to dense.	~305.0 	3	19 0 19 0		×			21
а а а а а а а а а а а а а а а а а а а		  ~301.3	6	34 Ŏ 56 for 230mm		×			2:
END	UF BUREHULE.								
					0	Elapsed Time	Water Level (m)	Ho	le Op 10 (m

oject: cation:	Geotechnical Investigation Airport Road and Cranstor	n Drive											Shee	et No	1	_ 0	of _
te Drilled [.]	May 8, 2017		_	Auger Sa	ample					0	Combu Natura	ıstible \ I Moistu	/apour ire	Readi	ing		
II Type:	CME 75-Marooka		_	SPT (N) Dynamic	Value Cone [·]	Test		0	2	F	Plastic	and Lic	quid Lir	nit	F		-0
itum:	Geodetic		_	Shelby T Field Var	ube ne Test			1	S	9 F	% Stra Penetr	in at Fa	illure			⊕	
Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	2 Shear S	0 Strength	SPT (I	N Valu 60	e) )	80 kP	C	Combus 2 Nat Attert	stible Va 25 ural Moi berg Lim	sture C its (% [	eading 75 Content Dry We	(ppm) % sight)	Sample	Natu Ur Wei kN/
~200 FILL grave	) mm Topsoil over : Clayey silt, trace sand, trace el, brown, wet.	305.93	0	ð									×	30			
_		_	1	ð								×					
		~303 8	2	ð								×					
CLA sean	YEY SILT TILL: Fine sand ns, trace gravel, brown, moist, stiff changing to firm.			13 O								*					
		-	3	5 O								×					
SAN	DY SILT TILL: Fine sand seams,	~301.9	4														
trace	e gravel, brown, wet, very dense.	-					53 O						×				
0 1 d 2 1 d		~300.3	5														
SILT mois	Y SAND: Fine grained, brown, it, dense.	-	6		31												
END	OF BOREHOLE.	~299.3															
			_							E	lapse Time	d		Wate Leve (m)	er I	Hol	e Op o (m)
	n									On C May	ompl 15, 2	etion 2017		Dry		;	5.94





roject:	Geotechnical Investigation						Sheet No	1	of _2
ocation:	Airport Road and Cranston	Drive							
ate Drilled [.]	 May 10_2017		- ,	Auger Sample	$\boxtimes$	Combust Natural M	ible Vapour Reading loisture	×	]
rill Type:	CME 75-Marooka		- s	SPT (N) Value Dynamic Cone Test	0 🛛	Plastic ar	nd Liquid Limit	⊢́	—0
atum:	Geodetic		- 5 - F	Shelby Tube Field Vane Test		% Strain Penetron	at Failure neter	€	)
1					S	Combustit	ole Vanour Reading (non	<u></u>	
Soil/Rock Symbol	Soil Description	ELEV. m 309 42	> Depth (m)	SPT (N Va 20 40 Shear Strength 100	lue) <u>60 80</u> kP 200	a Atterber 10	50 75 al Moisture Content % g Limits (% Dry Weight) 20 30	Sample	Natu Un Weię kN/r
~150 • <b>SAN</b>	) mm Topsoil over <b>DY SILT TILL:</b> Fine sand seams	000.12	0	6 O			<		
and occa	layers, trace gravel, trace clay, sional boulder fragments, brown,	_							
	a, compact to dense.	_	1	O O			×	V	22
а —		_							
0 e				Ö			<		22
o q				43					
o a		-		$\rightarrow$			*		21
o a a a	-	~306.2	3	40					
SILT	Y SAND: Fine grained, sandy silt rs, cemented zones, widely	_		Φ		×			
	tered gravel, brown, moist, dense.								
				43					
	-	_	5						
		_							
			6						
				43 O		- ×			
	-								
	-	_	7						
		_							
			8	Å5 Ö		×			22
	-	1	9	34					
	-	-		U U		×			
	Continued Next Page		10				\\\/_+	<u></u>	
	Continueu Next Page					Elapsed Time	vvater Level (m)	Ho	ole Ope to (m)
						On Complet May 15, 20	ion Dry 17 Dry		18.29

#### Log of Borehole 59 BRM-00235186-D0 Project No. Drawing No.





5/6/17

roject: ocation:	Geotechnical Investigatio Airport Road and Cransto	n on Drive				S	whig No	 1 c	of
ate Drilled: rill Type: atum:	May 16, 2017 CME 55-Rubber Track Geodetic			Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Combustible Va Natural Moisture Plastic and Liqu Undrained Triax % Strain at Failu Penetrometer	ipour Reading e iid Limit <b>l</b> iial at ure	□ × ⊕	O
Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N Va 20 40 Shear Strength	alue) 60 80 kPa	Combustible Vap 25 5 Natural Moist Atterberg Limits	our Reading (ppm) 50 75 ture Content % s (% Dry Weight)	Sample	Natu Un Weig kN/r
~75 I FILL brow	mm Topsoil over : Silty sand, trace clay, dark n, wet.	306.60	0				20 30		
	<b>DY SILT TILL:</b> Fine sand seams ayers, trace gravel, brown, moist, oact.	~304.7	2	5 O 21			×		
- SILT ceme layer dens	<b>Y SAND:</b> Fine grained, ented zones, silt seams and s, brown, moist, dense to very e.		3	46 0		*			20
		_	4		70	*			
	OF BOREHOLE.	~300.0	6		7	*			
						Florend	Water		
Έργ	n					Elapsed Time On Completion May 17, 2017	Level (m) Dry Dry Dry	Ho t	ie Op to (m) 5.99

Project No. Project:	BRM-00235186-D0 Geotechnical Investigation	<b>og o</b>	f	Boreł	nole	62	Drav Sł	ving No	6 10	33 of <u>1</u>
Location:	Airport Road and Cransto	n Drive								
Date Drilled: Drill Type:	May 16, 2017 CME 55- Rubber Track		_	Auger Sample SPT (N) Value Dynamic Cone Test		Comi Natur Plast Undr	oustible Vap ral Moisture ic and Liquid ained Triaxia	our Reading d Limit I al at	×	-0
Datum:	Geodetic		_	Shelby Tube Field Vane Test	∎ ŧ	% St Pene	rain at Failui trometer	re		
Groundwater Soil/Rock Symbol	Soil Description	ELEV. m 307.21	Depth (m)	SPT (N 20 40 Shear Strength 100	S I Value) 60 80 200	Comb kPa Atte	ustible Vapo <u>25 50</u> atural Moistu rberg Limits 10 20	ur Reading (ppm) ) 75 re Content % (% Dry Weight) ) 30	Sample	Natural Unit Weight kN/m ³
	) mm Topsoil over Y SAND: Fine grained, silt rs, brown, wet, compact. DY SILT TILL: Fine sand seams		0 1 2 3 4				× ×			
	der fragments, brown, moist, se to very dense.	  ~300.1	5 6 7	31 O	78		×			22.4
	of BoreHOLE.	 ~297.6	8		75 for 250r	ım	×			22.4
*ex	p.	-	_1			Elaps Tim On Com	ed e	Water Level (m) Dry	Ho	le Open to (m) 3.05



# BRM-00235186-D0 Log of Borehole 63

roject No.	BRM-00235186-D0	- 3 -	-		_	_		-	-	-		-	-	-		Drav	wing	No.		64
roject:	Geotechnical Investigat	ion														SI	neet	No.	_2_	of _2
5-0-C	<b>-</b>	FI FV	(E				SI	PT (N	l Valı	ue)			(	Combu	ustible 25	e Vapo 5	our Rea 0	iding (p 75	pm) 은	Natur
Symt	Soil Description	m	Depth	Sł	2 near \$	20 Stren	4 gth	10	6	60	8	30 kPa	_	Na Atter	tural berg	Moistu Limits	ire Con (% Dry	tent % /Weigh	t) (t	Weig
		302.56	10				1	00			2	00			10	2	0	30		KIN/II
0 0																				
° -		~301.8					50	) for	100n	nm				×						22.
EN	ID OF BOREHOLE.																			
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						Ħ														
						Ħ			+											
						Ħ				H					$\square$					
						Ħ		Ħ												
I			l							1			<u></u> ,	Elanse	ed be		v	Vater	Н	
														Time			L	.evel (m)		to (m)
•													On C	Comp	letio	'n		Dry		10.61
°ex	(D.																			
0/	` <b>`</b>																			
	I																			

roject: Geotechnical Investigation Airport Road and Cranston Drive												_	S	Shee	et No		1	of _2
ocation:	Aliport Road and Crariston	n Drive																
ate Drilled: May 17, 2017				Auger Sar	mple /alue			$\cap$			Con Nati	nbus ural I	tible Va Noistur	apour e	Readi	ng	×	]
rill Type:	CME 55-Rubber Track		- !	Dynamic (	Cone 1	Fest		_			Plas Und	stic a Iraine	ed Tria	uid Lir kial at	nit	I	Œ	—O ə
atum:	Geodetic		_	Field Van	e Test				s		Pen	etro	neter	ure				
Soil/Rock Symbol	Soil Description	ELEV.	Depth (m)	20 Shear St	) trength	SPT ( 40	N Valu 61	e) D	80	kPa	Com I Att	busti 25 Natur terbe	ible Vap ral Mois rg Limit	oour R 50 ture C s (% [	eading 75 Content Dry We	(ppm) % eight)	Sample	Natur Unit Weig kN/m
~300 SAN	0 mm Topsoil over IDY SILT TILL: Fine sand seams,	312.27	0	5					200				×	20	30			
_ L_trace	e gravel, trace clay, occasional der fragments, brown, moist,	-																
<pre>compact.</pre>	_	1	Ö								2	×					22.	
	_		14															
	_	2	0								ľ	×				ľ	22.	
	_		17								×							
	_	3	18 O								>	<					22.	
	_																	
	_~308.3	4																
a a a		_					EA											
		_	5				Ö					×						22.
d do d																		
		_	6						921	or 280 O	mm		×					21.2
		-																
SIL1	TY SAND: Fine grained, silt	~305.3	7															
<ul> <li>seams and layers, brown, wet,</li> <li>compact.</li> </ul>	pact.	_																
	_	8	Č	5								×						
	000 7																	
SANDY SILT TILL: Fine sand seams and layers, trace gravel, brown, moist, compact to very dense.	~303.7																	
		9	16									~						
0 0 0 0		-																22.
	Continued Next Page		10												Wate	r	<u> </u>	
											Elap Tir	ne			Leve (m)	I	н	to (m)

## Project No. BRM-00235186-D0 Log of Borehole 64D Drawing No.

roject No.	BRM-00235186-D0	0					Ū		Ū	-	Ū				Draw	ving	No.		6	65
roject:	Geotechnical Investigation	on												_	Sh	leet	No.	_2	2_0	of _2
ž-			(E	SPT (N Value)						Comb	oustible V 25	Vapou 50	ur Rea	ding (j 75	ppm)	ē	Natura			
Symb	Soil Description	m	epth (	She	20 ar S	) treng	40 th	)	60		80	kPa	N Atte	latural M erberg Li	loistur imits (	re Cor (% Dry	itent % Weig	% ght)	Samp	Unit Weigh
		302.27	10				10	0			200			10	20	)	30			kN/m
0 0																				
o -		_																		
a a											8	4 )		×						
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0 a																				
0 e																				
0 a_		_	12																	
a		~300.0					50	for 80	mm					×					Z	
END	OF BOREHOLE.																			
					+															
					Ħ				F								Ħ			
					Ħ				H											
					+															
						+														
													Elaps	sed		V	/ater		Hc	le Op
													Tim	e			.evel (m)			to (m)
												0	n Com	pletion	ιſ	Ī	Dry	ſ		12 1 <u>9</u>



Project: Geotechnical Investigation _ocation: Airport Road and Cranston Drive													Dra S	wing heet	i No. t No.	_1		of
		Drive																
ate Drilled:	May 17, 2017		- Auger Sample								Co Na	mbust tural N	ible Va loisture	pour F	Readin	ıg	□ ×	0
orill Type:	CME 55-Rubber Track		D	ynami helby	ynamic Cone Test helby Tube			_			Pla Un % :	istic ar draine Strain	nd Liqu d Triax at Faili	id Lim ial at ire	lit	F	$\oplus$	-0
atum:	Geodetic		F	ield Va	ane Te	st			s		Pe	netron	neter				<b></b>	
Soil/Rock Symbol	Soil Description	ELEV. m	E         SPT (N Value)           ±         20         40         60         80           ©         Shear Strength					kPa	Cor	nbustik 25 Natura tterber	ole Vap t al Moist g Limits	our Re 50 ure Co 5 (% D	eading 75 ontent ry Wei	(ppm) % ght)	Sample	Natura Unit Weigh		
~300 SAN	0 mm Topsoil over	312.27	0	5		100			20			10		20	30			
∑tracetrace	e gravel, trace clay, occasional der fragments, brown, moist,	-	Ē														8	
Com	pact.	_	1	Č	)							>	<					22
2 / c																		
0 0				Č								>	<					22.6
0 (q				1	7													
	-		(	2							×					8		
	-	3		18													~~~	
	_		(	ر ا							X					4	22	
	~308.3	4																
^p Bec	oming very dense.																	
o							54 C	)				*						22
0 G			5															
0 a_		-																
		_	6						- 92	for 280	mm							
END	OF BOREHOLE.	~305.9								0		" ×					8	21.
											Ela	ipsed			Water Level		Ho	le Ope to (m)
										0	n Coi	mplet	ion		Dry			6.10

Project: _ocation:	Geotechnical Investigation Airport Road and Cranstor	n Drive											-	Sh	eet	No.	1	of _1
Date Drilled: Drill Type: Datum:	May 11, 2017 CME 55 - Rubber Track Geodetic	Auger Sample     Auger Sample     SPT (N) Value     Dynamic Cone Test     Shelby Tube     Field Vane Test							Combusti Natural M Plastic an Undrainec % Strain : Penetrorr			stible Vapour Reading Moisture and Liquid Limit ed Triaxial at n at Failure ometer				] O 		
oil/Rock Symbol	Soil Description	ELEV.	epth (m)	SPT (N Value)						80 kl	Pa	Comb Na Atte	mbustible Vapour Reading (ppm) 25 50 75 Natural Moisture Content % Vartheren Limite (% Drv Moistet)					Natura Unit Weigł
5 00 ~16 FILL 	5 mm Topsoil over .: Clayey silt, trace gravel, brown ark brown, moist.	311.56	Ŭ 0	5		10	0			200			10 X	20		30		kN/m
SAN and boul	IDY SILT TILL: Fine sand seams layers, trace gravel, occasional lder fragments, brown, moist, upact to dense.	~310.2 -	2										×					21.8
0 1 0 0 1 0 0 1 0 0 0 0 0 0 0		_	3		23	31 Э								*				22.
sill wet,	<b>TY SAND:</b> Fine grained, brown, dense.	~307.6	4															
		~306.0	5			37 O								×				
P CLA P Seal P Seal P Seal	<b>YEY SILT TILL:</b> Fine sand ms, trace gravel, brown, moist, <u>1</u> .	_	6		21													22.
END OF BOREHOLE.	~303.5				35							×					22.	
•₽.											Or	Elaps Time			L	/ater .evel (m) D <b>ry</b>	н	ole Ope to (m) 8.53


ate Drilled:       May 10, 2017       Auger Sample       Drinnet Con Teal       Nutra Motion       Nutra Motion       Nutra Motion       Nutra Motion       Nutra Motion       Image: Sample	oject No. oject: ocation:	Geotechnical Investigation Airport Road and Cranston Drive			otechnical Investigation port Road and Cranston Drive						Sheet No of _1				
Bit Type:     Unit of privations       atum:     Geodetic	ate Drilled:	May 10, 2017	Auger Sample SPT (N) Value O			Comb Natura Plastic	ustible Vapo al Moisture c and Liquid	our Reading Limit	×	: 0					
Soil Description         ELEV. m         ELEV. m         Soil Constraints of the Display of	atum:	Geodetic		_	Shelby Tube Field Vane Test	S	Undra % Stra Penet	ined Triaxial ain at Failure rometer	at e	⊕					
	Soil/Rock Symbol	Soil Description	ELEV. m	Depth (m)	SPT (N 20 40 Shear Strength	Value) 60 80 k 200	Combu Na Pa Atter	ustible Vapour 25 50 tural Moisture berg Limits (9	r Reading (ppm) 75 e Content % % Dry Weight) 30	Sample	Natu Ur Wei kN/				
Elapsed     Water       Level     Unit	<pre></pre>	o mm Topsoil over YEY SILT TILL: Trace sand, e gravel, brown, moist, stiff to very Y SAND: Fine grained, silt ns, widely scattered gravel, brown, t, compact.	~292.4	1 2 3 4 5 6							21 22 22				
Elapsed Time (m) to (m	END	OF BOREHOLE.													
				_			Elapse	ed	Water Level (m)	Ho	le Op to (m				

Triple Crown Line Residential Development Airport Road and Cranston Drive, ON Preliminary Hydrogeological Investigation BRM-00235186-E0 June 14, 2017

Appendix C: SWRT Procedures and Results













K = 8.723E-6 m/sec

y0 = 0.5838 m













Triple Crown Line Residential Development Airport Road and Cranston Drive, ON Preliminary Hydrogeological Investigation BRM-00235186-E0 June 14, 2017

Appendix D: Groundwater Analysis and Laboratory Certificates of Analysis





Your P.O. #: BRM-ENV Your Project #: BRM-00235186-E0 Site Location: 15717 AIRPORT RD Your C.O.C. #: 612400-01-01

#### Attention:Nathan Orr

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

> Report Date: 2017/06/06 Report #: R4500628 Version: 1 - Final

### **CERTIFICATE OF ANALYSIS**

#### MAXXAM JOB #: B7A8091

#### Received: 2017/05/26, 18:59

Sample Matrix: Water # Samples Received: 1

		Date	Date		
Analyses	Quantity	Extracted	Analyzed	Laboratory Method	Reference
ABN Compounds in Water by GC/MS	1	2017/06/01	2017/06/04	CAM SOP-00301	EPA 8270 m
Carbonaceous BOD	1	2017/05/27	2017/06/01	CAM SOP-00427	SM 22 5210B m
Total Cyanide	1	2017/05/30	2017/05/30	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2017/05/30	2017/05/31	CAM SOP-00449	SM 22 4500-F C m
Mercury in Water by CVAA	1	2017/05/31	2017/06/01	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2017/06/01	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2017/05/26	CAM SOP-00552	MOE LSB E3371
Total Nonylphenol in Liquids by HPLC	1	2017/05/29	2017/06/02	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC	1	2017/05/29	2017/06/02	CAM SOP-00313	Maxxam Method
Animal and Vegetable Oil & Grease	1	N/A	2017/06/01	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2017/05/30	2017/06/01	CAM SOP-00326	EPA1664B m,SM5520A m
Polychlorinated Biphenyl in Water	1	2017/05/30	2017/05/31	CAM SOP-00309	EPA 8082A m
рН	1	N/A	2017/05/31	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2017/05/31	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2017/06/02	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2017/05/30	2017/06/02	CAM SOP-00938	OMOE E3516 m
TPH (Heavy Oil) (1)	1	2017/05/30	2017/06/01	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2017/05/29	2017/05/29	CAM SOP-00428	SM 22 2540D m
Volatile Organic Compounds in Water	1	N/A	2017/05/31	CAM SOP-00226	EPA 8260C m

### Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam 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.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise



Your P.O. #: BRM-ENV Your Project #: BRM-00235186-E0 Site Location: 15717 AIRPORT RD Your C.O.C. #: 612400-01-01

#### Attention:Nathan Orr

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

> Report Date: 2017/06/06 Report #: R4500628 Version: 1 - Final

### **CERTIFICATE OF ANALYSIS**

#### MAXXAM JOB #: B7A8091 Received: 2017/05/26, 18:59

agreed in writing.

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.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) 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. Deepthi Shaji, Project Manager Email: dshaji@maxxam.ca Phone# (905)817-5700 Ext:5807

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



### PEEL SANITARY & STORM PKG (53-2010)

Maxxam ID					ELH795	ELH795					
Sampling Date					2017/05/26 09:00	2017/05/26 09:00					
COC Number					612400-01-01	612400-01-01					
		UNITS	Criteria	Criteria-2	BH41	BH41 Lab-Dup	RDL	QC Batch			
Calculated Paramete	ers										
Total Animal/Vegetal	ble Oil and Grease	mg/L	150	-	ND		0.50	5001507			
norganics											
Total Carbonaceous I	BOD	mg/L	300	15	ND	ND	2	5001844			
Fluoride (F-)		mg/L	10	-	0.19		0.10	5005214			
Total Kjeldahl Nitroge	en (TKN)	mg/L	100	1	ND (1)		1.0	5005026			
рН		рН	5.5:10.0	6.0:9.0	8.11			5005229			
Phenols-4AAP		mg/L	1	0.008	ND		0.0010	5007573			
Total Suspended Soli	ds	mg/L	350	15	110		10	5002859			
Dissolved Sulphate (SO4)		mg/L	1500	-	50	49	1.0	5007251			
Total Cyanide (CN)		mg/L	2	0.02	ND		0.0050	5005476			
Petroleum Hydrocar	bons										
Total Oil & Grease		mg/L	-	-	ND		0.50	5004372			
Total Oil & Grease Mineral/Synthetic		mg/L	15	-	ND		0.50	5004390			
Miscellaneous Paran	neters										
Nonylphenol Ethoxyl	ate (Total)	mg/L	0.2	-	ND	ND	0.025	5003255			
Nonylphenol (Total)		mg/L	0.02	-	0.001	0.001	0.001	5003399			
Metals						-					
Mercury (Hg)		mg/L	0.01	0.0004	ND		0.0001	5006834			
Total Aluminum (Al)		ug/L	50000	-	26000		25	5007141			
Total Antimony (Sb)		ug/L	5000	-	ND		0.50	5007141			
Total Arsenic (As)		ug/L	1000	20	11		1.0	5007141			
Total Cadmium (Cd)		ug/L	700	8	0.20		0.10	5007141			
Total Chromium (Cr)		ug/L	5000	80	39		5.0	5007141			
No Fill	No Exceedance										
Grey	Exceeds 1 criteria	policy/level									
Black Exceeds both criteria/levels											
RDL = Reportable De	RDL = Reportable Detection Limit										
QC Batch = Quality Co	ontrol Batch										
Lab-Dup = Laboratory	y Initiated Duplicate										
<u> </u>			- · ·								

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

(1) Due to a high concentration of NOx, the sample required dilution. The detection limit was adjusted accordingly.



### PEEL SANITARY & STORM PKG (53-2010)

Maxxam ID					ELH795	ELH795			
Sampling Date					2017/05/26	2017/05/26			
					09:00	09:00			
COC Number					612400-01-01	612400-01-01			
		UNITS	Criteria	Criteria-2	BH41	BH41 Lab-Dup	RDL	QC Batch	
Total Cobalt (Co)		ug/L	5000	-	18		0.50	5007141	
Total Copper (Cu)		ug/L	3000	50	45		1.0	5007141	
Total Iron (Fe)		ug/L	-	-	39000		100	5007141	
Total Lead (Pb)		ug/L	3000	120	21		0.50	5007141	
Total Manganese (Mr	n)	ug/L	5000	50	1600		2.0	5007141	
Total Molybdenum (N	No)	ug/L	5000	-	19		0.50	5007141	
Total Nickel (Ni)		ug/L	3000	80	36		1.0	5007141	
Total Phosphorus (P)		ug/L	10000	-	1900		100	5007141	
Total Selenium (Se)		ug/L	1000	20	2.2		2.0	5007141	
Total Silver (Ag)		ug/L	5000	120	ND		0.10	5007141	
Total Tin (Sn)		ug/L	5000	-	2.9		1.0	5007141	
Total Titanium (Ti)		ug/L	5000	-	250		5.0	5007141	
Total Zinc (Zn)		ug/L	3000	40	98		5.0	5007141	
Semivolatile Organic	s	•	•	•			μ	•	
Bis(2-ethylhexyl)phthalate		ug/L	12	8.8	ND		2.0	5012088	
Di-N-butyl phthalate		ug/L	80	15	ND		2.0	5012088	
Volatile Organics									
Benzene		ug/L	10	2	ND		0.10	5000695	
Chloroform		ug/L	40	2	ND		0.10	5000695	
1,2-Dichlorobenzene		ug/L	50	5.6	ND		0.20	5000695	
1,4-Dichlorobenzene		ug/L	80	6.8	ND		0.20	5000695	
cis-1,2-Dichloroethyle	ene	ug/L	4000	5.6	ND		0.10	5000695	
trans-1,3-Dichloropro	opene	ug/L	140	5.6	ND		0.20	5000695	
Ethylbenzene		ug/L	160	2	ND		0.10	5000695	
Methylene Chloride(	Dichloromethane)	ug/L	2000	5.2	ND		0.50	5000695	
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 Regior	nal Municipality of P	eel Storm Se	wer Disch	arge.					
By-Law Number 53-2	010.								
ND = Not detected									



### PEEL SANITARY & STORM PKG (53-2010)

Maxxam ID					ELH795	ELH795			
Sampling Date					2017/05/26 09:00	2017/05/26 09:00			
COC Number					612400-01-01	612400-01-01			
		UNITS	Criteria	Criteria-2	BH41	BH41 Lab-Dup	RDL	QC Batch	
Methyl Ethyl Ketone	(2-Butanone)	ug/L	8000	-	ND		5.0	5000695	
Styrene		ug/L	200	-	ND		0.20	5000695	
1,1,2,2-Tetrachloroet	hane	ug/L	1400	17	ND		0.20	5000695	
Tetrachloroethylene		ug/L	1000	4.4	ND		0.10	5000695	
Toluene		ug/L	270	2	ND		0.20	5000695	
Trichloroethylene		ug/L	400	8	ND		0.10	5000695	
p+m-Xylene		ug/L	-	-	ND		0.10	5000695	
o-Xylene		ug/L	-	-	ND		0.10	5000695	
Total Xylenes		ug/L	1400	4.4	ND		0.10	5000695	
PCBs						•			
Total PCB		ug/L	1	0.4	ND		0.05	5004747	
Microbiological						•			
Escherichia coli		CFU/100mL	-	200	<10		10	5001652	
Surrogate Recovery	(%)		-				,		
2,4,6-Tribromophenol		%	-	-	36			5012088	
2-Fluorobiphenyl		%	-	-	56			5012088	
2-Fluorophenol		%	-	-	16			5012088	
D14-Terphenyl		%	-	-	100			5012088	
D5-Nitrobenzene		%	-	-	80			5012088	
D5-Phenol		%	-	-	20			5012088	
Decachlorobiphenyl		%	-	-	86			5004747	
4-Bromofluorobenze	ne	%	-	-	95			5000695	
D4-1,2-Dichloroethar	ne	%	-	-	97			5000695	
D8-Toluene		%	-	-	100			5000695	
No Fill	No Exceedance								
Grey	Exceeds 1 criteria	oolicy/level							
Black	Exceeds both crite	ria/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 Regior	nal Municipality of Po	eel Storm Sev	wer Disch	arge.					
By-Law Number 53-2	010.								
ND = Not detected									



Report Date: 2017/06/06

exp Services Inc Client Project #: BRM-00235186-E0 Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

#### **TEST SUMMARY**

Maxxam ID: Sample ID: Matrix:	ELH795 BH41 Water					Collected: Shipped: Received:	2017/05/26 2017/05/26
Test Description		Instrumentation	Batch	Extracted	Date Analyzed	Analyst	
ABN Compounds in Wate	er by GC/MS	GC/MS	5012088	2017/06/01	2017/06/04	Daniel Kim	
C		50	5004044	2017/05/27	2017/05/01	District D'	-

Abiv Compounds in water by GC/Wis	90/1013	5012088	2017/00/01	2017/00/04	Damer Kim	
Carbonaceous BOD	DO	5001844	2017/05/27	2017/06/01	Prakash Piya	
Total Cyanide	SKAL/CN	5005476	2017/05/30	2017/05/30	Lantian Jin	
Fluoride	ISE	5005214	2017/05/30	2017/05/31	Surinder Rai	
Mercury in Water by CVAA	CV/AA	5006834	2017/05/31	2017/06/01	Ron Morrison	
Total Metals Analysis by ICPMS	ICP/MS	5007141	N/A	2017/06/01	Prempal Bhatti	
E.coli, (CFU/100mL)	PL	5001652	N/A	2017/05/26	Riddhi Bayal	
Total Nonylphenol in Liquids by HPLC	LC/FLU	5003399	2017/05/29	2017/06/02	Tonghui ( Jenny) Chen	
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	5003255	2017/05/29	2017/06/02	Tonghui ( Jenny) Chen	
Animal and Vegetable Oil & Grease	BAL	5001507	N/A	2017/06/01	Automated Statchk	
Total Oil and Grease	BAL	5004372	2017/05/30	2017/06/01	Amjad Mir	
Polychlorinated Biphenyl in Water	GC/ECD	5004747	2017/05/30	2017/05/31	Li Peng	
рН	AT	5005229	N/A	2017/05/31	Surinder Rai	
Phenols (4AAP)	TECH/PHEN	5007573	N/A	2017/05/31	Zahid Soikot	
Sulphate by Automated Colourimetry	KONE	5007251	N/A	2017/06/02	Deonarine Ramnarine	
Total Kjeldahl Nitrogen in Water	SKAL	5005026	2017/05/30	2017/06/02	Rajni Tyagi	
TPH (Heavy Oil)	BAL	5004390	2017/05/30	2017/06/01	Amjad Mir	
Total Suspended Solids	BAL	5002859	2017/05/29	2017/05/29	Arpan Shah	
Volatile Organic Compounds in Water	P&T/MS	5000695	N/A	2017/05/31	Dina Wang	

Maxxam ID:	ELH795 Dup
Sample ID:	BH41
Matrix:	Water

Collected:	2017/05/26
Shipped:	
Received:	2017/05/26

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Carbonaceous BOD	DO	5001844	2017/05/27	2017/06/01	Prakash Piya
Total Nonylphenol in Liquids by HPLC	LC/FLU	5003399	2017/05/29	2017/06/02	Tonghui ( Jenny) Chen
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	5003255	2017/05/29	2017/06/02	Tonghui ( Jenny) Chen
Sulphate by Automated Colourimetry	KONE	5007251	N/A	2017/06/02	Deonarine Ramnarine



#### **GENERAL COMMENTS**

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

Package 1	7.3°C
Package 2	4.3°C
Package 3	5.3°C

#### PEEL SANITARY & STORM PKG (53-2010)

Total Nonylphenol in Liquids by HPLC: The recovery in the matrix spike was not calculated (NC). Because of the high concentration of this analyte in the parent sample, the relative difference between the spiked and unspiked concentrations is not sufficiently significant to permit a reliable recovery calculation.

Results relate only to the items tested.



Maxxam Job #: B7A8091 Report Date: 2017/06/06

## **QUALITY ASSURANCE REPORT**

exp Services Inc Client Project #: BRM-00235186-E0

Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

			Matrix	Spike	SPIKED	BLANK	Method B	lank	RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5000695	4-Bromofluorobenzene	2017/05/31	96	70 - 130	97	70 - 130	94	%				
5000695	D4-1,2-Dichloroethane	2017/05/31	92	70 - 130	95	70 - 130	97	%				
5000695	D8-Toluene	2017/05/31	102	70 - 130	99	70 - 130	100	%				
5004747	Decachlorobiphenyl	2017/05/31	86	60 - 130	92	60 - 130	97	%				
5012088	2,4,6-Tribromophenol	2017/06/04	116	10 - 130	111	10 - 130	68	%				
5012088	2-Fluorobiphenyl	2017/06/04	60	30 - 130	61	30 - 130	82	%				
5012088	2-Fluorophenol	2017/06/04	39	10 - 130	42	10 - 130	28	%				
5012088	D14-Terphenyl	2017/06/04	101	30 - 130	102	30 - 130	102	%				
5012088	D5-Nitrobenzene	2017/06/04	60	30 - 130	66	30 - 130	78	%				
5012088	D5-Phenol	2017/06/04	27	10 - 130	29	10 - 130	26	%				
5000695	1,1,2,2-Tetrachloroethane	2017/05/31	95	70 - 130	105	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5000695	1,2-Dichlorobenzene	2017/05/31	94	70 - 130	100	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5000695	1,4-Dichlorobenzene	2017/05/31	95	70 - 130	100	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5000695	Benzene	2017/05/31	95	70 - 130	103	70 - 130	ND, RDL=0.10	ug/L	NC	30		
5000695	Chloroform	2017/05/31	89	70 - 130	96	70 - 130	ND, RDL=0.10	ug/L	NC	30		
5000695	cis-1,2-Dichloroethylene	2017/05/31	97	70 - 130	104	70 - 130	ND, RDL=0.10	ug/L	NC	30		
5000695	Ethylbenzene	2017/05/31	95	70 - 130	102	70 - 130	ND, RDL=0.10	ug/L	NC	30		
5000695	Methyl Ethyl Ketone (2-Butanone)	2017/05/31	88	60 - 140	100	60 - 140	ND, RDL=5.0	ug/L	NC	30		
5000695	Methylene Chloride(Dichloromethane)	2017/05/31	87	70 - 130	94	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5000695	o-Xylene	2017/05/31	91	70 - 130	97	70 - 130	ND, RDL=0.10	ug/L	NC	30		
5000695	p+m-Xylene	2017/05/31	91	70 - 130	98	70 - 130	ND, RDL=0.10	ug/L	NC	30		
5000695	Styrene	2017/05/31	95	70 - 130	101	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5000695	Tetrachloroethylene	2017/05/31	87	70 - 130	95	70 - 130	ND, RDL=0.10	ug/L	NC	30		
5000695	Toluene	2017/05/31	94	70 - 130	99	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5000695	Total Xylenes	2017/05/31					ND, RDL=0.10	ug/L	NC	30		
5000695	trans-1,3-Dichloropropene	2017/05/31	89	70 - 130	97	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5000695	Trichloroethylene	2017/05/31	89	70 - 130	96	70 - 130	ND, RDL=0.10	ug/L	NC	30		
5001844	Total Carbonaceous BOD	2017/06/01					ND,RDL=2	mg/L	NC	25	89	85 - 115
5002859	Total Suspended Solids	2017/05/29					ND, RDL=10	mg/L	13	25	97	85 - 115



Maxxam Job #: B7A8091 Report Date: 2017/06/06

# QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00235186-E0

Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

			Matrix	Matrix Spike		BLANK	Method B	lank	RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	% Recovery QC Limits %		QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5003255	Nonylphenol Ethoxylate (Total)	2017/06/02	110	50 - 130	97	50 - 130	ND, RDL=0.025	mg/L	NC	40		
5003399	Nonylphenol (Total)	2017/06/02	NC	50 - 130	105	50 - 130	ND, RDL=0.001	mg/L	10	40		
5004372	Total Oil & Grease	2017/06/01			98	85 - 115	ND, RDL=0.50	mg/L	3.9	25		
5004390	Total Oil & Grease Mineral/Synthetic	2017/06/01			94	85 - 115	ND, RDL=0.50	mg/L	1.8	25		
5004747	Total PCB	2017/05/31	84	60 - 130	79	60 - 130	ND, RDL=0.05	ug/L	NC	40		
5005026	Total Kjeldahl Nitrogen (TKN)	2017/06/02	104	80 - 120	101	80 - 120	ND, RDL=0.10	mg/L	6.7	20	100	80 - 120
5005214	Fluoride (F-)	2017/05/31	98	80 - 120	104	80 - 120	ND, RDL=0.10	mg/L	11	20		
5005229	рН	2017/05/31			102	98 - 103			1.4	N/A		
5005476	Total Cyanide (CN)	2017/05/30	104	80 - 120	102	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
5006834	Mercury (Hg)	2017/06/01	100	75 - 125	106	80 - 120	ND, RDL=0.0001	mg/L	NC	20		
5007141	Total Aluminum (Al)	2017/06/01	104	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L				
5007141	Total Antimony (Sb)	2017/06/01	101	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	NC	20		
5007141	Total Arsenic (As)	2017/06/01	103	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	20		
5007141	Total Cadmium (Cd)	2017/06/01	102	80 - 120	98	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5007141	Total Chromium (Cr)	2017/06/01	100	80 - 120	97	80 - 120	ND, RDL=5.0	ug/L	NC	20		
5007141	Total Cobalt (Co)	2017/06/01	105	80 - 120	104	80 - 120	ND, RDL=0.50	ug/L	NC	20		
5007141	Total Copper (Cu)	2017/06/01	102	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	20		
5007141	Total Iron (Fe)	2017/06/01	101	80 - 120	99	80 - 120	ND, RDL=100	ug/L	2.3	20		
5007141	Total Lead (Pb)	2017/06/01	103	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	NC	20		
5007141	Total Manganese (Mn)	2017/06/01	100	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L				
5007141	Total Molybdenum (Mo)	2017/06/01	105	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	NC	20		
5007141	Total Nickel (Ni)	2017/06/01	100	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	20		
5007141	Total Phosphorus (P)	2017/06/01	99	80 - 120	98	80 - 120	ND, RDL=100	ug/L				
5007141	Total Selenium (Se)	2017/06/01	105	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	20		
5007141	Total Silver (Ag)	2017/06/01	100	80 - 120	95	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5007141	Total Tin (Sn)	2017/06/01	100	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L				_
5007141	Total Titanium (Ti)	2017/06/01	101	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L				



Maxxam Job #: B7A8091 Report Date: 2017/06/06

# QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00235186-E0

Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

					A		÷				A	
			Matrix	Spike	SPIKED	BLANK	Method E	Blank	RP	D	QC Sta	andard
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5007141	Total Zinc (Zn)	2017/06/01	104	80 - 120	101	80 - 120	ND, RDL=5.0	ug/L	NC	20		
5007251	Dissolved Sulphate (SO4)	2017/06/02	NC	75 - 125	106	80 - 120	ND, RDL=1.0	mg/L	1.4	20		
5007573	Phenols-4AAP	2017/05/31	103	80 - 120	103	85 - 115	ND, RDL=0.0010	mg/L	NC	20		
5012088	Bis(2-ethylhexyl)phthalate	2017/06/04	91	30 - 130	91	30 - 130	ND, RDL=2.0	ug/L	3.2	40		
5012088	Di-N-butyl phthalate	2017/06/04	NC	30 - 130	101	30 - 130	ND, RDL=2.0	ug/L	NC	40		

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).



Report Date: 2017/06/06

exp Services Inc Client Project #: BRM-00235186-E0 Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

## 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 Specialist

Custin Carriere

Cristina Carriere, Scientific Services

Riddhi Bayal

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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# Exceedence Summary Table – Peel Region Sanitary 2010

**Result Exceedences** 

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						
The exceedence summa	ary table is for information p	ourposes only and should no	t be considered a compreh	ensive listing or	statement of	conformance
to applicable regulatory	guidelines.					

# Exceedence Summary Table – Peel Region Storm 2010

# **Result Exceedences**

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
BH41	ELH795-09	Total Manganese (Mn)	50	1600	2.0	ug/L
BH41	ELH795-06	Total Suspended Solids	15	110	10	mg/L
BH41	ELH795-09	Total Zinc (Zn)	40	98	5.0	ug/L
The exceedence summary to applicable regulatory g	y table is for information p juidelines.	ourposes only and should not be c	onsidered a comprel	hensive listing or	statement of	conformance



Your P.O. #: BRM-ENV Your Project #: BRM-00235186-E0 Site Location: 15717 AIRPORT RD Your C.O.C. #: 612400-02-01

#### Attention:Nathan Orr

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

> Report Date: 2017/06/01 Report #: R4495205 Version: 1 - Final

# **CERTIFICATE OF ANALYSIS**

# MAXXAM JOB #: B7A8115

#### Received: 2017/05/26, 18:59

Sample Matrix: Water # Samples Received: 1

		Date	Date		
Analyses	Quantity	Extracted	Analyzed	Laboratory Method	Reference
Alkalinity	1	N/A	2017/05/31	CAM SOP-00448	SM 22 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2017/06/01	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2017/05/30	CAM SOP-00463	EPA 325.2 m
Conductivity	1	N/A	2017/05/31	CAM SOP-00414	SM 22 2510 m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2017/05/29	CAM SOP-00446	SM 22 5310 B m
Hardness (calculated as CaCO3)	1	N/A	2017/05/30	CAM SOP 00102/00408/00447	SM 2340 B
Lab Filtered Metals by ICPMS	1	2017/05/29	2017/05/30	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	1	N/A	2017/06/01		
Anion and Cation Sum	1	N/A	2017/06/01		
Total Ammonia-N	1	N/A	2017/05/31	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	1	N/A	2017/05/31	CAM SOP-00440	SM 22 4500-NO3I/NO2B
рН	1	N/A	2017/05/31	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	1	N/A	2017/05/30	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2017/06/01		
Sat. pH and Langelier Index (@ 4C)	1	N/A	2017/06/01		
Sulphate by Automated Colourimetry	1	N/A	2017/05/30	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	1	N/A	2017/06/01		

#### Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam 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.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.



Your P.O. #: BRM-ENV Your Project #: BRM-00235186-E0 Site Location: 15717 AIRPORT RD Your C.O.C. #: 612400-02-01

#### Attention:Nathan Orr

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

> Report Date: 2017/06/01 Report #: R4495205 Version: 1 - Final

### **CERTIFICATE OF ANALYSIS**

# MAXXAM JOB #: B7A8115

#### Received: 2017/05/26, 18:59

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.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

**Encryption Key** 

Please direct all questions regarding this Certificate of Analysis to your Project Manager. Deepthi Shaji, Project Manager Email: dshaji@maxxam.ca Phone# (905)817-5700 Ext:5807

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 2 Page 2 of 12



Maxxam ID					ELH855			
Sampling Date					2017/05/26 09:00			
COC Number					612400-02-01			
		UNITS	Criteria	Criteria-2	BH41	RDL	QC Batch	
Calculated Paramet	ers							
Anion Sum		me/L	-	-	8.75	N/A	5000463	
Bicarb. Alkalinity (ca	lc. as CaCO3)	mg/L	-	-	270	1.0	5001384	
Calculated TDS		mg/L	-	-	520	1.0	5000397	
Carb. Alkalinity (calc	. as CaCO3)	mg/L	-	-	3.4	1.0	5001384	
Cation Sum		me/L	-	-	8.71	N/A	5000463	
Hardness (CaCO3)		mg/L	-	-	260	1.0	5001331	
Ion Balance (% Diffe	rence)	%	-	-	0.210	N/A	5001385	
Langelier Index (@ 2	:0C)	N/A	-	-	0.972		5000395	
Langelier Index (@ 4	C)	N/A	-	-	0.725		5000396	
Saturation pH (@ 20	IC)	N/A	-	-	7.16		5000395	
Saturation pH (@ 4C	:)	N/A	-	-	7.40		5000396	
Inorganics								
Total Ammonia-N		mg/L	-	-	0.059	0.050	5006175	
Conductivity		umho/cm	-	-	840	1.0	5003678	
Dissolved Organic Ca	arbon	mg/L	-	-	3.0	0.20	5003215	
Orthophosphate (P)		mg/L	-	-	ND	0.010	5004246	
рН		рН	5.5:10.0	6.0:9.0	8.13		5003691	
Dissolved Sulphate (	SO4)	mg/L	1500	-	47	1.0	5004244	
Alkalinity (Total as C	aCO3)	mg/L	-	-	280	1.0	5003675	
Dissolved Chloride (	CI)	mg/L	-	-	16	1.0	5004243	
Nitrite (N)		mg/L	-	-	0.118	0.010	5003210	
Nitrate (N)		mg/L	-	-	25.2	1.0	5003210	
Nitrate + Nitrite (N)		mg/L	-	-	25.3	1.0	5003210	
No Fill N	o Exceedance							
Grey Ex	xceeds 1 criter	ia policy/lev	/el					
Black Ex	xceeds both cr	iteria/levels	i					
RDL = Reportable Detection Limit								
QC Batch = Quality C	Control Batch							
Criteria: The Regiona By-Law Number 53-2	al Municipality 2010.	of Peel San	itary Sewe	er Discharg	е.			
Criteria-2: The Regio	onal Municipali	ity of Peel S	torm Sewe	er Discharge	е.			
By-Law Number 53-2010.								
N/A = Not Applicable	е							
ND = Not detected								

### **RCAP - COMPREHENSIVE (LAB FILTERED)**



Maxxam ID ELH855								
Sampling Data					2017/05/26			
Sampling Date					09:00			
COC Number					612400-02-01			
		UNITS	Criteria	Criteria-2	BH41	RDL	QC Batch	
Metals								
Dissolved Alumin	ium (Al)	ug/L	50000	-	5.2	5.0	5003742	
Dissolved Antimo	ony (Sb)	ug/L	5000	-	ND	0.50	5003742	
Dissolved Arsenio	c (As)	ug/L	1000	20	1.0	1.0	5003742	
Dissolved Barium	า (Ba)	ug/L	-	-	82	2.0	5003742	
Dissolved Berylliu	um (Be)	ug/L	-	-	ND	0.50	5003742	
Dissolved Boron	(B)	ug/L	-	-	28	10	5003742	
Dissolved Cadmin	um (Cd)	ug/L	700	8	ND	0.10	5003742	
Dissolved Calciur	n (Ca)	ug/L	-	-	75000	200	5003742	
Dissolved Chrom	ium (Cr)	ug/L	5000	80	ND	5.0	5003742	
Dissolved Cobalt	(Co)	ug/L	5000	-	ND	0.50	5003742	
Dissolved Copper	r (Cu)	ug/L	3000	50	ND	1.0	5003742	
Dissolved Iron (Fe	e)	ug/L	-	-	ND	100	5003742	
Dissolved Lead (F	ug/L	3000	120	ND	0.50	5003742		
Dissolved Magne	ug/L	-	-	18000	50	5003742		
Dissolved Manga	ug/L	5000	50	61	2.0	5003742		
Dissolved Molybe	denum (Mo)	ug/L	5000	-	18	0.50	5003742	
Dissolved Nickel	(Ni)	ug/L	3000	80	ND	1.0	5003742	
Dissolved Phosph	norus (P)	ug/L	10000	-	ND	100	5003742	
Dissolved Potassi	ium (K)	ug/L	-	-	3500	200	5003742	
Dissolved Seleniu	um (Se)	ug/L	1000	20	ND	2.0	5003742	
Dissolved Silicon	(Si)	ug/L	-	-	4000	50	5003742	
Dissolved Silver (	Ag)	ug/L	5000	120	ND	0.10	5003742	
Dissolved Sodiun	n (Na)	ug/L	-	-	78000	100	5003742	
Dissolved Stronti	um (Sr)	ug/L	-	-	450	1.0	5003742	
Dissolved Thalliu	m (TI)	ug/L	-	-	ND	0.050	5003742	
Dissolved Titaniu	ım (Ti)	ug/L	5000	-	ND	5.0	5003742	
No Fill	No Exceedance							
Grey	Exceeds 1 criteri	a policy/lev	vel					
Black	Black Exceeds both criteria/levels							
RDL = Reportable	Detection Limit							
QC Batch = Quali	ty Control Batch							
Criteria: The Reg	ional Municipality	of Peel San	itary Sew	er Discharge	e.			
By-Law Number	53-2010.							
Criteria-2: The Regional Municipality of Peel Storm Sewer Discharge.								
By-Law Number :	53-2010.							
nD = not detected	20							

### **RCAP - COMPREHENSIVE (LAB FILTERED)**



Maxxam ID					ELH855			
Sampling Data					2017/05/26			
Sampling Date		L			09:00			
COC Number					612400-02-01			
		UNITS	Criteria	Criteria-2	BH41	RDL	QC Batch	
Dissolved Uraniu	ım (U)	ug/L	-	-	6.2	0.10	5003742	
Dissolved Vanad	ium (V)	ug/L	-	-	0.79	0.50	5003742	
Dissolved Zinc (Zn) ug/L 3000 40 ND 5.0 500						5003742		
No Fill	No Exceedance							
Grey	Exceeds 1 criteri	a policy/lev	/el					
Black	Exceeds both cri	teria/levels	5					
RDL = Reportable	e Detection Limit							
QC Batch = Quali	ality Control Batch							
Criteria: The Reg	The Regional Municipality of Peel Sanitary Sewer Discharge.							
By-Law Number	.aw Number 53-2010.							
Criteria-2: The Regional Municipality of Peel Storm Sewer Discharge.								
By-Law Number	53-2010.							
ND = Not detecte	ed							

# **RCAP - COMPREHENSIVE (LAB FILTERED)**



#### **TEST SUMMARY**

Maxxam ID:	ELH855
Sample ID:	BH41
Matrix:	Water

 Collected:
 2017/05/26

 Shipped:
 2017/05/26

 Received:
 2017/05/26

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5003675	N/A	2017/05/31	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5001384	N/A	2017/06/01	Automated Statchk
Chloride by Automated Colourimetry	KONE	5004243	N/A	2017/05/30	Alina Dobreanu
Conductivity	AT	5003678	N/A	2017/05/31	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5003215	N/A	2017/05/29	Azadeh Shahbazi
Hardness (calculated as CaCO3)		5001331	N/A	2017/05/30	Automated Statchk
Lab Filtered Metals by ICPMS	ICP/MS	5003742	2017/05/29	2017/05/30	Thao Nguyen
Ion Balance (% Difference)	CALC	5001385	N/A	2017/06/01	Automated Statchk
Anion and Cation Sum	CALC	5000463	N/A	2017/06/01	Automated Statchk
Total Ammonia-N	LACH/NH4	5006175	N/A	2017/05/31	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5003210	N/A	2017/05/31	Chandra Nandlal
рН	AT	5003691	N/A	2017/05/31	Surinder Rai
Orthophosphate	KONE	5004246	N/A	2017/05/30	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5000395	N/A	2017/06/01	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5000396	N/A	2017/06/01	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5004244	N/A	2017/05/30	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	5000397	N/A	2017/06/01	Automated Statchk



#### **GENERAL COMMENTS**

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

Package 1	7.3°C
Package 2	5.3°C
Package 3	4.3°C

Results relate only to the items tested.



Maxxam Job #: B7A8115 Report Date: 2017/06/01

# QUALITY ASSURANCE REPORT

exp Services Inc Client Project #: BRM-00235186-E0

Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5003210	Nitrate (N)	2017/05/31	NC	80 - 120	104	80 - 120	ND, RDL=0.10	mg/L	4.0	20
5003210	Nitrite (N)	2017/05/31	101	80 - 120	99	80 - 120	ND, RDL=0.010	mg/L	15	20
5003215	Dissolved Organic Carbon	2017/05/29	95	80 - 120	98	80 - 120	ND, RDL=0.20	mg/L	1.2	20
5003675	Alkalinity (Total as CaCO3)	2017/05/31			96	85 - 115	ND, RDL=1.0	mg/L	1.1	20
5003678	Conductivity	2017/05/31			101	85 - 115	ND, RDL=1.0	umho/cm	0.41	25
5003691	рН	2017/05/31			101	98 - 103			0.052	N/A
5003742	Dissolved Aluminum (Al)	2017/05/30	103	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L		
5003742	Dissolved Antimony (Sb)	2017/05/30	107	80 - 120	103	80 - 120	ND, RDL=0.50	ug/L		
5003742	Dissolved Arsenic (As)	2017/05/30	100	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	20
5003742	Dissolved Barium (Ba)	2017/05/30	99	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	0.32	20
5003742	Dissolved Beryllium (Be)	2017/05/30	103	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L		
5003742	Dissolved Boron (B)	2017/05/30	105	80 - 120	102	80 - 120	ND, RDL=10	ug/L	2.3	20
5003742	Dissolved Cadmium (Cd)	2017/05/30	102	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	NC	20
5003742	Dissolved Calcium (Ca)	2017/05/30	NC	80 - 120	98	80 - 120	ND, RDL=200	ug/L	0.040	20
5003742	Dissolved Chromium (Cr)	2017/05/30	100	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC	20
5003742	Dissolved Cobalt (Co)	2017/05/30	99	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L		
5003742	Dissolved Copper (Cu)	2017/05/30	103	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	2.9	20
5003742	Dissolved Iron (Fe)	2017/05/30	100	80 - 120	99	80 - 120	ND, RDL=100	ug/L	NC	20
5003742	Dissolved Lead (Pb)	2017/05/30	99	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L	NC	20
5003742	Dissolved Magnesium (Mg)	2017/05/30	98	80 - 120	100	80 - 120	ND, RDL=50	ug/L	1.6	20
5003742	Dissolved Manganese (Mn)	2017/05/30	NC	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	2.4	20
5003742	Dissolved Molybdenum (Mo)	2017/05/30	105	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L		
5003742	Dissolved Nickel (Ni)	2017/05/30	97	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L		
5003742	Dissolved Phosphorus (P)	2017/05/30	107	80 - 120	109	80 - 120	ND, RDL=100	ug/L		
5003742	Dissolved Potassium (K)	2017/05/30	NC	80 - 120	101	80 - 120	ND, RDL=200	ug/L	1.8	20
5003742	Dissolved Selenium (Se)	2017/05/30	100	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L		
5003742	Dissolved Silicon (Si)	2017/05/30	99	80 - 120	99	80 - 120	ND, RDL=50	ug/L		
5003742	Dissolved Silver (Ag)	2017/05/30	99	80 - 120	98	80 - 120	ND, RDL=0.10	ug/L		
5003742	Dissolved Sodium (Na)	2017/05/30	NC	80 - 120	100	80 - 120	ND, RDL=100	ug/L	2.6	20
5003742	Dissolved Strontium (Sr)	2017/05/30	NC	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L		



Maxxam Job #: B7A8115 Report Date: 2017/06/01

# QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00235186-E0

Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5003742	Dissolved Thallium (TI)	2017/05/30	98	80 - 120	99	80 - 120	ND, RDL=0.050	ug/L		
5003742	Dissolved Titanium (Ti)	2017/05/30	102	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L		
5003742	Dissolved Uranium (U)	2017/05/30	102	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L		
5003742	Dissolved Vanadium (V)	2017/05/30	100	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L		
5003742	Dissolved Zinc (Zn)	2017/05/30	98	80 - 120	97	80 - 120	ND, RDL=5.0	ug/L	NC	20
5004243	Dissolved Chloride (Cl)	2017/05/30	101	80 - 120	105	80 - 120	ND, RDL=1.0	mg/L	0.66	20
5004244	Dissolved Sulphate (SO4)	2017/05/30	96	75 - 125	103	80 - 120	ND, RDL=1.0	mg/L	0.53	20
5004246	Orthophosphate (P)	2017/05/30	99	75 - 125	100	80 - 120	ND, RDL=0.010	mg/L	NC	25
5006175	Total Ammonia-N	2017/05/31	93	80 - 120	95	85 - 115	ND, RDL=0.050	mg/L	NC	20

N/A = Not Applicable

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

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

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.

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).


Report Date: 2017/06/01

exp Services Inc Client Project #: BRM-00235186-E0 Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

### 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 Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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n:	Central Services	•		Attention	Nathan	Orr					PO#		EN	V- BI	2m				
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	(905) 793-9800 >	Fax:	(905) 793-0641	X vTal		744	Fax	· ·			Site #		_						Deepthi Shaji
-	Karen Burke@ex	(p.com		Email	nathan.	orr@exp.com					Sampled By			CS.		_		C#612400-02-01	CONTRACTOR AND A
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e 1 1	Ind/Comm Coarse	Reg 558	Storm Sewer	Bylaw			OC	1									Standard TAT	= 5-7 Working days for most tests .	
le 3	Agri/Other For RS		Municipality	PEEL			hg) h	3	nsive								days - contact	sandard TAT for certain tests such as b your Project Manager for details.	OD and Dioxinsimutens are > 5
e		PWQ0					erec als /	F	rehe								Job Specific	c Rush TAT (if applies to entire subr	nission)
		Other _		- 2 h			d Filt	I.	Comp								Date Required	iTin	ne Required:
	Include Criteri	a on Certificate of <i>i</i>	Analysis (Y/N)? _	Y			Field	DILD I	- dy								Ausi Comm	(c	all lab for #)
Sampi	e Barcode Label	Sample (Location	n) Identification	Date Sampled	Time Sampled	Matrix		₽¥	RC						_		a of Bottles	Comm	ants
		RHL	11	26/05/17	1900	GW	N		X								4		
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exp Services Inc Client Project #: BRM-00235186-E0 Site Location: 15717 AIRPORT RD Your P.O. #: BRM-ENV Sampler Initials: CS

## Exceedence Summary Table – Peel Region Sanitary 2010

**Result Exceedences** 

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						
The exceedence summa	ary table is for information p	ourposes only and should no	t be considered a compret	nensive listing or	statement of	conformance
to applicable regulatory	guidelines.					

# Exceedence Summary Table – Peel Region Storm 2010

### **Result Exceedences**

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units			
BH41	ELH855-01	Dissolved Manganese (Mn)	50	61	2.0	ug/L			
The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance									
to applicable regulatory guidelines.									

Triple Crown Line Residential Development Airport Road and Cranston Drive, ON Preliminary Hydrogeological Investigation BRM-00235186-E0 June 14, 2017

Appendix E: Groundwater Flow Calculations



### **APPENDIX E: Construction Dewatering Calculations**

Airport Road and Cranston Drive, Caledon East, ON BRM-00235186-E0

#### Table E-1: Flow all Sides of the Excavation

Value	Unit	Southern Portion	Northern Portion
Geological Formation	-	Glacial Deposit	Glacial Deposit
Ground Elevation	mASL	305	310
Approx. WL Elev.	mASL	304.2	304.2
Top of Overburden Aquifer	mASL	304.2	304.2
Bottom of Overburden Aquifer	mASL	297.0	299.0
Thickness of Overburden Aquifer	m	7.2	5.2
H (above base of aquifer)	m	7.2	5.2
Dewatered elevation target in overburden	mASL	297	299
h _w (dewatered water table above aquifer substratum)	m	0	0
Hydraulic Conductivity	m/s	7.50E-05	7.50E-05
Transmissivity	m²/s	5.38E-04	3.88E-04
Length of Excavation	m	60	60
Width of excavation	m	5	5
Method to Calculate Radius of Influence, Ro		Sichardt	Sichardt
Radius of Influence from Sides of Excavation, Ro	m	186	134
Distance to Linear Source from Sides of excavation (Lo = Ro/2)	m	93	67
Radius of Influence of both Radial and Linear Flows (R'=Ro+Lo)	m	279	201
Dewatering Flow Rate (unconfined linear flow component)	m ³ /day	232	168
Factor of Safety	-	2	2
Dewatering flow rates multiplied by factor of safety	m ³ /day	465	335

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

(Based on the Dupuit Equation)

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

Where:

 $Q_w$  = Fow rate per unit length of excavation (m³/s)

K = hydraulic conductivity (m/s)

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

 $h_{\rm w}$  = height of target water level above the base of water-bearing zone  $\ (m)$ 

Lo=Distance of Influence (m)

#### Table E-2: Precipitation Estimate

Location	Assumed Precipitaiton Event (mm)	Length of Excavation (m)	Width of Excavation (m)	Rainwater Collection (m ³ )
Site Extent	10	60	5	3

Notes:

mASL - meters above sea level

SWMP: Storm Water Management Pond