

Hydrogeological Investigation

**129 Collier Street
Barrie, Ontario
L4M 1H5**

Prepared For:

Pinemount Holdings Ltd.

Project No: 19-291-400
Date: February 11, 2022



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February 11, 2022

Pinemount Holdings Ltd.
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Attention: Mr. Oren Turkienicz

**RE: Hydrogeological Investigation
129 Collier Street, Barrie, Ontario**

DS Consultants Limited (DS) was retained by Pinemount Holdings Ltd. to undertake a hydrogeological investigation in support of the future residential development, which is located at 129 Collier Street Barrie, Ontario. The investigation was completed to provide an overview of the existing geological and hydrogeological conditions at the Site and to provide an assessment of the hydrogeological constraints to development including an estimation of construction dewatering requirements and potential impacts to local groundwater resources. Based on the results of our investigation, the following summary of conclusions and recommendations are presented:

1. A review of the water well records indicated that there are forty-one (41) water wells within 500 m. Of the forty-one records, seven (7) are records of well abandonments, two (2) are listed as public supply wells, two (2) as industrial supply wells, twenty-three (23) as monitoring wells, five (5) as test holes/observations holes that are not in use, and two (2) that did not specify. The depths of the water supply wells range from 4.6 to 98.1 mbgs.
2. There were two (2) boreholes drilled as part of this investigation at the Site on November 15th , 2019. The depths of these boreholes were each 9.8 m below the existing ground surface (mbgs). All boreholes were used to interpret the subsurface soils on-site.
3. Groundwater conditions in the upper groundwater zone were assessed using four (4) monitoring wells. One was installed in BH19-1, the other three were existing wells MW1, MW2, and MW3 drilled by landtek limited. The installed monitoring well 19-1 is screened in the silty fine sand unit under the surficial sand and gravel layer. The three existing monitoring wells are screened in the sand and gravel layers above the stiff clay Till.
4. Surficial geology mapping made available by the Ontario Geological Survey (2010) indicates that the Site is covered by a coarse-textured glaciolacustrine deposit including sand, gravel, minor silt and clay littoral deposits. About 150m north of the site, mapping shows an ancient shoreline and the beginning of surficial glacial deposits of sandy silt to silty sand till. Locally, the glaciolacustrine deposit forms a thin veneer overlying the regionally extensive Glacial till. The glaciolacustrine deposits are generally discontinuous, deposited in valley systems and low-lying areas.

5. Groundwater levels were measured on December 11th, 2019, January 14th, and February 18th, 2020. The highest water levels were encountered on February 18th, and ranged from 5.57-6.14 mbgs, corresponding to elevations ranging from 221.29-226.55 masl. Based on measured water levels, the localized groundwater flow in the vicinity of the Site is interpreted to be in a Southerly direction with a horizontal gradient of about 0.09 m/m in the north and shallowing to a gradient of 0.037 m/m in the south.
6. Single Well Response Tests (SWRTs) to assess in-situ hydraulic conductivity (K) were completed by DS on January 14, 2020, at all four (4) monitoring wells. The testing was completed using data loggers placed at the bottom of the wells to accurately measure the change in the hydraulic head versus time. Manual water level measurements were also collected to confirm datalogger readings. K values were calculated using the Bouwer and Rice method. The K values ranged from 1.79×10^{-5} m/sec in the silty fine sand unit to as high as 2.82×10^{-4} m/sec in the sandy gravel unit with a geometric mean of 4.14×10^{-5} m/sec.
7. The geotechnical report proposed construction of the building with underground parking levels below grade supported by spread and strip footings or possibly a raft foundation on native silty sand. Based on well data, most of the building foundation will be founded above the groundwater table. The north limits of underground parking levels 2 and 3 will contact the groundwater table during seasonally high groundwater conditions. It is assumed that footings at these locations will extend approximately 1m below the design floor elevation. Dewatering will be required during the construction of the proposed building at these two footing locations.
8. The estimated steady-state flow rate for unsealed excavation for a trench with dimensions of 50 m long and 10 m wide at any given time would be **40,000 L/day (40 m³/day)** without a safety factor. However, a dewatering volume of **60,000 L/day (60m³/day)** with the safety factor of 1.5 is recommended for design purposes during the installation of footings to account for the variability in hydraulic conductivity, precipitation, and any water in fills that may be encountered. Since the expected design dewatering rate is greater than 50,000 L/day, an EASR is required from the MECP for short-term dewatering.
9. The proposed construction of parking levels P2 and P3 are expected to remain above the water table at the site however, there may be instances where groundwater intercepts the northern boundary of each level. As a result, it is recommended that underfloor drainage be considered for parking levels 2 and 3 in these areas. It is expected that the drainage would be re-infiltrated further south within the drainage system once the groundwater gradient has fallen below the P1 level.
10. A Groundwater quality analysis indicated that all parameters were within guideline limits for Barrie sanitary sewer bylaw. All but two parameters were within guideline limits for Barrie storm sewer bylaw. The two reported analytical results that were in exceedance of the storm sewer use bylaw include total copper and total suspended solids (TSS). Considering the minor exceedance in copper, it is expected that treatment with a settlement tank to lower TSS will also reduce copper to within limits set by the Barrie storm sewer bylaw. Also, considering the radius of influence (40m) of construction dewatering and the limited amount of dewatering anticipated, potential impacts

resulting from migrating contamination is unlikely. No adverse impact on any source water is anticipated.

11. In conformance with Regulation 903 of the Ontario Water Resources Act, the decommissioning of any dewatering system and monitoring wells should be carried out by a licensed contractor under the supervision of a licensed water well technician.

Should you have any questions regarding these findings, please contact the undersigned.

DS Consultants Ltd

Prepared By:



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Reviewed By:



Martin Gedeon, M.Sc. P.Geo.,
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Table of Contents

1. INTRODUCTION	1
1.1 Purpose.....	1
1.2 Scope of Work	1
2. PHYSICAL SETTING	1
2.1 Regional Physiography and Drainage.....	1
2.2 Geology.....	2
2.3 Hydrogeology	3
2.3.1 Groundwater Resources and Supply	3
2.3.3 Groundwater Conditions.....	4
2.3.4 Hydraulic Conductivity	5
2.3.5 Water Quality	5
3. CONSTRUCTION DEWATERING	6
3.1 Estimation of Flow Rates- Proposed Building and Site Servicing	6
3.2 Total Estimation of Flow Rate (Short-Term/ Temporary Discharge).....	6
3.3 Permanent Drainage (Long-term Discharge).....	7
3.4 Environmental Activity and Sector Registry (EASR) /Permit to Take Water (PTTW) Application.....	7
4. POTENTIAL IMPACTS.....	7
4.1 Local Groundwater Use	7
4.2 Point of Discharge and Groundwater Quality	7
4.3 Groundwater Recharge	8
4.4 Well Decommissioning	8
5. LIMITATIONS	9
6. REFERENCES	10

FIGURES

FIGURE 1	Site and MECP Water Well Location Map
FIGURE 2	Surficial Geology Map
FIGURE 3	Borehole and Monitoring Well Location Map
FIGURE 4	Groundwater Flow Direction Map

APPENDICES:

Appendix A	Borehole Logs
Appendix B	Hydraulic Conductivity Analysis
Appendix C	Groundwater Quality Certificate of Analysis
Appendix D	MECP Water Well Record and A PTTW Summary
Appendix E	Hydrographs

1. INTRODUCTION

DS Consultants Limited (DS) was retained by Pinemount Holdings Limited to complete a hydrogeological investigation in support of the proposed residential development located at 129 Collier street Barrie, Ontario (site). The site is bounded by Collier street to the north and Dunlop street to the south. The site primarily consists of an open landscaped area about 0.6 ha in size that is treed along the east and west boundaries. The proposed development will consist of two midrise complexes of approximately nine stories including a 3-storey podium and up to three levels of underground parking.

The investigation was completed to characterize groundwater conditions and understand potential constraints to development.

1.1 Purpose

The purpose of this investigation is to document existing hydrogeological conditions of site, identify potential impacts to local groundwater conditions from the proposed development, and recommend mitigation measures to reduce or eliminate the impacts of development on local water resources, groundwater users, and the natural environment.

1.2 Scope of Work

The scope of work for this investigation included:

- (i) Background information review of relevant information to assess local conditions, available through past geotechnical, geological, and environmental studies along with the Ministry of the Environment and Climate Change Water Well Record database for the area
- (ii) Drilling program to confirm soil and groundwater conditions at the site including two (2) boreholes with one (1) monitoring well, as well as in-situ conductivity testing;
- (iii) Collect one (1) groundwater sample for laboratory analysis to assess discharge options of dewatering water;
- (iv) Data analyses and preparation of a hydrogeological report.

2. PHYSICAL SETTING

2.1 Regional Physiography and Drainage

The Site is situated within the Simcoe Lowlands Physiographic Region of Southern Ontario (Chapman and Putnam, 1984) bordering the Simcoe Uplands to the North. The Simcoe Lowlands are generally characterized as flat-lying contiguous valleys, consisting of sandy glacial till interpreted as the Newmarket Till. The site lies within a Sand Plain Physiographic Landform. Relief across the Site is high ranging from an elevation of about 235 masl on the north boundary sloping south toward lake Simcoe to an elevation of

approximately 226 masl, a distance of around 100m. The site drains toward Dunlop street and into Lake Simcoe. The site lies within the regulatory limits of the Lake Simcoe Region Conservation Authority (LSRCA) and is located within the Barrie Creeks Sub Watershed.

2.2 Geology

Surficial geology mapping made available by the Ontario Geological Survey (2010) indicates that the site is covered by a coarse-textured glaciolacustrine deposit including sand, gravel, minor silt and clay littoral deposits. About 150m north of the site, mapping shows an ancient shoreline and the beginning of surficial glacial deposits of sandy silt to silty sand till. Locally, the glaciolacustrine deposit forms a thin veneer overlying the regionally extensive Glacial till. The glaciolacustrine deposits are generally discontinuous, deposited in valley systems and low-lying areas. An illustration of surficial geology for the site and surrounding area is provided in **Figure 2**.

Bedrock mapping suggests that the site is underlain by the bedrock of the Middle Ordovician sedimentary period. The bedrock surface surrounding the Site is generally flat, consisting of grey shale over Limestone each belonging to the Simcoe Group Formation. Based on local MECP water well records within 500m of the Site, bedrock was not found to the maximum explored depth of 98.1m. Overburden thickness in the area likely ranges from approximately 175 - 190 metres based on bedrock mapping.

As part of this investigation, two (2) boreholes (MW19-1 and BH19-2) were completed by DS on November 15th, 2019. The depths of these boreholes were each 9.8 m below the existing ground surface (mbgs). All boreholes were used to interpret the subsurface soils on-site. The locations of the boreholes are shown in **Figure 3**, and detailed subsurface conditions are presented on the Borehole Logs in **Appendix A**. The results of the test drilling show heterogeneous soil conditions across the site. Subsurface conditions are summarized as follows:

Topsoil:

At the borehole locations, a topsoil layer was overlaid by sand and gravel fill containing some organics. The topsoil extended to a depth of 800 to 900 mm. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative of the site and should not be relied on to calculate the amount of topsoil at the site.

Fill Materials:

Fill materials were found in borehole 19-2, extending to a depth of approximately 6 m. The fill consisted of loose sand and gravel with trace cobbles and clay brick fragments.

Sand and Gravel Soils:

In all boreholes, cohesionless (sandy) deposits of sand and gravel with some cobbles were found. This material is extending to depths of 4.9 to 6.0 m. The sand and gravel was interpreted as fill in BH 19-2 due to the loose nature and presence of foreign materials such as clay brick. The measured SPT values in

this material was 7 to 17. In BH19-1 there is also sand and gravel material however it is in a very dense state, with measured SPT 'N' values ranging from 30 to 80 blows per 300 mm of penetration, with no foreign materials encountered.

Silty Fine Sand Deposits:

Below the sand & gravel soils, a major layer of silty fine sand deposit was encountered in BH19-1. This material extended to the limit of boring at 9.8 m. It was not encountered in BH 19-2. This material was very wet and very dense with all measured SPT 'N' values being greater than 100 blows per 300 mm of penetration. Occasional soft layer and some very stiff to hard clay layers were present within the silty clay deposits. Beyond 9m depth, the fine sand had some clay seams present.

Silty Clay:

In BH19-2, below the sand and gravel fill, a silty clay was found extending to the maximum explored depth of 9.8m. The silty clay was initially soft but became stiff with depth. The SPT 'N' values measured in the silty clay ranged from 8 to 34 blows per 300 mm penetration, indicating soft to stiff consistency.

2.3 Hydrogeology

The following sections provide an overview of the general hydrogeological characteristics of the study area. The hydrogeological conditions were evaluated using the data collected from the MECP water well records, on-site monitoring wells installed as part of this investigation, and other reports for the area.

2.3.1 Groundwater Resources and Supply

As part of the hydrogeological study, DS completed a search of the Ministry of Environment, Climate and Parks (MECP) Water Well Record (WWR) and Permit to Take Water (PTTW) database. A summary of the search is presented in **Appendix E** and **Figure 1** shows the location of all MECP-registered water well and PTTW records within a 500-meter radius of the site.

A review of the water well records indicated that there are forty-one (41) water wells within 500 m. Of the forty-one records, seven (7) are records of well abandonments, two (2) are listed as public supply wells, two (2) as industrial supply wells, twenty-three (23) as monitoring wells, five (5) as test holes/observations holes that are not in use, and two (2) that did not specify. The depths of the water supply wells range from 4.6 to 98.1 mbgs.

The two public supply wells (MECP WWR # 5700235 & 5719264) were completed in July 13th, 1948 and June 14th, 1984 respectively. The city of Barrie began supplying water from surface water sources in 2011, however only for the south end of the city. The north end does still use ground water sources and has a valid permit to take water listed in **Appendix E**. Supply well WWR #5719264 is installed 61.2m deep corresponding to Barrie supply well #14 which has the valid PTTW.

The two Industrial supply wells (MECP WWR # 5700262 and 5700236) were installed in Oct 1962 and May 1952, respectively. Both are installed at depths of 23.8 and 24.1 mbgs. The water well records do

not have records of abandonment, however it is uncertain whether these are still in use due to age, lack of documented permits and industrial practices in the area.

There are thirteen (13) records of PTTW as issued by the MECP that are within 500m of the Site. Three (3) of the permits are water takings from sources of surface water, six (6) are from sources of groundwater and the remaining four (4) are sources of surface and groundwater. Of the thirteen permits, twelve (12) are inactive. They were used previously by the City of Barrie for water supply and used by developers for construction dewatering and remediation. The one (1) remaining active permit is used for municipal water supply purposes by the City of Barrie. The active PTTW for The Corporation of the City of Barrie (PTTW # 5183-8EZKMA) is for a maximum of 9,100,000 L/Day for 365 days of the Year. The PTTW is approved until April 30, 2021.

2.3.3 Groundwater Conditions

For the Site, groundwater conditions in the upper groundwater zone were assessed using four (4) monitoring wells. One was installed in BH19-1 as part of this investigation. The other three wells include MW1, MW2, and MW3 drilled by landtek limited in August 2019. The monitoring well 19-1 is screened in a silty fine sand unit underlying sand and gravel. The three existing monitoring wells MW1, MW2, and MW3 are screened in the sand and gravel layers above stiff clay. The most recent groundwater level monitoring was conducted on February 18th, 2020, at all available monitoring wells. **Table 1** presents a summary of the measured groundwater level elevations in all wells, and **Figure 3** shows the monitoring well locations.

Table 1: Groundwater Levels in Monitoring Wells

Monitoring Well	Ground Elevation (masl)	Well Depth (mbgs)	Screened Interval (mbgs)	Ground Water Elevation (masl)		
				December 11, 2019	January 14, 2020	February 18, 2020
MW19-1	232.69	8.02	6.71– 8.23	226.31	226.45	226.55
MW1	226.86	9.30	6.1– 9.1	220.69	220.84	221.29
MW2	228.07	9.63	6.8– 9.8	221.81	221.88	222.68
MW3	228.25	9.78	7.3– 10.6	222.09	221.93	222.79

Notes: Water levels measured are representative of stabilized conditions.

Groundwater levels were measured on December 11th, 2019, January 14th, and February 18th, 2020. The highest water levels were encountered on February 18th, and ranged from 5.57-6.14 mbgs, corresponding to elevations ranging from 221.29-226.55 masl. Based on measured water levels, the localized groundwater flow in the vicinity of the Site is interpreted to be in a Southerly direction with a maximum horizontal gradient of about 0.09 m/m in north sections of the site and a low horizontal gradient of 0.037 m/m in the south. A groundwater flow direction map is provided in **Figure 4**.

Continuous water level monitoring was conducted on existing MW2 and MW19-1 using a fixed interval pressure and temperature data recording device which was corrected for atmospheric pressure. The data is displayed in hydrographs which can be found in **Appendix E**. The water level in MW19-1 had

minimal variation throughout the testing period, even during rain events. The water level fluctuated between 226.289 -226.559 masl throughout the testing. The water level in the existing monitoring well MW2 had greater variation between 221.045-223.076 masl. MW2 experiences a greater variation in water level during rainfall and snowmelt events. The different response patterns between each well are likely the result of the change in horizontal gradients from north to south sections of the site. The site's soil profile is composed of mostly free draining sandy soils.

2.3.4 Hydraulic Conductivity

Single Well Response Tests (SWRTs) to assess in-situ hydraulic conductivity (K) were completed by DS on January 14, 2020, at all four (4) monitoring wells. The testing was completed using data loggers placed at the bottom of the wells to accurately measure the change in the hydraulic head versus time. Manual water level measurements were also collected to confirm datalogger readings. K values were calculated using the Bouwer and Rice method. The K values ranged from 1.79×10^{-5} m/sec in the silty fine sand unit to as high as 2.82×10^{-4} m/sec in the sandy gravel unit with a geometric mean of 4.14×10^{-5} m/sec. **Table 2** presents a summary of the Hydraulic Conductivity (K) results for the testing. Individual reports are provided in **Appendix B**.

Table 2: Summary of Hydraulic Conductivity Results

Monitoring Well	Depth (mbgs)	Sample Screened Interval (masl)	Screen Formation	In-situ Hydraulic Conductivity (K) (m/sec)	Geomean Hydraulic Conductivity * (m/sec)
MW19-1	8.02	225.98-224.46	silty fine sand	2.17×10^{-5}	4.14×10^{-5}
MW1	9.30	220.76-217.76	gravelly sand	2.69×10^{-5}	
MW2	9.63	221.27-218.27	sandy gravel	2.82×10^{-4}	
MW3	9.78	220.95-217.65	fine sand some silt	1.79×10^{-5}	

2.3.5 Water Quality

To assess groundwater quality and evaluate options for discharging water collected during construction, one unfiltered groundwater sample was collected on January 28, 2020. The groundwater sample was submitted under a chain of custody to ALS Environmental, a CALA certified laboratory, for chemical analysis of various metals listed in the Provincial Water Quality Objectives (PWQO). All samples were within guideline limits for Barrie sanitary sewer bylaw. All but two sample results were within guideline limits for Barrie storm sewer bylaw. The two reported analytical results that were in exceedance of the storm sewer use bylaw are listed in the Table below. **Table 3** presents a summary of exceeded parameters, and the certificate of analysis is provided in **Appendix C**.

Table 3: Parameters in Groundwater Exceeding the PWQO for Surface Water

Parameter Exceeded	Ontario Sewer Use	Unit	Guideline Limit	BH/MW19-1 Concentration
Total Suspended Solids	Barrie Storm Sewer	mg/L	15	84
Copper-Total	Barrie Storm Sewer	mg/L	0.01	0.013

Note: **Bold** – Exceeded the Sewer use bylaw for storm sewer

3. CONSTRUCTION DEWATERING

3.1 Estimation of Flow Rates- Proposed Building and Site Servicing

Building concept plans were available at the time of writing the report however detailed designs were not. The geotechnical report proposed construction of the building with underground parking levels below grade supported by spread and strip footings or possibly a raft foundation on native silty sand. Based on well data, most of the building foundation will be founded above the groundwater elevation. The north limits of underground parking levels 2 and 3 will contact the groundwater elevation. It is assumed that footings at these locations will extend approximately 1m below the design floor elevation. Dewatering will be required during the construction of the proposed building at these two footing locations. However, it is assumed that these excavations will not be completed at the same time. Dewatering for the installation of services is not expected. DS considered an unsealed (open cut) excavation, a maximum installation depth of about 2 m below the existing water table and a section/trench (50 m long and 10 m wide) to estimate flow rate. The dewatering volume was estimated using the steady-state equation (unconfined aquifer) was estimated as below:

$$Q = K * (H^2 - h^2) / 0.733 * \log (R/r_e) = 40,000 \text{ L/day without a safety factor}$$

Where,

K – Hydraulic conductivity = 2.17×10^{-5} m/s (from MW 19-1)

H – Distance from static water level to the bottom of an aquifer 3 m

h – Depth of water in the well while pumping 1 m

r_e – equivalent radius [m] = $((a*b) / \pi)^{0.5}$ where a and b are excavation dimensions (50 x 10 m) = 12.6 m

R – Radius of the cone of depression = $r_e + 3000 * (H - h) * K^{0.5} = 40.6 \text{ m}$

It is estimated that up to **40,000 L/day (40m³/day)** of groundwater will need to be managed in the open-cut section during the installation of footings for the proposed section.

3.2 Total Estimation of Flow Rate (Short-Term/ Temporary Discharge)

The estimated steady-state flow rate for unsealed excavation for a trench with dimensions of 50 m long and 10 m wide at any given time would be **40,000 L/day (40 m³/day)** without a safety factor. However, a dewatering volume of **60,000 L/day (60m³/day)** with the safety factor of 1.5 is recommended for design

purposes during the installation of footings to account for the variability in hydraulic conductivity, precipitation, and any water in fills that may be encountered.

3.3 Permanent Drainage (Long-term Discharge)

The proposed construction of the parking level 2 and 3 is expected to remain above the water table at the site however, there may be periodic or seasonal instances where the water table rises and intercepts the water table at the northern extent of each level. As a result, it is recommended that underfloor drainage be considered for the parking level 2 and 3 in these areas. It is expected that the drainage would be re-infiltrated further south within the drainage system once the groundwater gradient has fallen below the 3rd (bottom) level.

3.4 Environmental Activity and Sector Registry (EASR) /Permit to Take Water (PTTW) Application

An Environmental Activity Sector Registration (EASR) is required to be submitted to the Ministry of the Environment, Conservation and Parks (MECP) if the taking of groundwater and stormwater for a temporary construction project is between 50,000 L/day and 400,000 L/ day. The EASR application is an online registry and should be submitted to the MECP before any construction dewatering. A PTTW is required to be submitted to the MECP if the taking of groundwater and stormwater for a temporary construction project is more than 400,000 L/ day.

Since the expected design dewatering rate is greater than 50,000 L/day, an EASR is required from the MECP for short-term dewatering, however a PTTW is not.

4. POTENTIAL IMPACTS

The following are the predicted potential impacts as a result of the proposed development and associated construction dewatering:

4.1 Local Groundwater Use

Based on the MECP WWRs, there are no wells expected in the predicted radius of Influence (40m). Water supply wells are noted to be installed at deeper depths within lower aquifers. Since the proposed construction is anticipated to be shallow and the expected dewatering volume is minimal, there will be no short-term or long-term predicted impacts on private and public water wells occurring from the proposed short-term dewatering.

No adverse impact on any source water is anticipated since the proposed construction will not have permanent under-slab drainage and short-term construction dewatering is expected for only the installation of footings.

4.2 Point of Discharge and Groundwater Quality

Groundwater quality analysis indicated that total copper and total suspended solids in groundwater exceeded the PWQO for surface water. Therefore, groundwater pumped during the construction can

not be discharged or diverted to any nearby surface water features without treatment. However, the expected dewatering volume is minimal, and it could be discharged into the storm sewer with treatment such as a settlement tank. Also, considering the radius of influence anticipated (40m) impacts migrating onsite as a result of dewatering is unlikely. No adverse impact on any source water is anticipated.

4.3 Groundwater Recharge

Potential impacts to aquifer recharge include a reduction in pervious area where infiltration can occur. The post-development mitigation design was not available to DS at the time of writing this report and so a full impact assessment including a comparison of pre and post-development water balance with mitigation was not completed. Low Impact Development (LID) Plan should be developed to provide mitigative measures to reduce or remove the estimated infiltration deficit created by the proposed development. In-situ infiltration testing for areas with proposed infiltration systems should be completed once designs are available.

4.4 Well Decommissioning

Following the completion of construction activities, all dewatering wells, well points, eductors and monitoring wells installed at various stages of this project must be decommissioned. The installation and eventual decommissioning of the wells and the dewatering system must be carried out by a licenced water well contractor in accordance with Regulation 903 of the Ontario Water Resources Act.

5. LIMITATIONS

This report was prepared for the sole use of the addressee to provide an assessment of the hydrogeological conditions on the property. The information presented in this report is based on information collected during the completion of the hydrogeological investigation. DS Consultants Ltd. was required to use and rely upon various information sources produced by other parties. The information provided in this report reflects DS's judgment in light of the information available at the time of report preparation. This report may not be relied upon by any other person or entity without the written authorization of DS Consultants Ltd. The scope of services performed in the execution of this investigation may not be appropriate to satisfy the needs of other users, and any use or reuse of these documents or findings, conclusions, and recommendations represented herein, is at the sole risk of said users. The conclusions drawn from the Hydrogeological report were based on information at selected observation and sampling locations. Different conditions between and beyond these locations may become apparent during future investigations or on-site work, which could not be detected or anticipated at the time of this investigation. DS Consultants Ltd. cannot be held responsible for hydrogeological conditions at the Site that was not apparent from the available information.

Should you have any questions regarding these findings, please do not hesitate to contact the undersigned.

DS CONSULTANTS LTD

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Project Manager

Reviewed By:



Martin Gedeon, M.Sc. P.Geo.,
Senior Hydrogeologist

6. REFERENCES

Chapman, L.J., and D.F. Putnam; The Physiography of Southern Ontario, Third Edition, Ontario Geological Survey Special Volume 2; 1984, & 2007.

Ontario Geological Survey, 2010. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release— Data 128 – Revised.

Ministry of Northern Development and Mines Map 2544, Bedrock Geology of Ontario, Scale 1:10,000,000

Ministry of Natural Resources Map P.2715 Physiography of Southern Ontario, Scale 1:6000,000

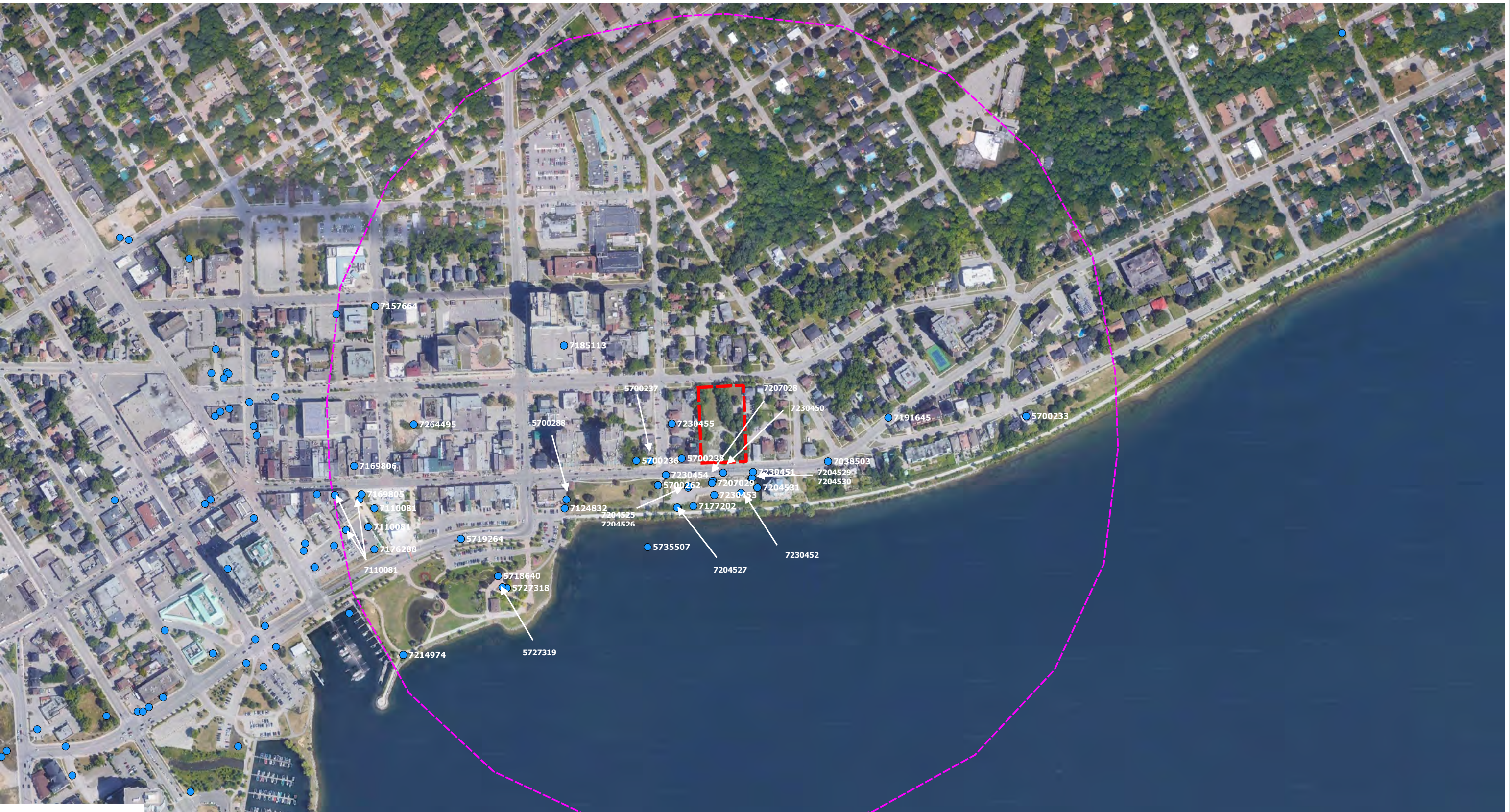
Powers, J. Patrick, P.E. (1992); Construction Dewatering: New Methods and Applications - Second Edition, New York: John Wiley & Sons

Pat M. Cashman and Martin Preene; Groundwater Lowering in Construction- Second Edition, CRC Press

Landtek Limited. (2019) Geotechnical Investigation - Proposed Residential Development 129 Collier Street Barrie, Ontario.

FIGURES

\\192.168.2.252\projects\2019 Projects\19-291-400 129 Collier St, Barrie_Pinemount Holdings Ltd\Drawings\BH Location Map.ggs



- Legend**
- MECP WWR
 - 500m buffer
 - Site Boundary



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Project:
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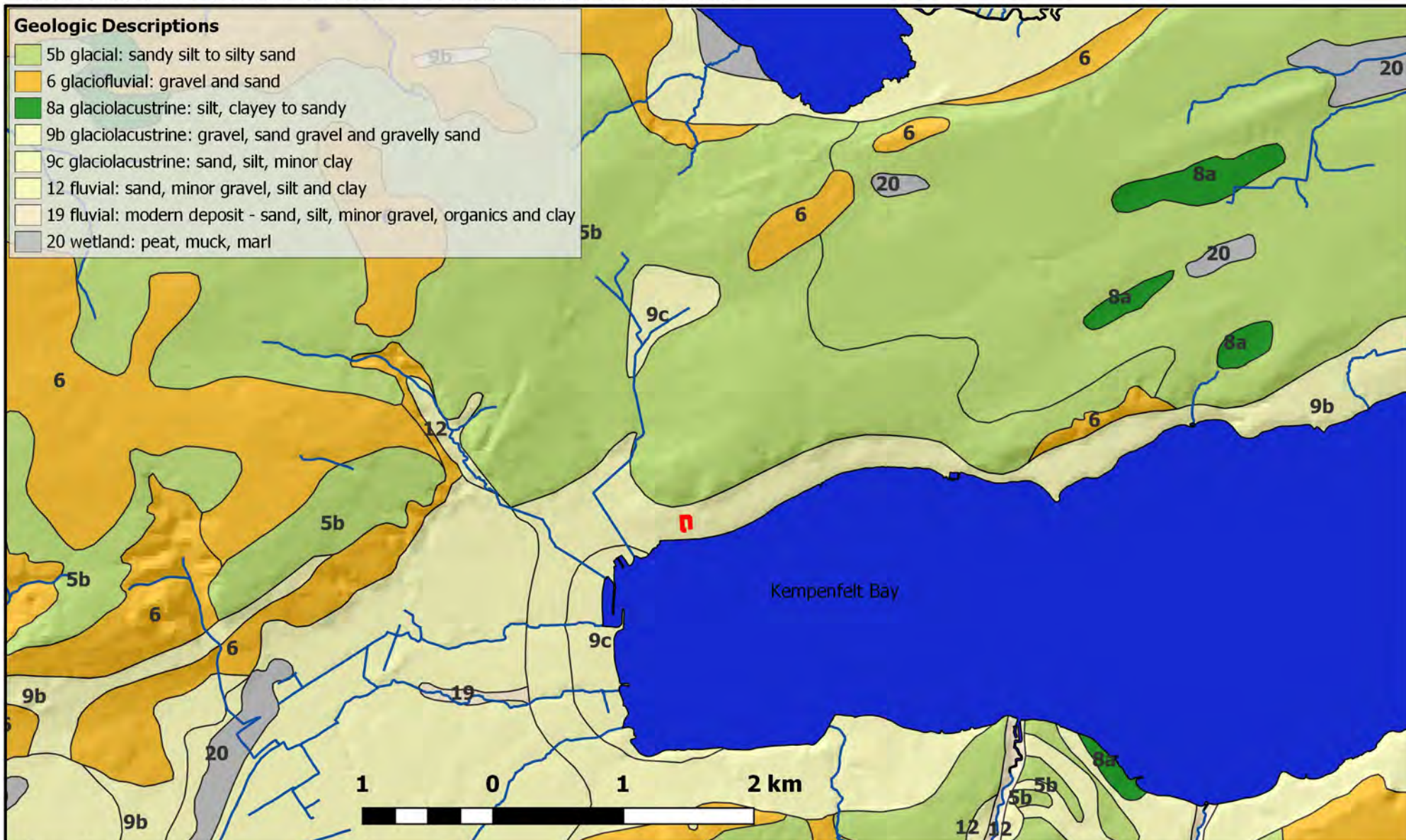
Title:
Site and MECP Water Well Location Map



Size: 11x17	Approved By: S.W	Drawn By: M.Z	Date: February 5th, 2020
	Scale: As Shown	Project No.: 19-291-400	Figure No.: 1
Rev: 0	Image/Map Source: Google Satellite Image		

Geologic Descriptions

- 5b glacial: sandy silt to silty sand
- 6 glaciofluvial: gravel and sand
- 8a glaciolacustrine: silt, clayey to sandy
- 9b glaciolacustrine: gravel, sand gravel and gravelly sand
- 9c glaciolacustrine: sand, silt, minor clay
- 12 fluvial: sand, minor gravel, silt and clay
- 19 fluvial: modern deposit - sand, silt, minor gravel, organics and clay
- 20 wetland: peat, muck, marl



Legend

- Site Boundary
- Lake
- Watercourse



DS CONSULTANTS LTD.

40 Bell Farm Road, UNIT 8
Barrie, Ontario L4M 5L3
Telephone: (705) 721-9392
www.dsconsultants.ca

Client:

Pinemount Holdings Ltd.

Project:

Hydrogeological Investigation - 129 Collier St. Barrie, ON

Title:

Surficial Geology Map

Size:
8.5 x 11

Rev:
0

Approved By:

S.W

Drawn By:

M.Z

Date:

Feb. 5th, 2020

Scale:

As Shown

Project No.:

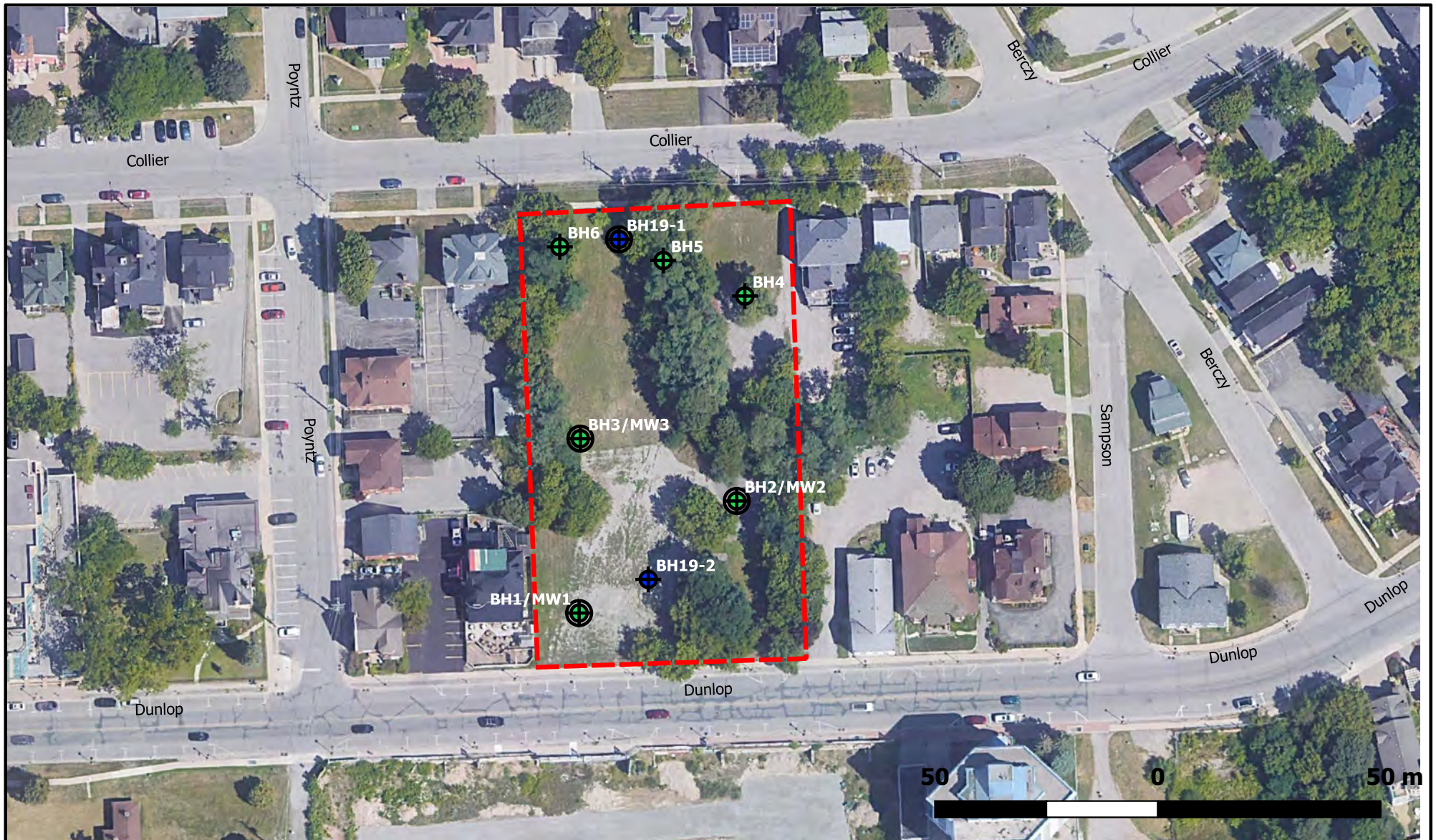
19-291-400

Figure No.:

2

Image/Map Source: Google Satellite Image





Legend

- Site Boundary
- + Borehole Location (DS 2019)
- + Monitoring Well Location (DS 2019)
- + Borehole Location (Landtek 2019)
- + Monitoring Well Location (Landtek 2019)



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Telephone: (705) 721-9392
www.dsconsultants.ca

Client:

Pinemount Holdings Ltd.

Project:

Hydrogeological Investigation - 129 Collier St. Barrie, ON

Title:

Borehole Location Map



Size:
8.5 x 11

Rev:
0

Approved By: S.W.

Scale: As Shown

Image/Map Source: Google Satellite Image

Drawn By: M.Z.

Project No.: 19-291-400

Date: Feb. 5th, 2020

Figure No.: **3**



Legend

- Groundwater Contour
- ⊕ DS Borehole
- ⊙ DS Monitoring Well
- ⊕ Landtek Borehole
- ⊙ Landtek Monitoring Well
- Site Boundary



DS CONSULTANTS LTD.

40 Bell Farm Rd., UNIT 8
Barrie, Ontario L4M 5L3
Telephone: (705) 721-9392
www.dsconsultants.ca

Client:

Pinemount Holdings Ltd.

Project:

Hydrogeological Investigation - 129 Collier St., Barrie, ON

Title:

Groundwater Flow Map

Size:
8.5 x 11

Rev:
0

Approved By:

S.W

Drawn By:

M.Z

Date:

Feb. 13th, 2020

Scale: As Shown

Project No.: 19-291-400

Figure No.:

4

Image/Map Source: Google Satellite Image



APPENDIX A BOREHOLE LOGS

PROJECT: Hydrogeological Investigation

CLIENT: Pinemount Holdings Ltd.

PROJECT LOCATION: 129 Collier Street, Barrie

DATUM: Geodetic

BOREHOLE LOCATION:

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150

Date: Nov/15/2019

REF. NO.: 19-291-400

ENCL NO.: 2

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
(m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)				W _p	W	W _L			
0.0	GRAVELLY SAND FILL: Dark brown sand and gravel, some organics, moist		1	SS	10			20	40	60	80	100					
0.2	TOPSOIL: Topsoil below sand and gravel fill, to 0.8m depth																
0.8	SAND AND GRAVEL: light brown, trace organics to 1.4m, some cobbles beyond 1.5m, damp, trace silt beyond 2.44m		2	SS	32												
			3	SS	80												
			4	SS	68												
			5	SS	62												
			6	SS	53												
4.9	FINE SAND: Grey, trace silt, wet to very wet, very dense, clay seams beyond 9m		7	SS	>100												
			8	SS	>100												
			9	SS	>100												
9.8	END OF BOREHOLE: Notes: 1) 50 mm diameter monitoring well installed upon completion 2) Water level Readings: Date: Water Depth (mbgs) Dec 11th, 2019 6.38																

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3 , × 3 : Numbers refer to Sensitivity

○ = 3% Strain at Failure

DS SOIL LOG 19-291-400 BOREHOLE LOGS.GPJ DS.GDT 19/12/13

PROJECT: Hydrogeological Investigation

CLIENT: Pinemount Holdings Ltd.

PROJECT LOCATION: 129 Collier Street, Barrie

DATUM: Geodetic

BOREHOLE LOCATION:

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150

Date: Nov/15/2019

REF. NO.: 19-291-400

ENCL NO.: 3

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT							PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)												WATER CONTENT (%)			GR	SA	SI	CL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
0.0	FILL: 150 mm Sand and gravel, some organics over topsoil		1	SS	6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

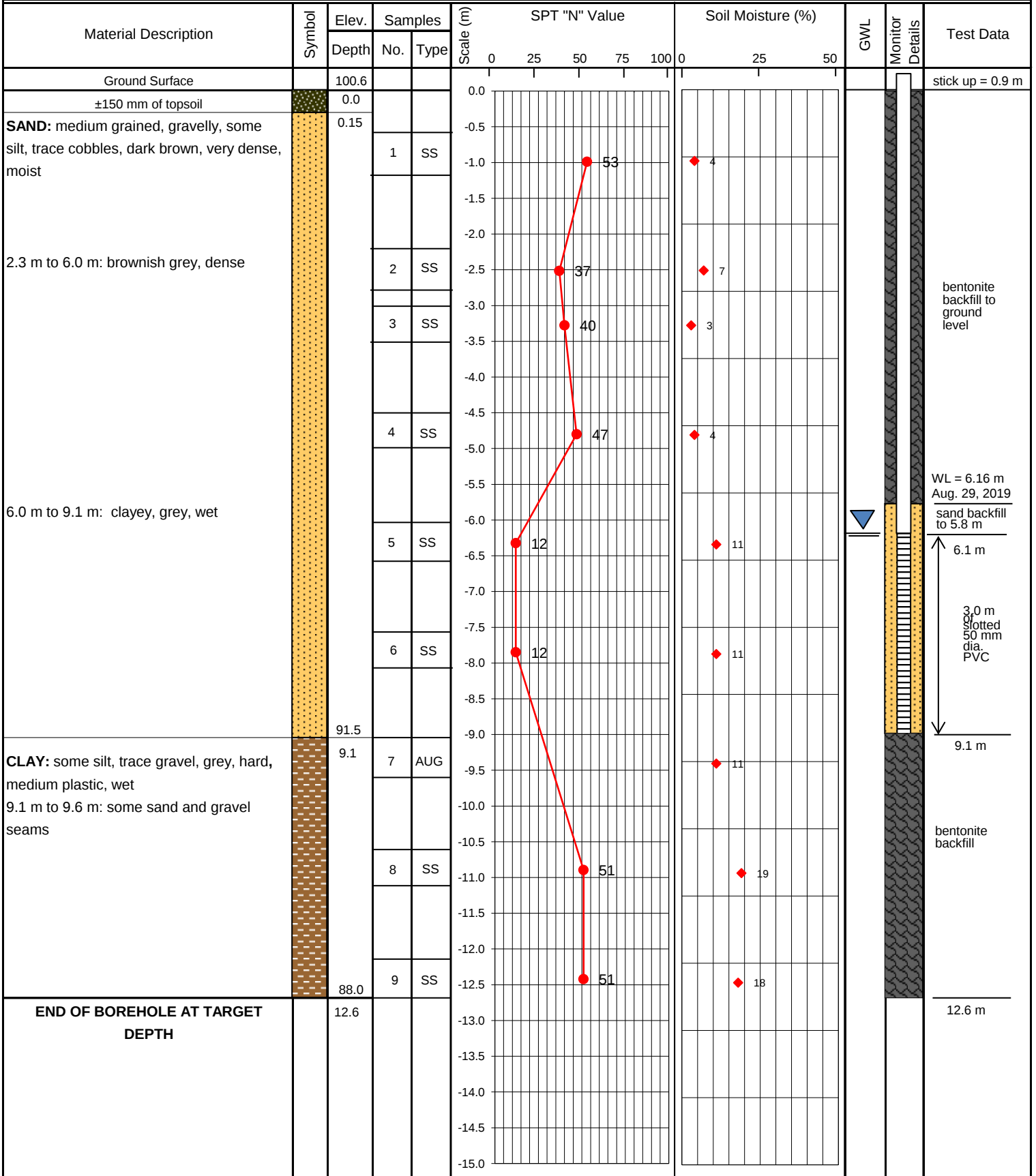
+ 3, × 3: Numbers refer to Sensitivity

○ = 3% Strain at Failure

DS SOIL LOG 19-291-400 BOREHOLE LOGS.GPJ DS.GDT 19/12/13

grinding during augering

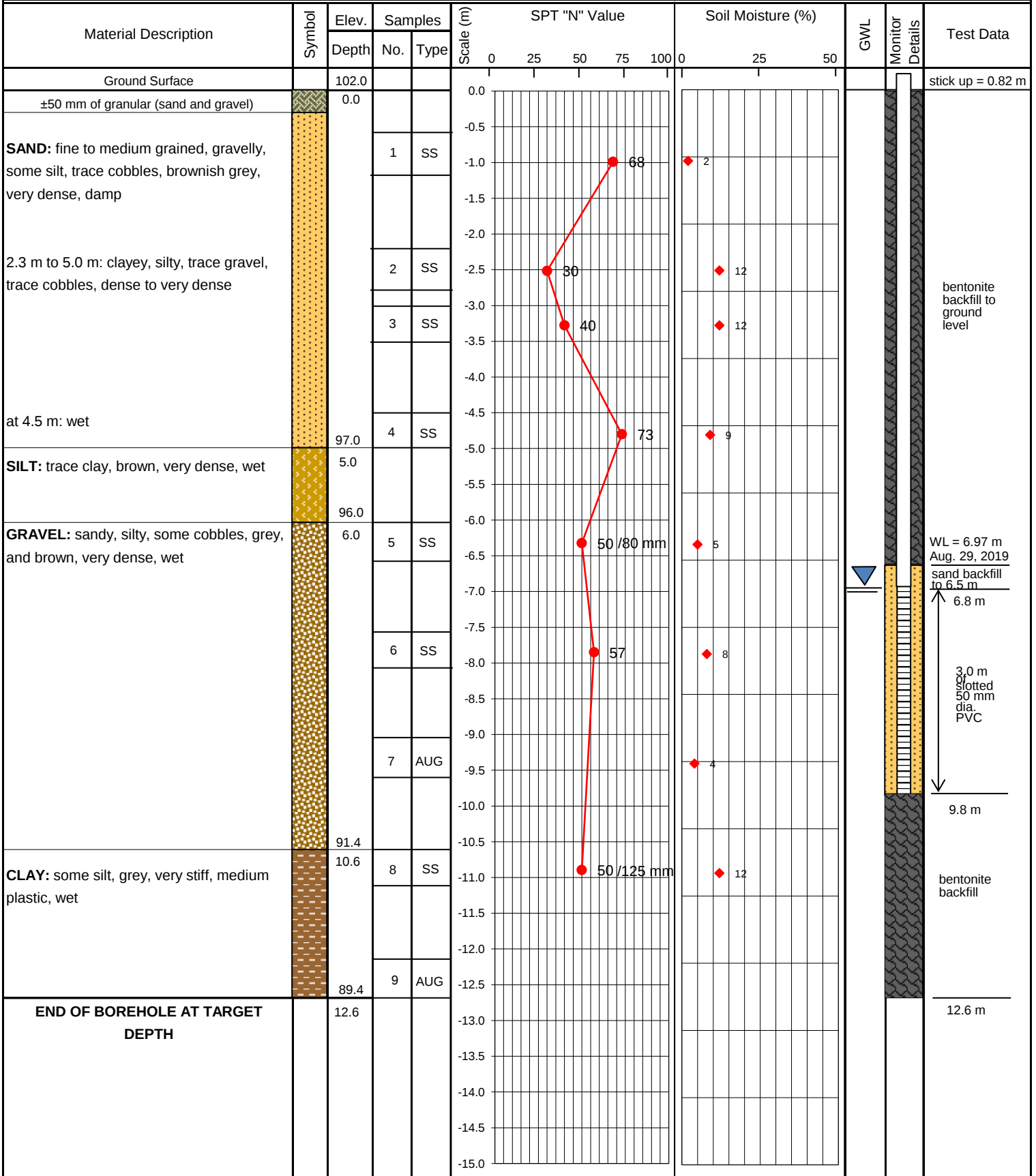
Project No.: 19280	Drill Date: August 12, 2019
Project: Geotechnical Investigation	Drill Method: ☐ solid stem ☒ hollow stem ☐ vibratory
Location: 129 Collier Street, Barrie, Ontario	Datum: TBM: Assumed elevation = 100 m



Notes:	1. On completion, borehole open to 12.2 m 2. Groundwater encountered below 6.0 m 3. Water level reading: WL at 6.16 m depth on August 29, 2019
PP = pocket penetrometer TCV = total combustible vapour BRD = bulk relative density PL = plastic limit LL = liquid limit PI = plasticity index FV = field vane LV = lab vane VS = vane sensitivity	LANDTEK LIMITED 205 Nebo Road, Unit 3 Hamilton, Ontario, Canada, L8W 2E1 Ph: (905) 383-3733 Fax: (905) 383-8433 www.landteklimited.com

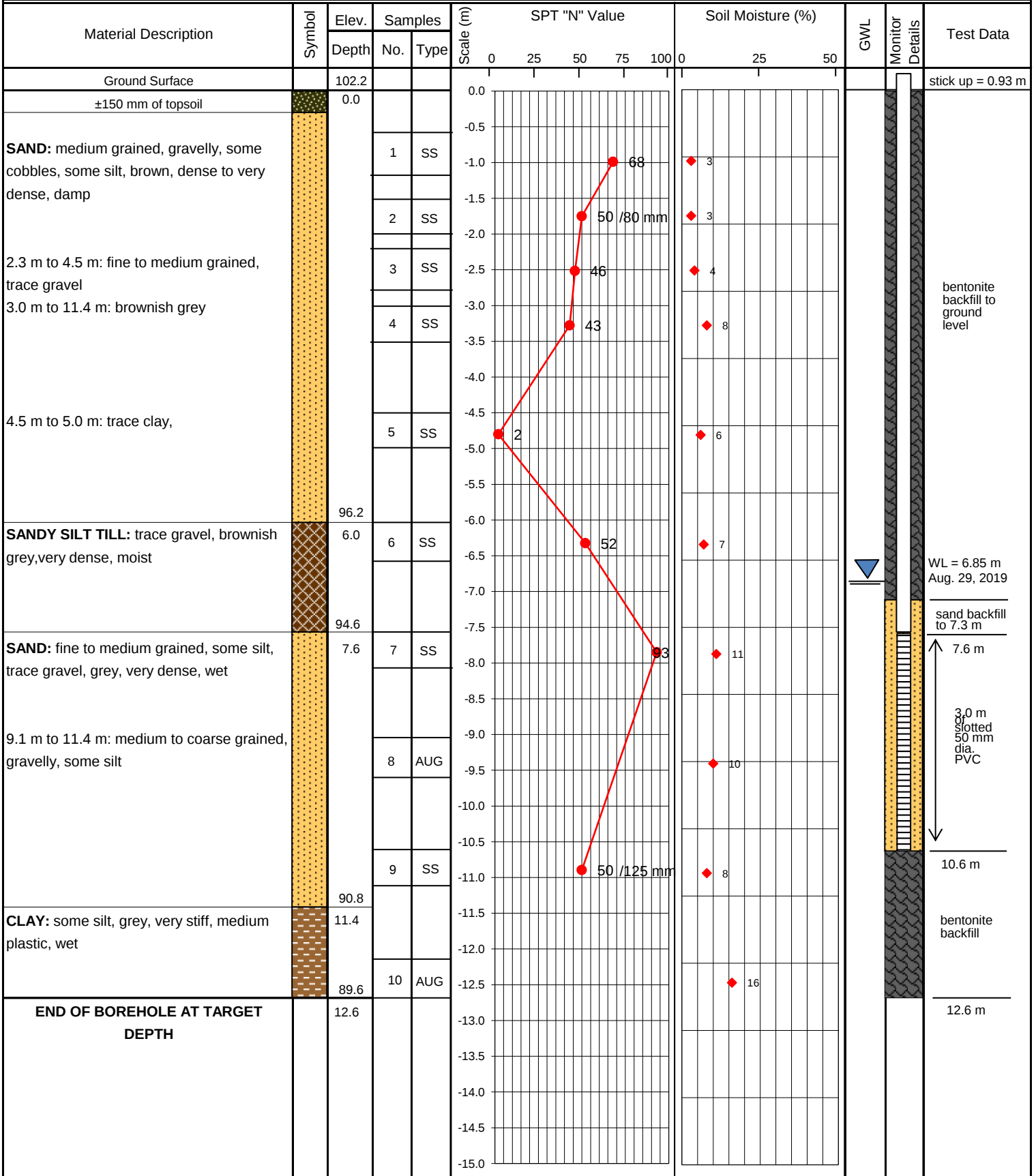


Project No.: 19280	Drill Date: August 12, 2019
Project: Geotechnical Investigation	Drill Method: ☐ solid stem ☒ hollow stem ☐ vibratory
Location: 129 Collier Street, Barrie, Ontario	Datum: TBM: Assumed elevation = 100 m



Notes: 1. On completion, borehole open to 12.2 m 2. Groundwater encountered below 4.5 m 3. Water level reading: WL at 6.97 m depth on August 29, 2019	LANDTEK LIMITED 205 Nebo Road, Unit 3 Hamilton, Ontario, Canada, L8W 2E1 Ph: (905) 383-3733 Fax: (905) 383-8433 www.landteklimited.com	
PP = pocket penetrometer TCV = total combustible vapour BRD = bulk relative density PL = plastic limit LL = liquid limit PI = plasticity index FV = field vane LV = lab vane VS = vane sensitivity		

Project No.: 19280	Drill Date: August 13, 2019
Project: Geotechnical Investigation	Drill Method: ☐ solid stem ☒ hollow stem ☐ vibratory
Location: 129 Collier Street, Barrie, Ontario	Datum: TBM: Assumed elevation = 100 m



Notes: 1. On completion, borehole open to 12.2 m 2. Groundwater encountered below 7.6 m 3. Water level reading: WL at 6.85 m depth on August 29, 2019	LANDTEK LIMITED 205 Nebo Road, Unit 3 Hamilton, Ontario, Canada, L8W 2E1 Ph: (905) 383-3733 Fax: (905) 383-8433 www.landteklimited.com	
PP = pocket penetrometer TCV = total combustible vapour BRD = bulk relative density PL = plastic limit LL = liquid limit PI = plasticity index FV = field vane LV = lab vane VS = vane sensitivity		

Project No.: 19280	Drill Date: August 13, 2019
Project: Geotechnical Investigation	Drill Method: ☐ solid stem ☒ hollow stem ☐ vibratory
Location: 129 Collier Street, Barrie, Ontario	Datum: TBM: Assumed elevation = 100 m

Material Description	Symbol	Elev.	Samples		Scale (m)	SPT "N" Value	Soil Moisture (%)	GWL	Monitor Details	Test Data
		Depth	No.	Type						
Ground Surface		106.0			0					
±50 mm of granular (sand and gravel)		0.0			0.0					
SILTY SAND: trace to some gravel, trace rootlets, brown, loose, damp 1.5 m to 2.7 m: dense			1	SS	-1.0	9	2			
			2	SS	-1.5	40	5			
			3	SS	-2.5	37	19			
2.3 m to 2.7 m: trace brick fragments, moist		103.3								
SILT: some clay, trace gravel, trace sand, brown and grey, dense, moist		2.7	4	SS	-3.0	36	8			
		101.5								
SAND: medium grained, some gravel, grey, dense to very dense, moist 6.0 m to 10.6 m: wet 6.0 m to 6.6 m: some iron staining, reddish brown		4.5	5	SS	-4.5	51	4			
			6	SS	-6.0	48	10			
			7	SS	-8.0	50 /100 mm	16			
			8	SS	-9.5	50 /100 mm	12			
		95.4								
SANDY SILT: trace clay, grey, very dense, wet		10.6	9	SS	-11.0	50 /100 mm	20			
			10	SS	-12.5	50 /125 mm	18			
		93.4								
END OF BOREHOLE AT TARGET DEPTH		12.6			-13.0					
					-13.5					
					-14.0					
					-14.5					
					-15.0					

Notes: 1. On completion, borehole open to 12.2 m 2. Groundwater encountered below 6.0 m	LANDTEK LIMITED 205 Nebo Road, Unit 3 Hamilton, Ontario, Canada, L8W 2E1 Ph: (905) 383-3733 Fax: (905) 383-8433 www.landteklimited.com	
	PP = pocket penetrometer TCV = total combustible vapour BRD = bulk relative density PL = plastic limit LL = liquid limit PI = plasticity index FV = field vane LV = lab vane VS = vane sensitivity	

Project No.: 19280	Drill Date: August 14, 2019
Project: Geotechnical Investigation	Drill Method: ☐ solid stem ☒ hollow stem ☐ vibratory
Location: 129 Collier Street, Barrie, Ontario	Datum: TBM: Assumed elevation = 100 m

Material Description	Symbol	Elev.	Samples		Scale (m)	SPT "N" Value	Soil Moisture (%)	GWL	Monitor Details	Test Data
		Depth	No.	Type						
Ground Surface		107.1			0					
±100 mm of topsoil		0.0			0.0					
FILL: silty sand, fine grained, gravelly, trace cobble, brown, very dense, damp			1	SS	-1.0	50 / 75 mm	2			
			2	AUG	-2.5		2			
SAND: gravelly, trace cobble, trace silt, brown, dense, moist		103.3			-3.5					
		3.8	3	AUG	-4.0		6			
SANDY SILT: fine grained sand, grey, very dense, moist 6.0 m to 9.4 m: wet		102.6			-4.5					
		4.5	4	SS	-5.0	57	19			
			5	SS	-6.5	58	18			
			6	SS	-8.0	50 / 100 mm	14			
CLAY: some silt, grey, very stiff, moist 10.5 m to 11.5 m: hard 12.0 m to 12.6 m: wet		97.7	7	SS	-9.5	23	16			
		9.4	8	SS	-11.0	65	19			
		94.5	9	SS	-12.5	17	23			
END OF BOREHOLE AT TARGET DEPTH		12.6			-13.0					

Notes: - On completion, borehole open to 12.2 m - Groundwater encountered below 6.0 m						LANDTEK LIMITED 205 Nebo Road, Unit 3 Hamilton, Ontario, Canada, L8W 2E1 Ph: (905) 383-3733 Fax: (905) 383-8433 www.landteklimited.com				
PP = pocket penetrometer TCV = total combustible vapour BRD = bulk relative density PL = plastic limit LL = liquid limit PI = plasticity index FV = field vane LV = lab vane VS = vane sensitivity										

Project No.: 19280	Drill Date: August 14, 2019
Project: Geotechnical Investigation	Drill Method: ☐ solid stem ☒ hollow stem ☐ vibratory
Location: 129 Collier Street, Barrie, Ontario	Datum: TBM: Assumed elevation = 100 m

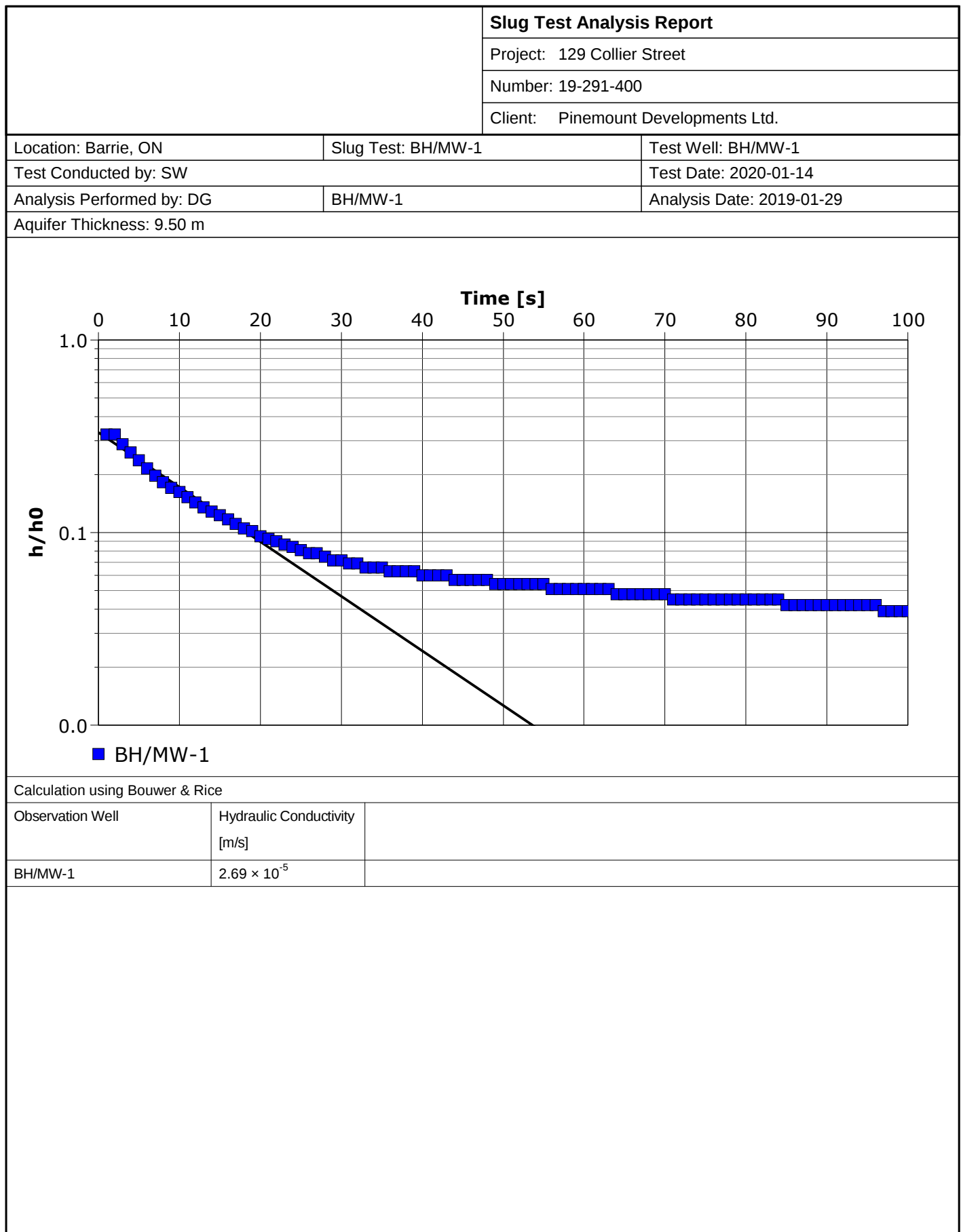
Material Description	Symbol	Elev.	Samples		Scale (m)	SPT "N" Value	Soil Moisture (%)	GWL	Monitor Details	Test Data
		Depth	No.	Type						
Ground Surface		108.5			0	0	0			
±100 mm of topsoil		0.0			0.0					
FILL: silty sand, fine grained, gravelly, some cobble, dark brown, compact to dense, damp			1	AUG	-1.0		5			
					-1.5					
			2	AUG	-2.5		5			
			3	AUG	-3.5		4			
		103.8	4	SS	-4.5	69	7			
SANDY SILT: fine grained sand, grey, very dense, moist 6.0 m to 12.6 m: wet		4.7			-5.5					
			5	SS	-6.5	50	18			
			6	SS	-8.0	68	22			
			7	SS	-9.5	67	24			
			8	SS	-11.0	50	17			
		95.9	9	SS	-12.5	69	22			
END OF BOREHOLE AT TARGET DEPTH		12.6			-13.0					
					-13.5					
					-14.0					
					-14.5					
					-15.0					

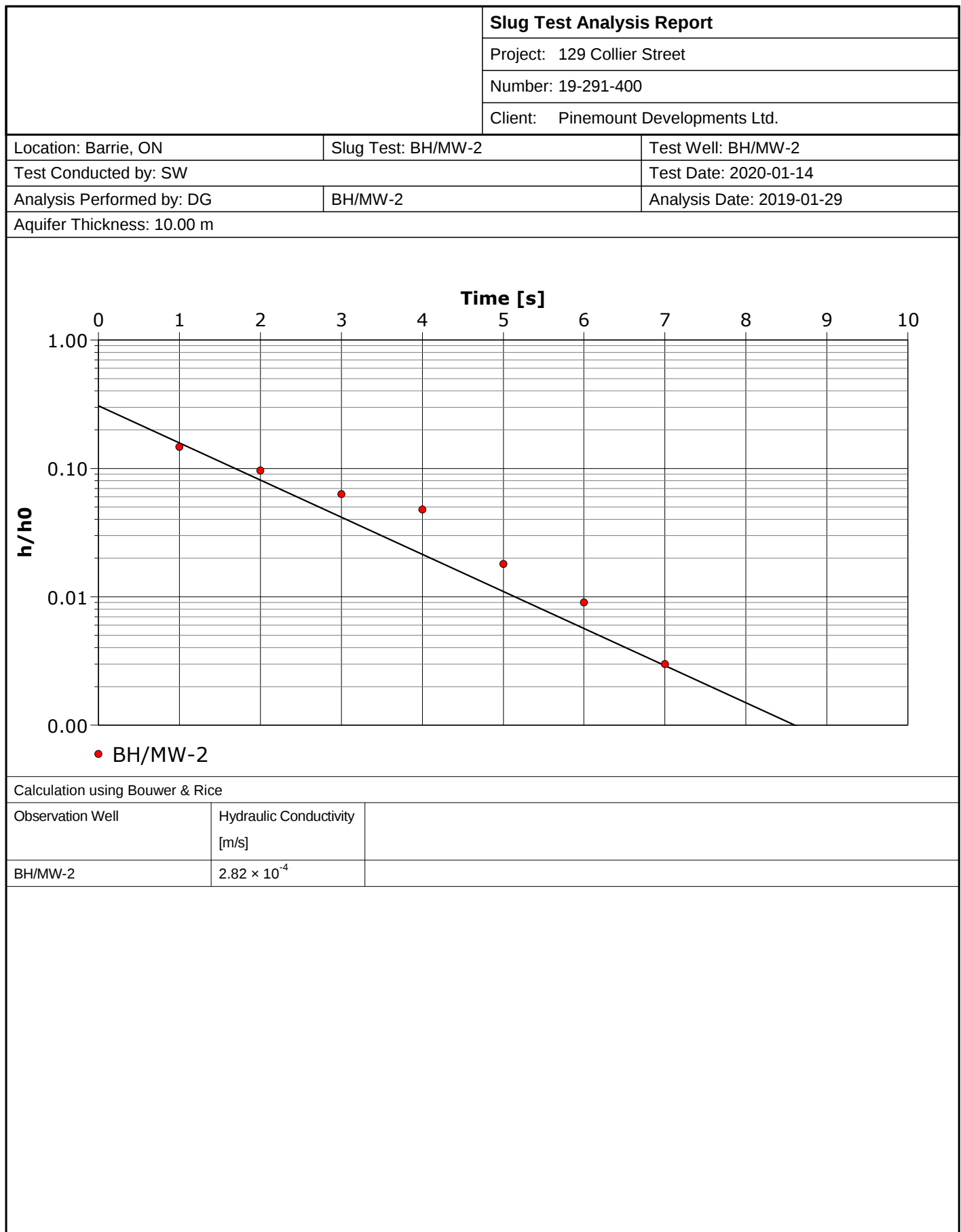
Notes: 1. On completion, borehole open to 12.2 m 2. Groundwater encountered below 6.0 m						LANDTEK LIMITED 205 Nebo Road, Unit 3 Hamilton, Ontario, Canada, L8W 2E1 Ph: (905) 383-3733 Fax: (905) 383-8433 www.landteklimited.com				
PP = pocket penetrometer TCV = total combustible vapour BRD = bulk relative density PL = plastic limit LL = liquid limit PI = plasticity index FV = field vane LV = lab vane VS = vane sensitivity										

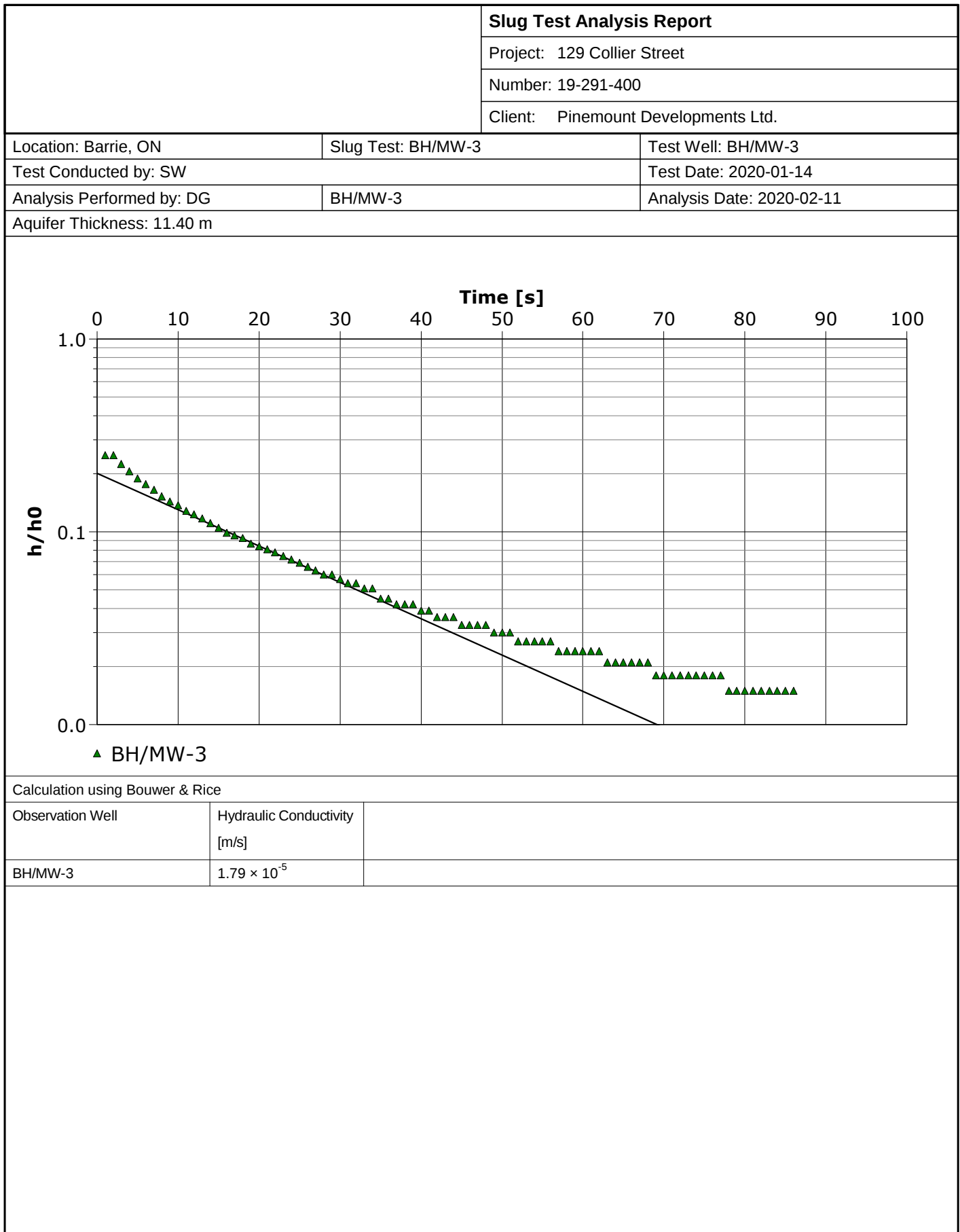
APPENDIX B

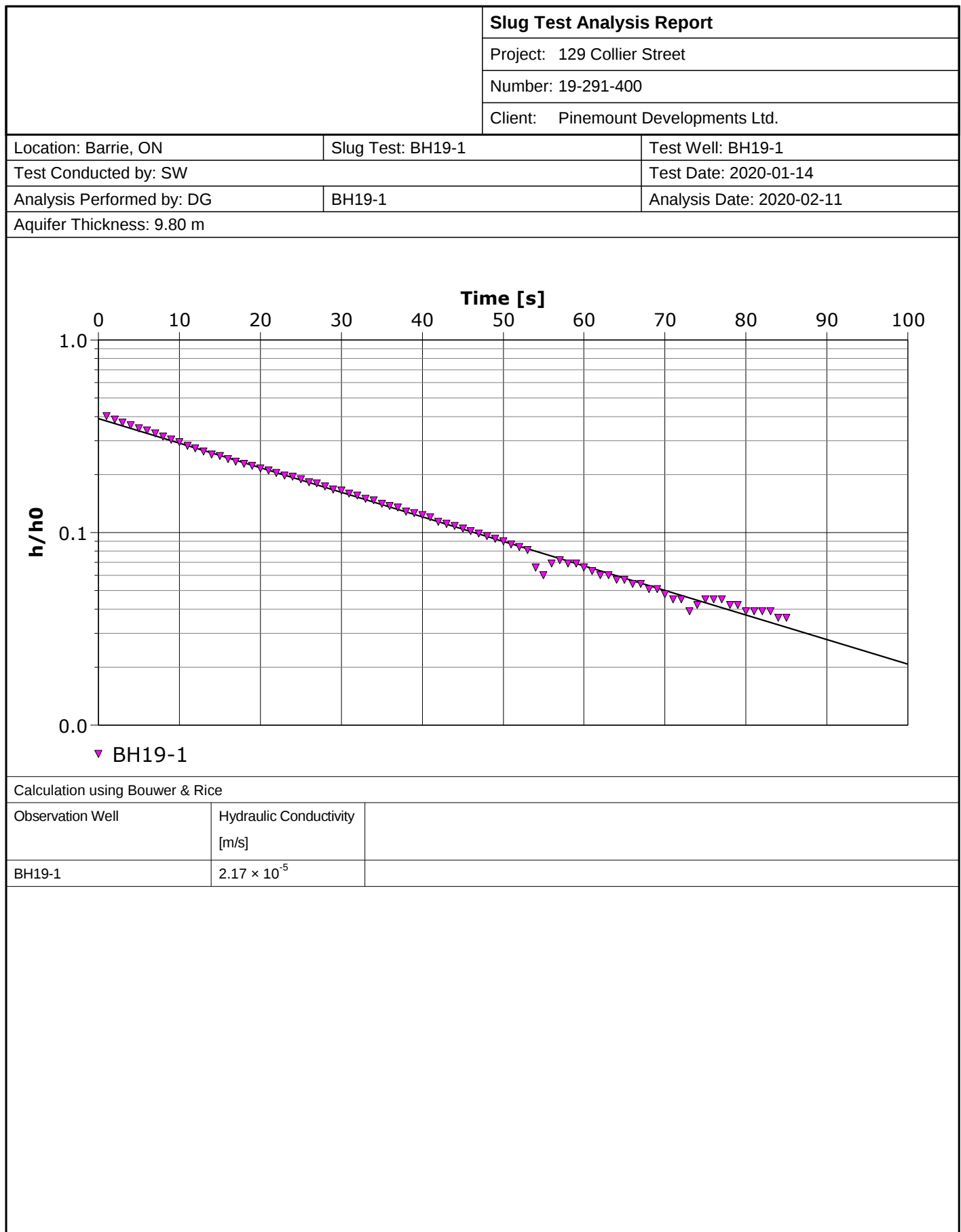
HYDRUALIC CONDUCTIVITY

ANALYSIS









APPENDIX C

GROUNDWATER QUALITY

CERTIFICATE OF ANALYSIS



DS Consultants (Vaughan)
ATTN: Matt Zammit
40 Bell Farm Road
Unit 8
Barrie ON L4M 56L3

Date Received: 28-JAN-20
Report Date: 06-FEB-20 14:11 (MT)
Version: FINAL

Client Phone: 289-456-9764

Certificate of Analysis

Lab Work Order #: L2410437
Project P.O. #: NOT SUBMITTED
Job Reference: 19-291-400
C of C Numbers: 17-821144
Legal Site Desc:

Amanda Overholster
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 5730 Coopers Avenue, Unit #26, Mississauga, ON L4Z 2E9 Canada | Phone: +1 905 507 6910 | Fax: +1 905 507 6927
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ANALYTICAL GUIDELINE REPORT

L2410437 CONTD....

Page 2 of 7

06-FEB-20 14:11 (MT)

19-291-400

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte									
L2410437-1	MW19-1									
Sampled By:	MZ on 28-JAN-20 @ 10:00									
Matrix:	WATER									
Physical Tests							#1	#2		
pH		7.43		0.10	pH units	30-JAN-20	6.0-9.5	6.0-9.5		
Total Suspended Solids		84.0		2.0	mg/L	31-JAN-20	350	*15		
Anions and Nutrients										
Chloride (Cl)		1150	DLDS	5.0	mg/L	29-JAN-20	1500			
Fluoride (F)		<0.20	DLDS	0.20	mg/L	29-JAN-20	10			
Total Kjeldahl Nitrogen		0.37		0.15	mg/L	30-JAN-20	100			
Phosphorus, Total		0.191		0.0030	mg/L	31-JAN-20	10			
Sulfate (SO4)		40.8	DLDS	3.0	mg/L	29-JAN-20	1500			
Sulphide (as S)		0.040		0.018	mg/L	29-JAN-20				
Sulphide (as H2S)		0.043		0.019	mg/L	29-JAN-20	1			
Cyanides										
Cyanide, Total		0.0033		0.0020	mg/L	28-JAN-20	1.2			
Total Metals										
Aluminum (Al)-Total		3.82	DLHC	0.050	mg/L	29-JAN-20	50			
Antimony (Sb)-Total		<0.0010	DLHC	0.0010	mg/L	29-JAN-20	5			
Arsenic (As)-Total		0.0012	DLHC	0.0010	mg/L	29-JAN-20	1			
Barium (Ba)-Total		0.321	DLHC	0.0010	mg/L	29-JAN-20	5			
Bismuth (Bi)-Total		<0.00050	DLHC	0.00050	mg/L	29-JAN-20	5			
Cadmium (Cd)-Total		0.000066	DLHC	0.000050	mg/L	29-JAN-20	0.7	0.001		
Chromium (Cr)-Total		0.0091	DLHC	0.0050	mg/L	29-JAN-20	2	0.08		
Cobalt (Co)-Total		0.0042	DLHC	0.0010	mg/L	29-JAN-20	5.0			
Copper (Cu)-Total		0.013	DLHC	0.010	mg/L	29-JAN-20	2.0	*0.01		
Iron (Fe)-Total		6.27	DLHC	0.10	mg/L	29-JAN-20	50			
Lead (Pb)-Total		0.00377	DLHC	0.00050	mg/L	29-JAN-20	0.7	0.05		
Manganese (Mn)-Total		0.208	DLHC	0.0050	mg/L	29-JAN-20	5			
Mercury (Hg)-Total		0.0000114		0.0000050	mg/L	30-JAN-20	0.01			
Molybdenum (Mo)-Total		<0.00050	DLHC	0.00050	mg/L	29-JAN-20	5			
Nickel (Ni)-Total		0.0071	DLHC	0.0050	mg/L	29-JAN-20	2	0.05		
Selenium (Se)-Total		0.00090	DLHC	0.00050	mg/L	29-JAN-20	1.0			
Silver (Ag)-Total		<0.00050	DLHC	0.00050	mg/L	29-JAN-20	0.4			
Tin (Sn)-Total		<0.0010	DLHC	0.0010	mg/L	29-JAN-20	5			
Titanium (Ti)-Total		0.308	DLHC	0.0030	mg/L	29-JAN-20				
Vanadium (V)-Total		0.0109	DLHC	0.0050	mg/L	29-JAN-20	5.0			
Zinc (Zn)-Total		<0.030	DLHC	0.030	mg/L	29-JAN-20	2.0	0.04		
Aggregate Organics										
BOD		<2.0		2.0	mg/L	04-FEB-20	300	15		
COD		43		10	mg/L	03-FEB-20	600			
Oil and Grease, Total		<5.0		5.0	mg/L	30-JAN-20				
Animal/Veg Oil & Grease		<5.0		5.0	mg/L	31-JAN-20	150			
Mineral Oil and Grease		<2.5		2.5	mg/L	30-JAN-20	15			
Phenols (4AAP)		0.0039		0.0010	mg/L	29-JAN-20	0.1			
Volatile Organic Compounds										
Acetone		<20		20	ug/L	29-JAN-20				
Benzene		<0.50		0.50	ug/L	29-JAN-20	10			

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Sewer Use Bylaws = [Suite] - ON-SAN+STORM-BARRIE (2012-172)

#1: Barrie Sanitary Sewer (2012-172)

#2: Barrie Storm Sewer (2012-172)

ANALYTICAL GUIDELINE REPORT

L2410437 CONTD....

Page 3 of 7

06-FEB-20 14:11 (MT)

19-291-400

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte									
L2410437-1	MW19-1									
Sampled By:	MZ on 28-JAN-20 @ 10:00									
Matrix:	WATER									
Volatile Organic Compounds										
	Bromodichloromethane	<1.0		1.0	ug/L	29-JAN-20				
	Bromoform	<1.0		1.0	ug/L	29-JAN-20				
	Bromomethane	<0.50		0.50	ug/L	29-JAN-20				
	Carbon Disulfide	<1.0		1.0	ug/L	29-JAN-20				
	Carbon tetrachloride	<0.50		0.50	ug/L	29-JAN-20				
	Chlorobenzene	<0.50		0.50	ug/L	29-JAN-20				
	Dibromochloromethane	<1.0		1.0	ug/L	29-JAN-20				
	Chloroethane	<1.0		1.0	ug/L	29-JAN-20				
	Chloroform	<1.0		1.0	ug/L	29-JAN-20				
	Chloromethane	<1.0		1.0	ug/L	29-JAN-20				
	1,2-Dibromoethane	<0.20		0.20	ug/L	29-JAN-20				
	1,2-Dichlorobenzene	<0.50		0.50	ug/L	29-JAN-20	50			
	1,3-Dichlorobenzene	<0.50		0.50	ug/L	29-JAN-20				
	1,4-Dichlorobenzene	<0.50		0.50	ug/L	29-JAN-20	80			
	Dichlorodifluoromethane	<1.0		1.0	ug/L	29-JAN-20				
	1,1-Dichloroethane	<0.50		0.50	ug/L	29-JAN-20				
	1,2-Dichloroethane	<0.50		0.50	ug/L	29-JAN-20				
	1,1-Dichloroethylene	<0.50		0.50	ug/L	29-JAN-20				
	cis-1,2-Dichloroethylene	<0.50		0.50	ug/L	29-JAN-20				
	trans-1,2-Dichloroethylene	<0.50		0.50	ug/L	29-JAN-20				
	Dichloromethane	<2.0		2.0	ug/L	29-JAN-20	90			
	1,2-Dichloropropane	<0.50		0.50	ug/L	29-JAN-20				
	cis-1,3-Dichloropropene	<0.30		0.30	ug/L	29-JAN-20				
	trans-1,3-Dichloropropene	<0.30		0.30	ug/L	29-JAN-20				
	Ethylbenzene	<0.50		0.50	ug/L	29-JAN-20	60			
	n-Hexane	<0.50		0.50	ug/L	29-JAN-20				
	2-Hexanone	<20		20	ug/L	29-JAN-20				
	Methyl Ethyl Ketone	<20		20	ug/L	29-JAN-20				
	Methyl Isobutyl Ketone	<20		20	ug/L	29-JAN-20				
	MTBE	<0.50		0.50	ug/L	29-JAN-20				
	Styrene	<0.50		0.50	ug/L	29-JAN-20				
	1,1,1,2-Tetrachloroethane	<0.50		0.50	ug/L	29-JAN-20				
	1,1,2,2-Tetrachloroethane	<0.50		0.50	ug/L	29-JAN-20	60			
	Tetrachloroethylene	<0.50		0.50	ug/L	29-JAN-20	60			
	Toluene	<0.50		0.50	ug/L	29-JAN-20	20			
	1,1,1-Trichloroethane	<0.50		0.50	ug/L	29-JAN-20				
	1,1,2-Trichloroethane	<0.50		0.50	ug/L	29-JAN-20				
	Trichloroethylene	<0.50		0.50	ug/L	29-JAN-20	50			
	Trichlorofluoromethane	<1.0		1.0	ug/L	29-JAN-20				
	Vinyl chloride	<0.50		0.50	ug/L	29-JAN-20				
	o-Xylene	<0.30		0.30	ug/L	29-JAN-20				
	m+p-Xylenes	<0.40		0.40	ug/L	29-JAN-20				
	Xylenes (Total)	<0.50		0.50	ug/L	29-JAN-20	300			
	Surrogate: 4-Bromofluorobenzene	99.3		70-130	%	29-JAN-20				
	Surrogate: 1,4-Difluorobenzene	99.0		70-130	%	29-JAN-20				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.020		0.020	ug/L	29-JAN-20				

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Sewer Use Bylaws = [Suite] - ON-SAN+STORM-BARRIE (2012-172)

#1: Barrie Sanitary Sewer (2012-172)

#2: Barrie Storm Sewer (2012-172)

ANALYTICAL GUIDELINE REPORT

L2410437 CONTD....

Page 4 of 7

06-FEB-20 14:11 (MT)

19-291-400

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte									
L2410437-1	MW19-1									
Sampled By:	MZ on 28-JAN-20 @ 10:00									
Matrix:	WATER									
Polycyclic Aromatic Hydrocarbons										
Acenaphthylene		<0.020		0.020	ug/L	29-JAN-20				
Anthracene		<0.020		0.020	ug/L	29-JAN-20				
Benzo(a)anthracene		<0.020		0.020	ug/L	29-JAN-20				
Benzo(a)pyrene		<0.010		0.010	ug/L	29-JAN-20				
Benzo(b)fluoranthene		<0.020		0.020	ug/L	29-JAN-20				
Benzo(g,h,i)perylene		<0.020		0.020	ug/L	29-JAN-20				
Benzo(k)fluoranthene		<0.020		0.020	ug/L	29-JAN-20				
Chrysene		<0.020		0.020	ug/L	29-JAN-20				
Dibenzo(ah)anthracene		<0.020		0.020	ug/L	29-JAN-20				
Fluoranthene		<0.020		0.020	ug/L	29-JAN-20				
Fluorene		<0.020		0.020	ug/L	29-JAN-20				
Indeno(1,2,3-cd)pyrene		<0.020		0.020	ug/L	29-JAN-20				
1-Methylnaphthalene		<0.020		0.020	ug/L	29-JAN-20				
2-Methylnaphthalene		<0.020		0.020	ug/L	29-JAN-20				
Naphthalene		<0.050		0.050	ug/L	29-JAN-20				
Phenanthrene		<0.020		0.020	ug/L	29-JAN-20				
Pyrene		<0.020		0.020	ug/L	29-JAN-20				
Surrogate: d10-Acenaphthene		95.9		60-140	%	29-JAN-20				
Surrogate: d12-Chrysene		113.5		60-140	%	29-JAN-20				
Surrogate: d8-Naphthalene		96.8		60-140	%	29-JAN-20				
Surrogate: d10-Phenanthrene		100.4		60-140	%	29-JAN-20				
Total PAHs		<0.095		0.095	ug/L	28-JAN-20	5			
							5			
Total PAHs		<0.095		0.095	ug/L	28-JAN-20	5			
							5			
Organochlorine Pesticides										
Hexachlorobenzene		<0.0080		0.0080	ug/L	03-FEB-20	0.1			
Surrogate: Tetrachloro-m-xylene		83.8		40-130	%	03-FEB-20				

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Sewer Use Bylaws = [Suite] - ON-SAN+STORM-BARRIE (2012-172)

#1: Barrie Sanitary Sewer (2012-172)

#2: Barrie Storm Sewer (2012-172)

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference***
BOD-WT	Water	BOD	APHA 5210 B
This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2
Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.			
When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference			
COD-T-WT	Water	Chemical Oxygen Demand	APHA 5220 D
This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.			
EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).			
OCP-ROUTINE-WT	Water	Pesticides, Organochlorine in Water	SW846 8270
Samples are extracted using a solvent mixture and the resulting extracts are analyzed on GC/MSD			
OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calc	CALCULATION
Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.			
OGG-SPEC-WT	Water	Speciated Oil and Grease- Gravimetric	APHA 5520 B
The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.			
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.			

Reference Information

PAH-511-WT	Water	PAH-O. Reg 153/04 (July 2011)	SW846 3510/8270
Aqueous samples, fortified with surrogates, are extracted using liquid/liquid extraction technique. The sample extracts are concentrated and then analyzed using GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).			
PAH-SUM-CALC-WT	Water	TOTAL PAH's	CALCULATION
Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.			
PH-WT	Water	pH	APHA 4500 H-Electrode
Water samples are analyzed directly by a calibrated pH meter.			
Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days			
PHENOLS-4AAP-WT	Water	Phenol (4AAP)	EPA 9066
An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.			
S2-T>H2S-CALC-WT	Water	Total Sulphide Calculated as H2S	Calculation
This calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S). Total Sulphide as (S2-) is determined using procedures adapted from APHA 4500-S2 "Sulphide".			
SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.			
SULPHIDE-WT	Water	Sulphide (as S)	APHA 4500S2D
This analysis is carried out using procedures adapted from APHA Method 4500-S2-D "Methylene Blue Method". Sulphide is determined colourmetrically.			
TKN-WT	Water	Total Kjeldahl Nitrogen	APHA 4500-Norg D
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 Celsius with analysis using an automated colorimetric method.			
VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260
Aqueous samples are analyzed by headspace-GC/MS.			
XYLENES-SUM-CALC-WT	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Total xylenes represents the sum of o-xylene and m&p-xylene.			

*** ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:			
17-821144			
The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:			
Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA		

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

*mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 2 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 5L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-WT		Water						
Batch	R4983967							
WG3265814-10	DUP	WG3265814-8						
Fluoride (F)		0.069	0.068		mg/L	1.1	20	29-JAN-20
WG3265814-7	LCS							
Fluoride (F)			99.97		%		90-110	29-JAN-20
WG3265814-6	MB							
Fluoride (F)			<0.020		mg/L		0.02	29-JAN-20
WG3265814-9	MS	WG3265814-8						
Fluoride (F)			100.3		%		75-125	29-JAN-20
HG-T-CVAA-WT		Water						
Batch	R4983743							
WG3265586-3	DUP	L2410610-1						
Mercury (Hg)-Total		0.0000117	0.0000105		mg/L	11	20	30-JAN-20
WG3265586-2	LCS							
Mercury (Hg)-Total			101.0		%		80-120	30-JAN-20
WG3265586-1	MB							
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	30-JAN-20
WG3265586-4	MS	L2410479-1						
Mercury (Hg)-Total			104.0		%		70-130	30-JAN-20
MET-T-CCMS-WT		Water						
Batch	R4982943							
WG3265454-4	DUP	WG3265454-3						
Aluminum (Al)-Total		0.124	0.145		mg/L	15	20	29-JAN-20
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-JAN-20
Arsenic (As)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-JAN-20
Barium (Ba)-Total		0.0413	0.0410		mg/L	0.8	20	29-JAN-20
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-JAN-20
Cadmium (Cd)-Total		0.000136	0.000126		mg/L	7.6	20	29-JAN-20
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	29-JAN-20
Cobalt (Co)-Total		0.0061	0.0060		mg/L	1.6	20	29-JAN-20
Copper (Cu)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-JAN-20
Iron (Fe)-Total		0.25	0.25		mg/L	0.8	20	29-JAN-20
Lead (Pb)-Total		0.00160	0.00158		mg/L	1.2	20	29-JAN-20
Manganese (Mn)-Total		0.488	0.484		mg/L	0.9	20	29-JAN-20
Molybdenum (Mo)-Total		0.00705	0.00688		mg/L	2.4	20	29-JAN-20
Nickel (Ni)-Total		0.0447	0.0452		mg/L	1.1	20	29-JAN-20
Selenium (Se)-Total		0.00086	0.00094		mg/L	8.6	20	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 3 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT		Water						
Batch	R4982943							
WG3265454-4 DUP		WG3265454-3						
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	29-JAN-20
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-JAN-20
Titanium (Ti)-Total		0.0033	0.0046	J	mg/L	0.0013	0.006	29-JAN-20
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	29-JAN-20
Zinc (Zn)-Total		0.096	0.094		mg/L	2.5	20	29-JAN-20
WG3265454-2 LCS								
Aluminum (Al)-Total			101.6		%		80-120	29-JAN-20
Antimony (Sb)-Total			97.9		%		80-120	29-JAN-20
Arsenic (As)-Total			95.5		%		80-120	29-JAN-20
Barium (Ba)-Total			99.7		%		80-120	29-JAN-20
Bismuth (Bi)-Total			94.9		%		80-120	29-JAN-20
Cadmium (Cd)-Total			97.1		%		80-120	29-JAN-20
Chromium (Cr)-Total			98.0		%		80-120	29-JAN-20
Cobalt (Co)-Total			96.2		%		80-120	29-JAN-20
Copper (Cu)-Total			95.4		%		80-120	29-JAN-20
Iron (Fe)-Total			95.2		%		80-120	29-JAN-20
Lead (Pb)-Total			96.1		%		80-120	29-JAN-20
Manganese (Mn)-Total			98.6		%		80-120	29-JAN-20
Molybdenum (Mo)-Total			94.4		%		80-120	29-JAN-20
Nickel (Ni)-Total			96.8		%		80-120	29-JAN-20
Selenium (Se)-Total			93.4		%		80-120	29-JAN-20
Silver (Ag)-Total			94.4		%		80-120	29-JAN-20
Tin (Sn)-Total			97.3		%		80-120	29-JAN-20
Titanium (Ti)-Total			99.3		%		80-120	29-JAN-20
Vanadium (V)-Total			99.3		%		80-120	29-JAN-20
Zinc (Zn)-Total			97.1		%		80-120	29-JAN-20
WG3265454-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	29-JAN-20
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	29-JAN-20
Arsenic (As)-Total			<0.00010		mg/L		0.0001	29-JAN-20
Barium (Ba)-Total			<0.00010		mg/L		0.0001	29-JAN-20
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	29-JAN-20
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	29-JAN-20
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 4 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT		Water						
Batch	R4982943							
WG3265454-1 MB								
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	29-JAN-20
Copper (Cu)-Total			<0.0010		mg/L		0.001	29-JAN-20
Iron (Fe)-Total			<0.010		mg/L		0.01	29-JAN-20
Lead (Pb)-Total			<0.000050		mg/L		0.00005	29-JAN-20
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	29-JAN-20
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	29-JAN-20
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	29-JAN-20
Selenium (Se)-Total			<0.000050		mg/L		0.00005	29-JAN-20
Silver (Ag)-Total			<0.000050		mg/L		0.00005	29-JAN-20
Tin (Sn)-Total			<0.00010		mg/L		0.0001	29-JAN-20
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	29-JAN-20
Vanadium (V)-Total			<0.00050		mg/L		0.0005	29-JAN-20
Zinc (Zn)-Total			<0.0030		mg/L		0.003	29-JAN-20
WG3265454-5 MS		WG3265454-3						
Aluminum (Al)-Total			N/A	MS-B	%		-	29-JAN-20
Antimony (Sb)-Total			97.5		%		70-130	29-JAN-20
Arsenic (As)-Total			93.9		%		70-130	29-JAN-20
Barium (Ba)-Total			N/A	MS-B	%		-	29-JAN-20
Bismuth (Bi)-Total			86.8		%		70-130	29-JAN-20
Cadmium (Cd)-Total			93.3		%		70-130	29-JAN-20
Chromium (Cr)-Total			96.9		%		70-130	29-JAN-20
Cobalt (Co)-Total			87.3		%		70-130	29-JAN-20
Copper (Cu)-Total			90.7		%		70-130	29-JAN-20
Iron (Fe)-Total			N/A	MS-B	%		-	29-JAN-20
Lead (Pb)-Total			87.2		%		70-130	29-JAN-20
Manganese (Mn)-Total			N/A	MS-B	%		-	29-JAN-20
Molybdenum (Mo)-Total			93.6		%		70-130	29-JAN-20
Nickel (Ni)-Total			N/A	MS-B	%		-	29-JAN-20
Selenium (Se)-Total			97.2		%		70-130	29-JAN-20
Silver (Ag)-Total			92.1		%		70-130	29-JAN-20
Tin (Sn)-Total			98.5		%		70-130	29-JAN-20
Titanium (Ti)-Total			111.6		%		70-130	29-JAN-20
Vanadium (V)-Total			100.0		%		70-130	29-JAN-20
Zinc (Zn)-Total			N/A	MS-B	%		-	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 5 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCP-ROUTINE-WT		Water						
Batch	R4987346							
WG3265531-2	LCS							
Hexachlorobenzene			98.3		%		50-150	03-FEB-20
WG3265531-1	MB							
Hexachlorobenzene			<0.0080		ug/L		0.008	03-FEB-20
Surrogate: Tetrachloro-m-xylene			72.1		%		40-130	03-FEB-20
OGG-SPEC-WT		Water						
Batch	R4984067							
WG3266294-2	LCS							
Oil and Grease, Total			100.5		%		70-130	30-JAN-20
Mineral Oil and Grease			93.6		%		70-130	30-JAN-20
WG3266294-1	MB							
Oil and Grease, Total			<5.0		mg/L		5	30-JAN-20
Mineral Oil and Grease			<2.5		mg/L		2.5	30-JAN-20
P-T-COL-WT		Water						
Batch	R4985587							
WG3265748-3	DUP	L2410479-1						
Phosphorus, Total		0.0239	0.0202		mg/L	17	20	31-JAN-20
WG3265748-2	LCS							
Phosphorus, Total			100.5		%		80-120	31-JAN-20
WG3265748-1	MB							
Phosphorus, Total			<0.0030		mg/L		0.003	31-JAN-20
WG3265748-4	MS	L2410479-1						
Phosphorus, Total			94.7		%		70-130	31-JAN-20
PAH-511-WT		Water						
Batch	R4983296							
WG3264635-2	LCS							
1-Methylnaphthalene			90.6		%		50-140	29-JAN-20
2-Methylnaphthalene			87.5		%		50-140	29-JAN-20
Acenaphthene			102.3		%		50-140	29-JAN-20
Acenaphthylene			103.6		%		50-140	29-JAN-20
Anthracene			110.8		%		50-140	29-JAN-20
Benzo(a)anthracene			134.9		%		50-140	29-JAN-20
Benzo(a)pyrene			110.0		%		50-140	29-JAN-20
Benzo(b)fluoranthene			107.0		%		50-140	29-JAN-20
Benzo(g,h,i)perylene			105.2		%		50-140	29-JAN-20
Benzo(k)fluoranthene			102.8		%		50-140	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 6 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT		Water						
Batch	R4983296							
WG3264635-2	LCS							
Chrysene			121.8		%		50-140	29-JAN-20
Dibenzo(ah)anthracene			107.6		%		50-140	29-JAN-20
Fluoranthene			108.2		%		50-140	29-JAN-20
Fluorene			104.6		%		50-140	29-JAN-20
Indeno(1,2,3-cd)pyrene			122.9		%		50-140	29-JAN-20
Naphthalene			91.5		%		50-140	29-JAN-20
Phenanthrene			111.4		%		50-140	29-JAN-20
Pyrene			110.2		%		50-140	29-JAN-20
WG3264635-1	MB							
1-Methylnaphthalene			<0.020		ug/L		0.02	29-JAN-20
2-Methylnaphthalene			<0.020		ug/L		0.02	29-JAN-20
Acenaphthene			<0.020		ug/L		0.02	29-JAN-20
Acenaphthylene			<0.020		ug/L		0.02	29-JAN-20
Anthracene			<0.020		ug/L		0.02	29-JAN-20
Benzo(a)anthracene			<0.020		ug/L		0.02	29-JAN-20
Benzo(a)pyrene			<0.010		ug/L		0.01	29-JAN-20
Benzo(b)fluoranthene			<0.020		ug/L		0.02	29-JAN-20
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	29-JAN-20
Benzo(k)fluoranthene			<0.020		ug/L		0.02	29-JAN-20
Chrysene			<0.020		ug/L		0.02	29-JAN-20
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	29-JAN-20
Fluoranthene			<0.020		ug/L		0.02	29-JAN-20
Fluorene			<0.020		ug/L		0.02	29-JAN-20
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	29-JAN-20
Naphthalene			<0.050		ug/L		0.05	29-JAN-20
Phenanthrene			<0.020		ug/L		0.02	29-JAN-20
Pyrene			<0.020		ug/L		0.02	29-JAN-20
Surrogate: d8-Naphthalene			94.4		%		60-140	29-JAN-20
Surrogate: d10-Phenanthrene			104.4		%		60-140	29-JAN-20
Surrogate: d12-Chrysene			110.4		%		60-140	29-JAN-20
Surrogate: d10-Acenaphthene			95.4		%		60-140	29-JAN-20

PH-WT **Water**



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 8 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SULPHIDE-WT		Water						
Batch	R4982913							
WG3265503-2	LCS							
Sulphide (as S)			107.6		%		75-125	29-JAN-20
WG3265503-1	MB							
Sulphide (as S)			<0.018		mg/L		0.018	29-JAN-20
WG3265503-4	MS	L2410159-1						
Sulphide (as S)			N/A	MS-B	%		-	29-JAN-20
TKN-WT		Water						
Batch	R4983677							
WG3265719-3	DUP	WG3265719-5						
Total Kjeldahl Nitrogen		0.60	0.57		mg/L	6.6	20	30-JAN-20
WG3265719-2	LCS							
Total Kjeldahl Nitrogen			102.1		%		75-125	30-JAN-20
WG3265719-1	MB							
Total Kjeldahl Nitrogen			<0.15		mg/L		0.15	30-JAN-20
WG3265719-4	MS	WG3265719-5						
Total Kjeldahl Nitrogen			98.1		%		70-130	30-JAN-20
VOC-ROU-HS-WT		Water						
Batch	R4982948							
WG3265402-4	DUP	WG3265402-3						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	29-JAN-20
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
2-Hexanone		<20	<20	RPD-NA	ug/L	N/A	30	29-JAN-20
Acetone		<20	<20	RPD-NA	ug/L	N/A	30	29-JAN-20
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
Bromodichloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 9 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT		Water						
Batch	R4982948							
WG3265402-4	DUP	WG3265402-3						
Bromoform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	29-JAN-20
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
Carbon Disulfide		<1.0	<1.0	RPD-NA	ug/L	N/A	30	29-JAN-20
Carbon tetrachloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
Chloroethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	29-JAN-20
Chloroform		6.5	6.7		ug/L	2.9	30	29-JAN-20
Chloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	29-JAN-20
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	29-JAN-20
Dibromochloromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	29-JAN-20
Dichlorodifluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	29-JAN-20
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	29-JAN-20
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	29-JAN-20
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	29-JAN-20
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	29-JAN-20
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
MTBE		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	29-JAN-20
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	29-JAN-20
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
Trichlorofluoromethane		<1.0	<1.0	RPD-NA	ug/L	N/A	30	29-JAN-20
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	29-JAN-20
WG3265402-1	LCS							
1,1,1,2-Tetrachloroethane			98.8		%		70-130	29-JAN-20
1,1,2,2-Tetrachloroethane			106.0		%		70-130	29-JAN-20
1,1,1-Trichloroethane			101.2		%		70-130	29-JAN-20
1,1,2-Trichloroethane			103.2		%		70-130	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 10 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT		Water						
Batch	R4982948							
WG3265402-1	LCS							
1,2-Dibromoethane			103.3		%		70-130	29-JAN-20
1,1-Dichloroethane			105.1		%		70-130	29-JAN-20
1,1-Dichloroethylene			103.8		%		70-130	29-JAN-20
1,2-Dichlorobenzene			103.3		%		70-130	29-JAN-20
1,2-Dichloroethane			102.7		%		70-130	29-JAN-20
1,2-Dichloropropane			115.1		%		70-130	29-JAN-20
1,3-Dichlorobenzene			99.2		%		70-130	29-JAN-20
1,4-Dichlorobenzene			99.4		%		70-130	29-JAN-20
2-Hexanone			91.9		%		60-140	29-JAN-20
Acetone			106.7		%		60-140	29-JAN-20
Benzene			108.0		%		70-130	29-JAN-20
Bromodichloromethane			103.8		%		70-130	29-JAN-20
Bromoform			104.1		%		70-130	29-JAN-20
Bromomethane			97.5		%		60-140	29-JAN-20
Carbon Disulfide			105.5		%		70-130	29-JAN-20
Carbon tetrachloride			101.3		%		70-130	29-JAN-20
Chlorobenzene			102.9		%		70-130	29-JAN-20
Chloroethane			115.6		%		70-130	29-JAN-20
Chloroform			105.2		%		70-130	29-JAN-20
Chloromethane			98.7		%		60-140	29-JAN-20
cis-1,2-Dichloroethylene			103.3		%		70-130	29-JAN-20
cis-1,3-Dichloropropene			106.4		%		70-130	29-JAN-20
Dibromochloromethane			95.8		%		70-130	29-JAN-20
Dichlorodifluoromethane			98.6		%		50-140	29-JAN-20
Dichloromethane			106.7		%		70-130	29-JAN-20
Ethylbenzene			101.1		%		70-130	29-JAN-20
m+p-Xylenes			99.7		%		70-130	29-JAN-20
Methyl Ethyl Ketone			101.8		%		60-140	29-JAN-20
Methyl Isobutyl Ketone			92.3		%		50-150	29-JAN-20
n-Hexane			95.2		%		70-130	29-JAN-20
MTBE			105.8		%		70-130	29-JAN-20
o-Xylene			100.8		%		70-130	29-JAN-20
Styrene			102.8		%		70-130	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 11 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT		Water						
Batch	R4982948							
WG3265402-1	LCS							
Tetrachloroethylene			99.8		%		70-130	29-JAN-20
Toluene			101.9		%		70-130	29-JAN-20
trans-1,2-Dichloroethylene			98.6		%		70-130	29-JAN-20
trans-1,3-Dichloropropene			105.6		%		70-130	29-JAN-20
Trichloroethylene			102.4		%		70-130	29-JAN-20
Trichlorofluoromethane			98.0		%		60-140	29-JAN-20
Vinyl chloride			109.8		%		60-140	29-JAN-20
WG3265402-2	MB							
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	29-JAN-20
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	29-JAN-20
1,1,1-Trichloroethane			<0.50		ug/L		0.5	29-JAN-20
1,1,2-Trichloroethane			<0.50		ug/L		0.5	29-JAN-20
1,2-Dibromoethane			<0.20		ug/L		0.2	29-JAN-20
1,1-Dichloroethane			<0.50		ug/L		0.5	29-JAN-20
1,1-Dichloroethylene			<0.50		ug/L		0.5	29-JAN-20
1,2-Dichlorobenzene			<0.50		ug/L		0.5	29-JAN-20
1,2-Dichloroethane			<0.50		ug/L		0.5	29-JAN-20
1,2-Dichloropropane			<0.50		ug/L		0.5	29-JAN-20
1,3-Dichlorobenzene			<0.50		ug/L		0.5	29-JAN-20
1,4-Dichlorobenzene			<0.50		ug/L		0.5	29-JAN-20
2-Hexanone			<20		ug/L		20	29-JAN-20
Acetone			<20		ug/L		20	29-JAN-20
Benzene			<0.50		ug/L		0.5	29-JAN-20
Bromodichloromethane			<1.0		ug/L		1	29-JAN-20
Bromoform			<1.0		ug/L		1	29-JAN-20
Bromomethane			<0.50		ug/L		0.5	29-JAN-20
Carbon Disulfide			<1.0		ug/L		1	29-JAN-20
Carbon tetrachloride			<0.50		ug/L		0.5	29-JAN-20
Chlorobenzene			<0.50		ug/L		0.5	29-JAN-20
Chloroethane			<1.0		ug/L		1	29-JAN-20
Chloroform			<1.0		ug/L		1	29-JAN-20
Chloromethane			<1.0		ug/L		1	29-JAN-20
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	29-JAN-20
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 12 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT		Water						
Batch	R4982948							
WG3265402-2 MB								
Dibromochloromethane			<1.0		ug/L		1	29-JAN-20
Dichlorodifluoromethane			<1.0		ug/L		1	29-JAN-20
Dichloromethane			<2.0		ug/L		2	29-JAN-20
Ethylbenzene			<0.50		ug/L		0.5	29-JAN-20
m+p-Xylenes			<0.40		ug/L		0.4	29-JAN-20
Methyl Ethyl Ketone			<20		ug/L		20	29-JAN-20
Methyl Isobutyl Ketone			<20		ug/L		20	29-JAN-20
n-Hexane			<0.50		ug/L		0.5	29-JAN-20
MTBE			<0.50		ug/L		0.5	29-JAN-20
o-Xylene			<0.30		ug/L		0.3	29-JAN-20
Styrene			<0.50		ug/L		0.5	29-JAN-20
Tetrachloroethylene			<0.50		ug/L		0.5	29-JAN-20
Toluene			<0.50		ug/L		0.5	29-JAN-20
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	29-JAN-20
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	29-JAN-20
Trichloroethylene			<0.50		ug/L		0.5	29-JAN-20
Trichlorofluoromethane			<1.0		ug/L		1	29-JAN-20
Vinyl chloride			<0.50		ug/L		0.5	29-JAN-20
Surrogate: 1,4-Difluorobenzene			100.6		%		70-130	29-JAN-20
Surrogate: 4-Bromofluorobenzene			100.7		%		70-130	29-JAN-20
WG3265402-5 MS		WG3265402-3						
1,1,1,2-Tetrachloroethane			99.6		%		50-150	29-JAN-20
1,1,2,2-Tetrachloroethane			104.3		%		50-150	29-JAN-20
1,1,1-Trichloroethane			101.2		%		50-150	29-JAN-20
1,1,2-Trichloroethane			103.0		%		50-150	29-JAN-20
1,2-Dibromoethane			102.0		%		50-150	29-JAN-20
1,1-Dichloroethane			103.7		%		50-150	29-JAN-20
1,1-Dichloroethylene			100.3		%		50-150	29-JAN-20
1,2-Dichlorobenzene			102.8		%		50-150	29-JAN-20
1,2-Dichloroethane			102.0		%		50-150	29-JAN-20
1,2-Dichloropropane			115.2		%		50-150	29-JAN-20
1,3-Dichlorobenzene			99.1		%		50-150	29-JAN-20
1,4-Dichlorobenzene			98.8		%		50-150	29-JAN-20
2-Hexanone			89.9		%		50-150	29-JAN-20



Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Page 13 of 14

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Contact: Matt Zammit

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT		Water						
Batch	R4982948							
WG3265402-5	MS	WG3265402-3						
Acetone			110.3		%		50-150	29-JAN-20
Benzene			107.3		%		50-150	29-JAN-20
Bromodichloromethane			103.9		%		50-150	29-JAN-20
Bromoform			101.5		%		50-150	29-JAN-20
Bromomethane			88.7		%		50-150	29-JAN-20
Carbon Disulfide			97.9		%		50-150	29-JAN-20
Carbon tetrachloride			101.4		%		50-150	29-JAN-20
Chlorobenzene			102.6		%		50-150	29-JAN-20
Chloroethane			110.2		%		50-150	29-JAN-20
Chloroform			106.0		%		50-150	29-JAN-20
Chloromethane			88.7		%		50-150	29-JAN-20
cis-1,2-Dichloroethylene			102.4		%		50-150	29-JAN-20
cis-1,3-Dichloropropene			108.7		%		50-150	29-JAN-20
Dibromochloromethane			94.4		%		50-150	29-JAN-20
Dichlorodifluoromethane			85.7		%		50-150	29-JAN-20
Dichloromethane			104.9		%		50-150	29-JAN-20
Ethylbenzene			101.2		%		50-150	29-JAN-20
m+p-Xylenes			99.3		%		50-150	29-JAN-20
Methyl Ethyl Ketone			103.2		%		50-150	29-JAN-20
Methyl Isobutyl Ketone			92.1		%		50-150	29-JAN-20
n-Hexane			91.1		%		50-150	29-JAN-20
MTBE			105.0		%		50-150	29-JAN-20
o-Xylene			100.9		%		50-150	29-JAN-20
Styrene			102.1		%		50-150	29-JAN-20
Tetrachloroethylene			99.6		%		50-150	29-JAN-20
Toluene			102.2		%		50-150	29-JAN-20
trans-1,2-Dichloroethylene			95.8		%		50-150	29-JAN-20
trans-1,3-Dichloropropene			102.7		%		50-150	29-JAN-20
Trichloroethylene			102.2		%		50-150	29-JAN-20
Trichlorofluoromethane			93.7		%		50-150	29-JAN-20
Vinyl chloride			100.1		%		50-150	29-JAN-20

Quality Control Report

Workorder: L2410437

Report Date: 06-FEB-20

Client: DS Consultants (Vaughan)
40 Bell Farm Road Unit 8
Barrie ON L4M 56L3

Page 14 of 14

Contact: Matt Zammit

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

**SGS Canada Inc.**

P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - K0L 2H0
Phone: 705-652-2000 FAX: 705-652-6365

ALS Laboratory (Mississauga)

Attn : Amanda Overholster

5730 Coopers Avenue, Unit # 26
Mississauga, ON
L4Z 2E9, Canada

Phone: 905-507-6910

Fax:

05-February-2020

Date Rec. : 30 January 2020
LR Report: CA15545-JAN20
Reference: Submission#:L2410437

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Temperature Upon Receipt °C	Gold (total) mg/L	Platinum (total) mg/L	Rhodium (total) mg/L
1: Analysis Start Date		---	03-Feb-20	03-Feb-20	03-Feb-20
2: Analysis Start Time		---	13:33	13:33	13:33
3: Analysis Completed Date		---	05-Feb-20	04-Feb-20	04-Feb-20
4: Analysis Completed Time		---	15:44	17:04	17:04
5: QC - Blank		---	< 0.00001	< 0.0001	< 0.0001
6: QC - STD % Recovery		---	NV	NV	NV
7: QC - DUP % RPD		---	ND	ND	ND
8: MDL		---	0.00001	0.0001	0.00001
9: L2410437-1 MW19-1	28-Jan-20 10:00	2.0	< 0.00001	< 0.0001	< 0.00001

MDL - SGS Method Detection Limit

ND - Not Detected

NV - No Value

Kimberley Didsbury
Project Specialist,
Environment, Health & Safety

Chain of Custody (COC) / Analytical Request Form

www.aisglobal.com

Canada Toll Free: 1 800 668 9878



L2410437-COFC

COC Number: 17 - 821144

Page 1 of 1

[illegible]

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

JUNE 2018 FRONT

APPENDIX D

MECP WATER WELL RECORD SUMMARY

Table: MECP Water Wells Records (500 m Radius)**Project: 19-291-400****Location: 129 Collier St., Barrie, ON**

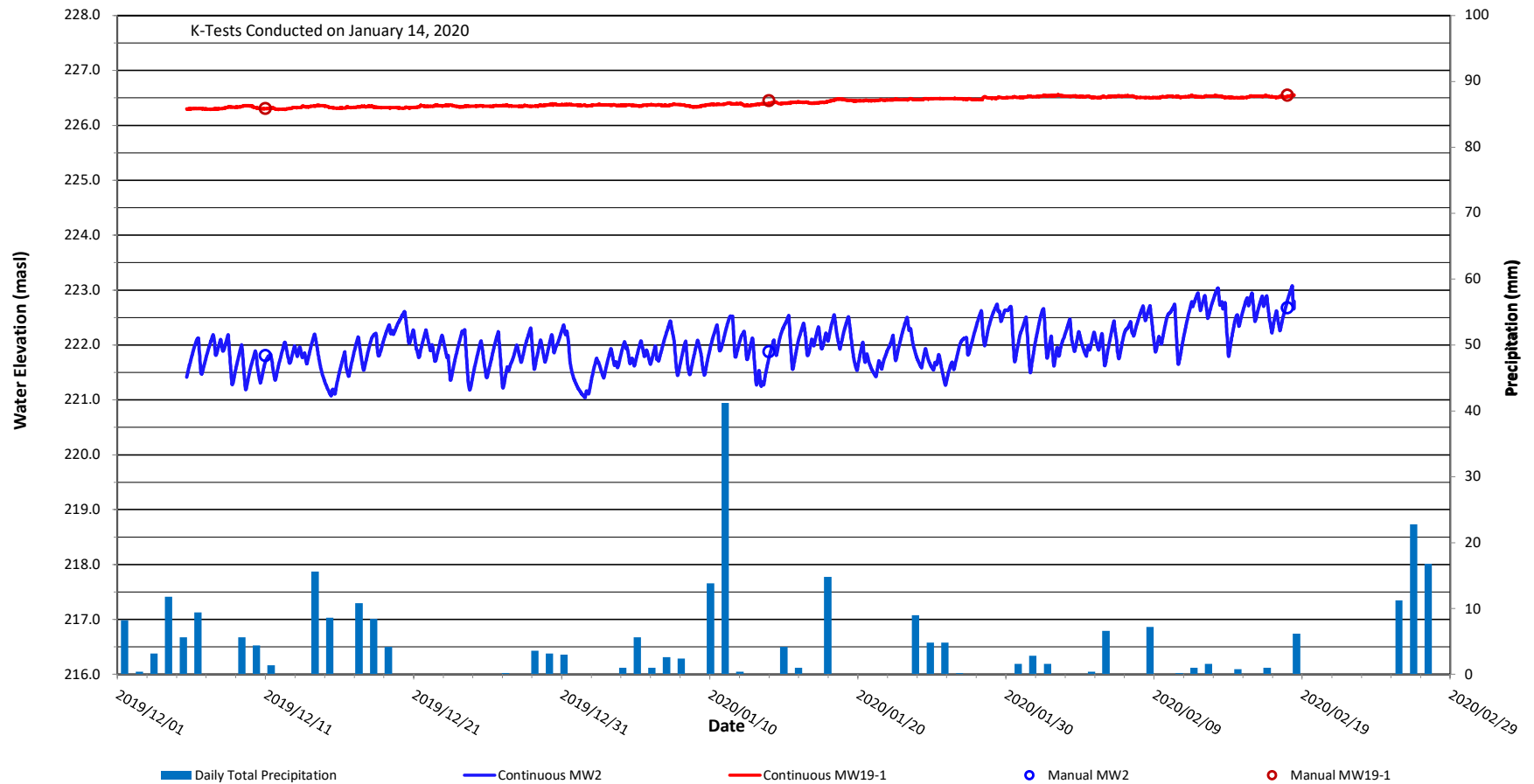
MEOCC WWR ID	Easting	Northing	Depth		Thickness		Stratigraphy				Water Found		Static Level		Water Kind	Date Completed	Status	Water Use
	UTM N17	UTM N17	(ft)	(m)	(ft)	(m)	Color	Primary	Secondary	Tertiary	(ft)	(m)	(ft)	(m)				
7038503	605108	4915978	10	3.0	10	3.0	Brown	Sand	Gravel		-	-	-	-	-	16/Oct/06	Abandoned	-
			13	4.0	3	0.9	Brown	Gravel	Sand	Silt								
			18	5.5	5	1.5	Brown	Gravel	Sand	Silt								
5700235	604911	4915982	9	2.7	9	2.7	-	Fill	-	-	-	-	Flowing	Fresh	13/Jul/48	Water Supply	Municipal / public	
			17	5.2	8	2.4	-	Sand	Gravel	Boulders								
			29	8.8	12	3.7	-	Sand	Silt	-								
			30	9.1	1	0.3	-	Clay	-	-								
			47	14.3	17	5.2	-	Sand	-	-								
			48	14.6	1	0.3	-	Sand	Gravel	Boulders								
			52	15.8	4	1.2	-	Clay	-	-								
			70	21.3	18	5.5	-	Sand	Gravel	Boulders								
7157665	604499	4916187	5	1.5	5	1.5	Brown	Loam	Rock	Loose	-	-	-	-	-	15/Dec/10	Monitoring	Monitoring
			16	4.9	11	3.4	Brown	Sand	-	Soft								
			20	6.1	4	1.2	Brown	Sand	Rock	-								
			28	8.5	8	2.4	Brown	Sand	-	Dense								
7110081	604460	4915886	12.5	3.8	12.5	3.8	Brown	Sand	Gravel	-	-	-	-	-	-	12/May/08	Observ.	Monitoring
			17.5	5.3	5	1.5	Brown	Sand	Silt	WBRG								
7191645	605189	4916037	15	4.6	15	4.6	Brown	Sand	Stones	Loose	15	4.6	-	-	Untested	10/Sep/12	Monitoring	Monitoring
			50	15.2	35	10.7	Brown	Sand	Gravel	-								
			55	16.8	5	1.5	Brown	Clay	Gravel	-								
			60	18.3	5	1.5	Brown	Sand	Gravel	-								
5700288	604756	4915927	7	2.1	7	2.1	-	Fill	-	-	67	20.4	-	-	Fresh	24/Jun/66	Test hole	Not used
			25	7.6	18	5.5	-	Gravel	Sand	Boulders								
			44	13.4	19	5.8	Brown	Clay	Sand	Silt								
			67	20.4	23	7.0	Grey	Clay	Sand	Gravel								
			84	25.6	17	5.2	-	Gravel	Sand	Clay								
			86	26.2	2	0.6	Brown	Clay	Gravel	-								
			101	30.8	15	4.6	-	Gravel	Sand	Clay								
			112	34.1	11	3.4	Grey	Clay	Gravel	Sand								
			137	41.8	25	7.6	Grey	Clay	-	-								
			153	46.6	16	4.9	-	Silt	-	-								
			243	74.1	90	27.4	Grey	Clay	Sand	-								
			244	74.4	1	0.3	-	Sand	Gravel	-								
			255	77.7	11	3.4	Grey	Clay	Sand	-								
			267	81.4	12	3.7	-	Gravel	Sand	Boulders								
			272	82.9	5	1.5	-	Clay	Sand	-								
			275	83.8	3	0.9	-	Sand	Gravel	-								
			319	97.2	44	13.4	Grey	Clay	-	-								
			322	98.1	3	0.9	-	Sand	Gravel	Rock								
			7204531	605013	4915943	10	3.0	10	3.0	Brown								
17	5.2	7				2.1	Brown	Sand	Stones	Loose								
7207028	604953	4915952	-	-	-	-	-	-	-	-	-	-	-	-	-	13/Jul/13	Abandoned	-
7204527	604906	4915916	17	5.2	17	5.2	Brown	Sand	Silt	Loose	-	-	-	-	-	15/Jun/13	Test hole	Monitoring
7230453	604955	4915933	15	4.6	15	4.6	Brown	Sand	Gravel	Packed	-	-	-	-	-	30/Jul/14	observ.	Monitoring
7204530	605005	4915955	10	3.0	10	3.0	Brown	Sand	Silt	Loose	-	-	-	-	-	6/Jun/13	Test hole	Monitoring
			34	10.4	24	7.3	Brown	Sand	Stones	Loose								
7204529	605006	4915956	10	3.0	10	3.0	Brown	Sand	Silt	Loose	-	-	-	-	-	5/Jun/13	Test hole	Monitoring
			17	5.2	7	2.1	Brown	Sand	Stones	Loose								
7185113	604753	4916134	7	2.1	7	2.1	Brown	Sand	Gravel	Dense	-	-	-	-	-	20/Apr/12	Observ.	Monitoring
			22	6.7	15	4.6	Brown	Sand	Stones	Dense								
			34	10.4	12	3.7	Brown	Sand	Gravel	Dry								
			40	12.2	6	1.8	Brown	Sand	Gravel	WBRG								
7230450	604967	4915963	15	4.6	15	4.6	Brown	Sand	Gravel	Packed	-	-	-	-	-	30/Jul/14	Observ.	Monitoring
7176288	604498	4915860	-	-	-	-	-	-	-	-	-	-	-	-	-	4/Oct/11	-	-

7157665	604499	4916187	5	1.5	5	1.5	Brown	Loam	Rock	Loose	-	-	-	-	-	15/Dec/10	Monitoring	Monitoring
			16	4.9	11	3.4	Brown	Sand	-	Soft								
			20	6.1	4	1.2	Brown	Sand	Rock	-								
			28	8.5	8	2.4	Brown	Sand	-	Dense								
7230455	604898	4916029	15	4.6	15	4.6	Brown	Sand	Gravel	Packed	-	-	-	-	-	30/Jul/14	Observ.	Monitoring
7264495	604551	4916028	10	3.0	10	3.0	Brown	Fill	-	Loose	20	6.1	-	-	Untested	11/May/16	Observ.	Monitoring
			35	10.7	25	7.6	Brown	Sand	-	Loose								
7204528	604905	4915916	35	10.7	10	3.0	Brown	Sand	Silt	Loose	-	-	-	-	-	15/Jun/13	Test hole	Monitoring
			47.5	14.5	12.5	3.8	Grey	Sand	Silt	Loose								
			48	14.6	0.5	0.2	Grey	Clay	Silt	Dense								
			1	0.3	1	0.3	-	Fill	-	-								
5700262	604879	4915946	25	7.6	24	7.3	Brown	Clay	Gravel	-	78	23.8	2	0.6	Fresh	12/Oct/62	Water Supply	Industrial
			40	12.2	15	4.6	-	Gravel	Sand	Clay								
			78	23.8	38	11.6	-	Gravel	Sand	-								
			32	9.8	32	9.8	-	Fill	-	-								
5727318	604676	4915808	58	17.7	26	7.9	-	Sand	Gravel	Silty	-	-	-	-	-	30/Jul/90	abandoned	not used
			68	20.7	10	3.0	Grey	Clay	Soft	-								
			91	27.7	23	7.0	-	Clay	Sand	Silty								
			109	33.2	18	5.5	Grey	Clay	Hard	-								
			130	39.6	21	6.4	Grey	Clay	Sand	Very								
			162	49.4	32	9.8	Grey	Clay	Sand	Packed								
			195	59.4	33	10.1	Grey	Clay	Sand	Hard								
			202	61.6	7	2.1	-	Sand	Clay	Marl								
			219	66.8	17	5.2	Grey	Clay	Very	Hard								
			226	68.9	7	2.1	Grey	Clay	Very	Hard								
			237	72.2	11	3.4	Grey	Clay	Very	Hard								
			7157664	604499	4916187	4	1.2	4	1.2	Brown								
16	4.9	12				3.7	Brown	Sand	Rock	Soft								
20	6.1	4				1.2	Brown	Sand	-	-								
29	8.8	9				2.7	Brown	Sand	Rock	Dense								
7204532	605013	4915943	10	3.0	10	3.0	Brown	Sand	Silt	Loose	-	-	-	-	-	6/Jun/13	Test hole	Monitoring
			30	9.1	20	6.1	Brown	Sand	Silt	Loose								
5700236	604850	4915979	2	0.6	2	0.6	-	Fill	-	-	64	19.5	Flowing	Fresh	23/May/52	Water Supply	Industrial	
			12	3.7	10	3.0	-	Gravel	Stones	-								
			79	24.1	67	20.4	-	Sand	Gravel	-								
7230454	604890	4915960	15	4.6	15	4.6	Brown	Sand	Gravel	Packed	-	-	-	-	-	30/Jul/14	Observ.	Monitoring
7169806	604471	4915972	30	9.1	-	-	-	-	-	-	-	-	-	-	-	27/Sep/11	Test hole	Monitoring
5735508	604879	4915946	-	-	-	-	-	-	-	-	-	-	-	-	-	23/Aug/00	Abandoned	-
5700237	604869	4915979	10	3.0	10	3.0	-	Fill	-	-	-	-	-	-	-	25/Feb/48	Test hole	Test hole
			17	5.2	7	2.1	-	Sand	Boulders	-								
			35	10.7	18	5.5	-	Sand	-	-								
			51	15.5	16	4.9	-	Sand	Clay	-								
			55	16.8	4	1.2	-	Boulders	-	-								
			62	18.9	7	2.1	-	Sand	Boulders	-								
			71	21.6	9	2.7	-	Sand	Gravel	-								
			82	25.0	11	3.4	-	Sand	Clay	-								
7230452	604991	4915936	15	4.6	15	4.6	Brown	Sand	Gravel	Packed	-	-	-	-	-	30/Jul/14	Observ.	Monitoring
7177202	604927	4915918	-	-	-	-	-	-	-	-	-	-	-	-	-	5/Jul/11	-	-

7157665	604499	4916187	5	1.5	5	1.5	Brown	Loam	Rock	Loose	-	-	-	-	-	15/Dec/10	Monitoring	Monitoring
			16	4.9	11	3.4	Brown	Sand	-	Soft								
			20	6.1	4	1.2	Brown	Sand	Rock	-								
			28	8.5	8	2.4	Brown	Sand	-	Dense								
5727319	604670	4915809	31	9.4	31	9.4	-	Fill	-	-	125	38.1	12	3.7	Fresh	31/Jul/90	Observ.	Not used
			53	16.2	22	6.7	-	Sand	Gravel	Silty								
			67	20.4	14	4.3	Grey	Clay	Soft	-								
			89	27.1	22	6.7	Grey	Clay	Sand	Silty								
			95	29.0	6	1.8	Grey	Clay	Hard	-								
			125	38.1	30	9.1	-	Clay	Sand	LYRD								
			151	46.0	26	7.9	-	Gravel	Sand	Marl								
			154	46.9	3	0.9	-	Gravel	Clay	-								
			161	49.1	7	2.1	-	Gravel	-	-								
			196	59.7	35	10.7	-	Sand	Gravel	-								
			220	67.1	24	7.3	-	Gravel	Sand	-								
			230	70.1	10	3.0	Grey	Clay	Gravel	Boulders								
7207029	604952	4915949	-	-	-	-	-	-	-	-	-	-	-	-	13/Jul/13	Abandoned	-	
5735507	604865	4915863	-	-	-	-	-	-	-	-	-	-	-	-	22/Aug/00	Abandoned	-	
5719264	604614	4915874	22	6.7	22	6.7	-	Fill	-	-	-	-	Flowing	Fresh	14/Jun/84	Water Supply	Municipal / Public	
			30	9.1	8	2.4	-	Clay	Sand	WDFR								
			47	14.3	17	5.2	-	Sand	Clay	LYRD								
			84	25.6	37	11.3	-	Clay	Stones	Silty								
			101	30.8	17	5.2	-	Clay	Stones	-								
			106	32.3	5	1.5	-	Sand	Gravel	Boulders								
			121	36.9	15	4.6	-	Gravel	Boulders	Hard								
			145	44.2	24	7.3	-	Sand	Gravel	Clay								
			202	61.6	57	17.4	-	Gravel	Sand	Boulders								
7230451	605007	4915964	15	4.6	15	4.6	Brown	Sand	Gravel	Packed	-	-	-	-	-	30/Jul/14	Observ.	Monitoring
7169805	604481	4915934	-	-	-	-	-	-	-	-	-	-	-	-	27/Sep/11	Observ.	Monitoring	
7204526	604920	5915943	17	5.2	17	5.2	Brown	Sand	Silt	Loose	-	-	-	-	-	10/Jun/13	Test hole	Monitoring
5718640	604664	4915824	23	7.0	23	7.0	-	Fill	-	-	100	30.5	18	5.5	Fresh	21/Jul/83	Observ.	not used
			29	8.8	6	1.8	-	Clay	Sand	WDFR								
			34	10.4	5	1.5	-	Sand	Gravel	Clay								
			37	11.3	3	0.9	-	Silt	Clay	Sand								
			67	20.4	30	9.1	-	Sand	Gravel	Clay								
			82	25.0	15	4.6	-	Clay	Sand	LYRD								
			86	26.2	4	1.2	-	Sand	Silt	Clay								
			99	30.2	13	4.0	-	Clay	Stones	Packed								
			109	33.2	10	3.0	-	Sand	Gravel	Clay								
			123	37.5	14	4.3	-	Sand	Gravel	Boulders								
			142	43.3	19	5.8	-	Sand	Gravel	Clay								
			203	61.9	61	18.6	-	Sand	Gravel	Boulders								
			214	65.2	11	3.4	-	Sand	Gravel	-								
			255	77.7	41	12.5	-	Clay	Stoney	Hard								
			269	82.0	14	4.3	-	Clay	Gravel	Sandy								
			294	89.6	25	7.6	-	Clay	Gravel	Boulders								
7214974	604537	4915718	-	-	-	-	-	-	-	-	-	-	-	-	22/Nov/13	Abandoned	-	
7124832	604754	4915915	4	1.2	4	1.2	Brown	Sand	Gravel	-	7	2.1	-	-	not stated	21/Apr/09	Observ.	Monitoring
			10	3.0	6	1.8	Grey	Sand	Silt	Gravel								
			20	6.1	10	3.0	Grey	Sand	Gravel	WBRG								
7204525	604921	4915945	28	8.5	28	8.5	Brown	Sand	Silt	Loose	-	-	-	-	-	10/Jun/13	Observ.	Monitoring
			33	10.1	5	1.5	Grey	Sand	Silt	Loose								
5700233	605374	4916039	15	4.6	15	4.6	-	Sand	Boulders	-	-	-	-	-	-	7/Jan/48	Test hole	-
			37	11.3	22	6.7	-	Sand	Gravel	-								
			60	18.3	23	7.0	-	Sand	Clay	-								
			85	25.9	25	7.6	-	Sand	Boulders	-								
			100	30.5	15	4.6	-	Clay	-	-								
			175	53.3	75	22.9	-	Clay	Sand	Gravel								
			185	56.4	10	3.0	-	Sand	Gravel	Clay								
			192	58.5	7	2.1	-	HPAN	-	-								

APPENDIX E GROUNDWATER LEVEL HYDROGRAPH

Groundwater Level Hydrograph



DS CONSULTANTS LTD.
Geotechnical • Environmental • Materials • Hydrogeology

129 Collier St., Barrie, ON

Hydrogeological Investigation

Project #: 19-291-400

December 2019 to February 2020

Figure 6