



Preliminary Hydrogeological Assessment

51, 53, 55, and 75 Bradford Street
and 20 Checkley Street
Barrie, Ontario

Barrie Lakeshore Developments

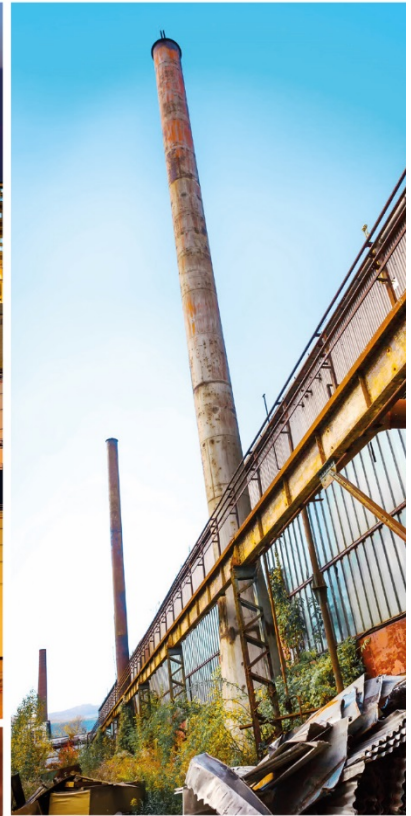




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1. Introduction

GHD Limited (GHD) was retained by Barrie Lakeshore Developments to undertake a Hydrogeological Assessment of the commercial property formerly addressed as 51, 55 and 75 Bradford Street, Barrie, Ontario (Site). GHD understands that the Site is being considered as a candidate site for a new development (see **Figure 1.1**)

The Site consists of five-adjointing tracts of commercial land totaling approximately 3.5 hectares (8.6 acres), and is now collectively addressed as 20 Checkley Street (**Figure 1.2**). The Site has one existing building with associated surrounding parking areas/driveways with the majority of the site being vacant land.

Historical Site operations included a tannery (Barrie Tanning Ltd.) with railway spurs and underground storage tanks (USTs), operation of wood and coal yard (Mickle Dymont & Co.) from as early as 1900 to at least 1985 (GHD, November 2019). An auto service dealerships operated at the Site from at least 1966 to approximately 2009.

The proposed development concept includes up to four high-rise combined residential/commercial buildings with no basement structures (slab-on-grade), and heights of up to 42 storeys with paved parking areas and associated driveways (**Figure 1.3**). GHD understands that the final design, as well as foundation details (McClymont & Rak Engineers, Inc. December 2019), are being developed in consultation with City of Barrie.

The objectives of this investigation were to:

- Characterize the current hydrogeological conditions.
- Assess potential impacts on groundwater and surface water post development.
- Determine if temporary dewatering is required during construction and the requirement for a groundwater taking Environmental and Activity Sector Registration (EASR) or Permit to Take Water (PTTW).
- Provide groundwater conditions and water balance information for storm water management recommendations (to be developed by others).

This Preliminary Hydrogeological Assessment Report presents the current groundwater monitoring data for the Site complete to November 2019. A report update will be provided subsequent to completion of seasonal groundwater level monitoring.

Environmental investigations (GHD, 2019) were undertaken by GHD concurrently with the hydrogeological assessment that included the following activities:

1. Borehole advancement and installation of monitoring wells in selected boreholes to facilitate the collection of groundwater levels to determine groundwater flow conditions.
2. Single well response testing (SWRT) to determine the horizontal hydraulic conductivity of the saturated geologic deposits.
3. Groundwater level monitoring to determine groundwater gradients and seasonal fluctuations of the groundwater table.



4. Collection of a groundwater water sample for laboratory analysis that would be used to assess options for the management of groundwater potentially collected during the construction of the development.
5. Completion of a water balance analysis (including determination of an infiltration deficit), to estimate the groundwater recharge potential at the Site under pre-development and proposed post development conditions, and potential increased runoff.

This report is organized into the following Sections:

Section 1.0 – Introduction: outlines the purpose, objectives and scope of work, and presents the report organization.

Section 2.0 – Background: Outlines previous investigations carried out at the Site and provides description of the existing Site conditions, background information and surrounding land uses. The regional environmental setting, including the physiography, topography, main surface water features surrounding the Site, and the surficial geology is presented.

Section 3.0 – Methodology: Describes the field activities and methodologies used to assess the site environmental conditions and to determine potential impacts associated with the undertaking.

Section 4.0 – Geology and Hydrogeology: Provides a detailed description of the Site geology, hydrogeology and the hydraulic properties of the underlying stratigraphy, and an evaluation of the potential temporary construction water takings for the development.

Section 5.0 – Impact Assessment: Presents a hydrogeological impact analysis of the proposed development.

Section 6.0 – Summary and Conclusions: Provides a summary of the study findings.

References, Figures, Tables and Appendices are provided following the text of this report, as indicated in the Table of Contents.

2. Background

2.1 Previous Investigations

The following background reports for the Site were provided by Barrie Lakeshore Developments, and were reviewed during this preliminary hydrogeological assessment:

- Geotechnical Investigation for Harmony Village, 51 – 75 Bradford Street, Barrie, Ontario (Bruce A. Brown Associates Limited, September 25, 2013).
- Wellhead Risk Assessment Study Report Proposed Harmony Village Development Barrie, ON (Exp July 13, 2013).
- Geotechnical Investigation, Harmony Village – Lake Simcoe Inc., Bradford Street, Barrie, Ontario (Terraprobe, December 16, 2014).
- Phase One Environmental Site Assessment, 51 – 75 Bradford Street, Barrie, Ontario (Terraprobe, September 12, 2017).



- Phase Two Environmental Site Assessment, 51 – 75 Bradford Street, Barrie, Ontario (Terraprobe, September 12, 2017).
- Preliminary Geotechnical Report Proposed Mixed Use Development Barrie Waterfront, Barrie, Ontario. (McClymont & Rak Engineers, Inc. December 2019).

Based on the above reports the deposits underlying the Site consist of fill soils generally comprising sandy silt with traces of gravel, natural organics, cinders and brick fragments, underlain by a layer of peat and native sandy soils. The water table was present in the fill material at depths of approximately 0.5 to 3 metres below the existing ground surface. The groundwater quality was found to exceed Applicable Site Condition Standards for Sodium, Chloride, Metals, Polycyclic Aromatic Hydrocarbons (PAHS), Petroleum Hydrocarbons (PHCs) and Volatile Organic Compounds (VOCs) indicating shallow groundwater impacts on the property.

In addition to the above investigations, GHD completed a Phase One Environmental Site Assessment (GHD, November 2019), as part of undertaking a risk assessment and record of Site Condition in accordance with Ontario Regulation (O. Reg.) 153/04, as amended, to support the proposed redevelopment of the Site. Based on the results of the Phase One ESA, including the Site reconnaissance, the information provided by Site representatives and regulatory agencies, documents reviewed, the review of Site history, and pending receipt and review of information from the MECP, the following APECs were identified to be associated with the Site.

- APEC #1 - Historical Tannery Operation (on-Site)
- APEC #2 - Fill Quality (on-Site)
- APEC #3 - Historical Railway Spurs (on-Site)
- APEC #4 - Historical Vehicle Maintenance and Servicing Operations (on-Site)
- APEC #5 - Historical Heating Oil Storage Area (on-Site)
- APEC #6 - Potential Impacts from Former Canadian General Electric Assembly Plant (off-Site)
- APEC #7 - Potential Impacts from Historical Storage Tanks (off-Site, west, southwest and south of Property)
- APEC #8 - Potential Impacts From Historical Dry Cleaner (off-Site)
- APEC #9 - Potential Impacts From Historic Ironworks and Fabrication Facilities (off-Site)
- APEC #10 - Potential Impacts from Historical Storage Tanks (off-Site, north of Property)
- APEC #11 - Historical Bunker's Creek Landfills (off-Site)

2.2 Site Description

The Site is designated "City Centre" which permits a broad range of uses including retail, commercial and residential. It is zoned commercial with environmental protection on the south portion of the Site, coinciding with a creek, Bunkers Creek (**Figure 2.1**). Currently, the majority of the Site is natively vegetated land with a commercial building (vacant) and associated paved areas.

The Site is bounded to the north by a U-Haul Storage enterprise, a commercial property and two condominium buildings with associated parking lot. Condominium buildings and Lakeshore Drive bound the Site to the east, and Kempenfelt Bay (Lake Simcoe) is located further to the east.



Bunker's Creek and commercial and residential properties bound the Site to the south. To the west of the Site is Bradford Street, and buildings occupied by retail and commercial tenants.

The surrounding commercial and residential properties have full municipal water and sewer services. Potable water is supplied by the City of Barrie, which obtains water from 12 active deep drilled wells, four of which are located in proximity to the Site (Wells 11, 12, 14, and 15).

2.2.1 Source Water Protection

The Site is located within the Lake Simcoe and Couchiching Black River Source Water Protection area (SGBLS SPP January 26, 2015), and situated within the City of Barrie Wellhead Protection Area B (WHPA B) for Wells 11, 12, 14, and 15 (with a vulnerability score of 6) (**Figure 2.2**). The Site also falls within the source water protection issues contributing area for sodium and chloride. The Site is not located within a source water protection Significant Groundwater Recharge Area or Highly Vulnerable Aquifer.

A Wellhead Risk Assessment for the Site identified road salt, snow storage, stormwater and sewage works as potential municipal drinking water threats, but given the presence of confining beds separating the shallow aquifer from the deeper municipal aquifer, the potential threats were considered to be insignificant or minor (Exp July 13, 2013).

2.2.2 Municipal Water Supply

As outlined in the Lakes Simcoe and Couchiching-Black River Source Protection Area Approved Assessment Report, Chapter 8 City of Barrie (SGBLS, 2015):

The water supply wells are constructed in deep overburden aquifers. The municipal wells in the core area are constructed within a channelized aquifer unit described as the Barrie-Borden tunnel valley aquifer. The aquifers underlying the City of Barrie are part of a regionally extensive and complex aquifer system, within which four major sand and gravel aquifer units have been identified. Locally, these are referred to as the upper, intermediate and shallow/deep lower aquifers. The municipal aquifers are identified regionally as part of the A3 and A4 aquifer systems (Golder Associates, 2004). These aquifers are locally overlain by relatively thick protective clay and silt aquitard deposits, however localized windows exist in areas. The aquifers in the vicinity of Barrie are productive, with relatively high transmissivities, ranging from approximately 250 to over 3,000 m²/day. Transmissivities in the core area of Barrie are high, ranging from approximately 1,000 to over 3,000 m²/day.

The capture zones and resultant wellhead protection areas for these wellfields are fairly broad and extend outward through the coarse grained and highly conductive deep aquifer systems. Whereas the wellhead protection areas are encompassed by a high to medium vulnerability area, the protective aquitard layers overlying the deep production aquifers provide effective barriers to surficial activities in most areas. The exception to this is that a portion of local recharge is possibly captured by Well 11. This is supported by the available groundwater quality data, which suggests that the water extracted contains elevated concentrations of industrial solvents, chloride and nitrate.

Wells 11 and 14 are located in Heritage Park, along the north shore of Kempenfelt Bay, adjacent to the City docks, and accessed off Lakeshore Drive. Wells 12 and 15 are located in Centennial Park,



on the west shore of Kempenfelt Bay. Well 15 is located north of Well 12 and is adjacent to the City marina.

Table 2.1 – City of Barrie Municipal Production Well Details and Rates

Well Name/ MOE ID#	PTTW ³ Max (m ³ /day)	2002 Average Use (m ³ /day)	MOE Well #	Easting ¹	Northing ¹	Elevation (mAMSL)	Screen Interval (mAMSL)
Well 11 Heritage	9100	2285	19264	604690	4915816	220	173.2- 159.1
Well 12 Centennial Beach	9100	5955	20696	604499	4914593	221	155.2- 137.0
Well 14 Heritage	9100	1467	27877	604661	4915782	220	177.6- 158.5
Well 15 Centennial Beach	9100	5716	28705	604412	4915199	220	174.4- 153.4

Wells 11, 12 and 14 have been identified to have a Drinking Water Issue due to elevated chloride concentrations. Recent reported chloride concentrations are 110 mg/L at Well 11, 85 mg/L at Well 14, and 197 mg/L at Well 12. The trend in chloride concentrations at these wells indicates that chloride concentrations would approach or exceed the ODWQS limit of 250 mg/L within a 50 year period. In addition to chloride, Well 11 and Well 12 also exhibit increasing concentration trends of sodium, which are projected to exceed the ODWQS limit of 200 mg/L in 50 years.

In addition, Wells 11, 12, 14, and 15 located in the Lakeshore area have low concentrations of volatile organic compounds (VOC) detected on more than one occasion. The presence and trends of the VOC at these wells were reviewed to determine if a Drinking Water Issue designation is warranted. Based on the evaluation of the existing data it was determined that there was insufficient evidence to support the inclusion of the VOCs as a Drinking Water Issue (SGBLS, 2015).

2.3 Regional Setting

The Site is located in the Simcoe Lowlands Physiographic Region (Chapman and Putnam 1984), which is characterized by a sand plain (and peat and muck) (**Figure 2.3**). The Site is situated within the lowland area surrounding Lake Simcoe, and topographical low drainage area near the shore of Kempenfelt Bay. During the last glacial period Kempenfelt Bay was carved by ice which extended farther to the west, and was gradually infilled with lacustrine silt, clays and sand under deep water conditions, before lake levels dropped and Kempenfelt Bay retreated to its present configuration.



Overall, the Site topography is relatively flat at an elevation of approximately 221 metres above mean sea level (mAMSL). The topography slopes slightly eastward towards Kempenfelt Bay, which is located approximately 65 metres to the east of the Site.

Drainage is provided by Bunkers Creek, which crosses the south portion of the Site (**Figure 2.4**). The creek flows to the east and discharges to Lake Simcoe at Kempenfelt Bay. Lake Simcoe is maintained at an elevation between about 219 to 220 mAMSL.

Regional surficial geology mapping (Ministry of Natural Resources and Forestry, 2018) of the area indicates that the Site and surrounding lands are underlain by coarse textured glaciolacustrine deposits (**Figure 2.5**). Older glacial deposits and channel deposits underlie the Site. The Kempenfelt Bay area is considered to be an erosional 'tunnel channel' feature (Barnett 1986 and 1990), infilled by coarse-grained deposits overlain by fine grained glaciolacustrine sediments, which are bounded by steep sided valleys.

Overburden underlying the Site is more than 100 m in thickness, and is generally described as a thick sequence of Pleistocene glacial deposits and channel deposits overlying limestone, dolostone, and shale of the Ottawa Group and Simcoe Group part of the Shadow Lake Formation (OGS, 1991).

The surficial geology and general stratigraphic framework for the Site and surrounding area, based on the regional mapping and previous investigations consists of the following deposits:

- **Fill** - silt, sand, and gravel, with wood, brick debris, and building rubble.
- **Peat and Organic Soil** - peat, organics and marl
- **Glaciolacustrine Deposits** – sand, silty sand, and silt and clay
- **Channel Deposits** - sand and gravel, silt and clay
- **Bedrock** – limestone, dolostone, and shale.

The location of recorded Ministry of Environment, Conservation and Parks (MECP) water well records within 500 metres of the Site is shown on **Figure 2.6**, and a summary of selected records is presented in **Appendix A**.

Based on review of the MECP well records, the majority of wells are observation wells, test holes, monitoring wells, abandoned wells, have other status or are unknown. Aside from the City of Barrie municipal water supply wells, there are only a few private water supply wells within 500 metres of the Site. These were completed prior to 1975, and it is anticipated they are no longer in use, as they are situated within the urban area with municipal water service.

There is one water supply well (MECP #5712847), which was drilled in 1975 and located within the Site. The well is a drilled well (8-inch) screened within a medium to coarse sand deposit at a depth of 56 mBGS. The owner is indicated as the Barrie Tanning Ltd., which is no longer in operation, and given the municipal water service in the area, the well is expected to be no longer in use.

The majority of the well records indicate the Site is underlain by soft loose fine sand and clay layers, and becomes coarser textured at depth, i.e., greater than approximately 40 mBGS, or below an elevation of approximately 180 mAMSL. The clay layers are typically silty to sandy, soft to firm, and range from approximately 5 to more than 20 metres thick. The fine sand deposits and clay layers are underlain sand and gravel deposits, which is interpreted to represent the municipal aquifer.



As described in the South Simcoe Municipal Groundwater Study (Golder Associates 2004), the lower aquifers are extensive sand and gravel aquifers (A3 and A4), which form the source of the majority of Barrie's groundwater supply. These aquifers are in direct contact with one another under the central Barrie area, as well as further to the west. One of the deep aquifers (A3) is also interpreted to be in contact with Kempenfelt Bay in areas to the east.

The WHPAs in the core areas of the City have been combined into two main areas: the Lakeshore Wells (Wells 11, 12, 14, and 15) and wells west of the Lakeshore Wells (Wells 3A, 4, 5, 7, 17, 18, and 19). Groundwater flow to the City's aquifer converges from the recharge areas to Kempenfelt Bay, which is a regional discharge area. However, the confining layers overlying the water supply aquifers are 'leaky'.

Review of the water well records and municipal aquifer information indicates that the overburden is more than 100 metres thick in the area, and that it is largely comprised of loose fine sand deposits and clay layers, underlain by regional sand and gravel aquifers. The hydrostratigraphic framework corresponds to the layered regional stratigraphy, and includes the following hydrostratigraphic units:

- *Glaciolacustrine Deposits (sand) – Aquifer (Unconfined)*
- *Glaciolacustrine Deposits (clay) – Aquitard ('leaky')*
- *Channel Deposits (sand and gravel) – Aquifer (semi-confined)*

In general, the sand deposits form an unconfined aquifer with intervening semi-confining clay layers, which overly the regional municipal water supply aquifers.

3. Methodology

Cognizant of the objectives of the project, the following activities were undertaken:

- Borehole advancement and installation of monitoring wells in selected boreholes to facilitate the collection of groundwater levels to determine groundwater flow conditions and gradients.
- SWRTs to determine hydraulic conductivity and groundwater flux of the saturated stratigraphic deposits investigated.
- Groundwater monitoring for six months to determine seasonal fluctuations of the groundwater table.
- Collection of one unfiltered groundwater water sample from a selected monitoring well to assess options for the management of groundwater potentially collected during the construction of the development.

The investigative activities listed above were completed concurrently with environmental investigations undertaken by GHD (2019). Details of these investigations are summarized in the following sections, and GHD's field investigation methodology and protocols are provided in **Appendix B**.



3.1 Borehole Advancement and Monitoring Well Installations

The scope of work consisted of advancing six boreholes and installing monitoring wells denoted as MW1-19 through MW6-19. The monitoring well locations are shown on **Figure 3.1**, and the well completion details are presented on **Table 3.1**. The monitoring wells are completed in the overburden and screened within the native glaciolacustrine deposits at depths between approximately 3.0 to 25.7 mBGS. In addition to these monitoring wells, the data obtained from previous investigations were also used in the characterization of the geology and hydrogeology of the Site. Copies of the Stratigraphic and Instrumentation logs are presented in **Appendix C**.

All monitoring wells were installed by MECP licensed well drillers, Altech Drilling & Investigative Services Ltd. (Altech) consistent with the requirements of Regulation 903 – Wells (R.R.O 1990) and O. Reg. 153/04 (as amended). The drilling and monitoring well installation methods and procedures are presented in **Appendix B**.

Monitoring wells were constructed with 50 mm (2-inch) Schedule 40 PVC screen and casing. The well screens are typically 3 m (10 feet) or 1.5 m (5 feet) in length and pre-slotted (No. 10 slot) (see **Table 3.1**). Silica sand pack was placed at the tip of the monitoring well screen and typically extends 0.6 m above the screen. The remaining annular space was sealed with bentonite, and the wells were completed with protective monument style casings set in concrete.

The drilling work was carried out utilizing track mounted power auger drilling rigs (Dietrich 120), supplied, and operated by Altech under the full-time supervision of GHD experienced technical personnel. The boreholes were advanced using a 102 mm solid stem or 228 mm O.D. hollow stem augers.

Boreholes were advanced using conventional drilling methods. Soil samples were collected using a 50 mm outside diameter split spoon sampler in accordance with the specifications of the Standard Penetration Test Method (ASTM D1586). Samples were generally collected every 0.75 metres (2.5-foot) to the termination depth of the boreholes. In addition, at each borehole location the relative density or consistency of the soils were measured using the Standard Penetration Test (SPT) method, by counting the number of blows ('N') required to drive a conventional split barrel soil sampler 300 mm depth. The detailed description of the soil deposits and groundwater conditions and ground stratigraphy as encountered at the borehole locations are recorded on the accompanying borehole logs presented in **Appendix C**.

3.2 Hydraulic Testing

Single well response testing was completed on selected monitoring wells to estimate the horizontal hydraulic conductivity of the saturated geologic deposits underlying the Site. Hydraulic response tests were completed on MW2-19 which is screened within peat and silty sand, MW5-19 which is screened in sandy silt, and MW6-19 which is screened in silty clay.

Single well response tests involve the injection or removal of a known volume of water into/from the well and measuring the water level response in the well until it returns to static conditions (i.e., falling/rising head test). The results of the hydraulic testing were analyzed using the Bouwer-Rice (1976) solution for confined conditions as provided in the software package AQTESOLV™.



The solution was used to determine the horizontal hydraulic conductivity of the saturated soils within the immediate vicinity of the screened interval of each monitoring well. The results of the testing are summarized in **Table 3.2**, and the analyses are presented in **Appendix D**. The results of the analyses are discussed in Section 4.0.

3.3 Groundwater Level Monitoring

Groundwater levels were collected from the newly installed monitoring wells on-site and are summarized in **Tables 3.3a**, and **3.3b**. Groundwater levels measured in metres above mean sea level (mAMSL) are presented in **Table 3.3a**, and groundwater levels representative of the depth to water table, measured in metres below ground surface (mBGS) are presented in **Table 3.3b**. A hydrograph of the observed groundwater levels is presented in **Appendix E**.

Groundwater level monitoring will be undertaken over a six-month period at selected onsite monitoring wells to determine seasonal fluctuations and groundwater gradients. Manual groundwater level measurements will be collected using a water level meter (Solinst Model 101) on a bi-monthly basis (every two months) and three monitoring wells, MW2-19, MW5-19 and MW6-19 were equipped with water level data loggers (Solinst Model 3001 – Levellogger Edge). The data loggers will continuously record water levels and provide a detailed record of the response of groundwater to climatic conditions throughout the six-month period.

3.4 Groundwater Quality

On November 22, 2019 a groundwater sample was collected from monitoring well MW2-19 for laboratory analysis of City of Barrie sewer use by law parameters to characterize the groundwater that may be collected during construction activities for discharge.

Prior to sampling, the well was purged to ensure that the sample collected was representative of groundwater quality. Purging of the well was considered to be complete when field measurements of pH, conductivity and temperature stabilized, which generally occurred after three to five well volumes of groundwater had been removed (see **Appendix B**).

The groundwater sample was submitted under chain of custody procedures to Bureau Veritas Canada (BV) of Mississauga, Ontario a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory. The laboratory analytical reports are provided in **Appendix F**. The analytical results are discussed in Section 4.0.

3.5 Water Balance Analysis

A water balance analysis was undertaken for the extent of the Site boundary to determine the amount of water surplus generated for the existing Site conditions. The water balance was estimated using the Toronto and Region Conservation Authority and Credit Valley Conservation Low Impact Development (LID) Treatment Train Tool (TTT) version 2.0.18.

The Low Impact Development Treatment Train Tool (LID TTT) has been developed by Lake Simcoe Region Conservation Authority (LSRCA), Credit Valley Conservation (CVC) and Toronto and Region Conservation Authority (TRCA) as a tool to help developers, consultants, municipalities and landowners understand and implement more sustainable stormwater management planning and



design practices in their watersheds. Using results from the US Environmental Protection Agency's Storm Water Management Model (EPA SWMM5) engine, the tool assesses preliminary annual water balance (i.e. surface evapotranspiration, surface runoff, infiltration to soil) volumes for pre- and post-development scenarios. The tool also analyzes pollutant load removal by the use of Best Management Practices (BMP)'s and LID techniques.

A water balance analysis was undertaken to determine the amount of water surplus generated as a result of the proposed development and increase in impermeable surfaces. The water surplus is then used to evaluate the proposed stormwater management controls to provide similar hydrologic contributions to maintain the downstream surface water features.

4. Geology and Hydrogeology

The following sections provide a description of the geology and hydrogeology of the Site, based on the results of the investigations completed and on the available background information. Hydrostratigraphic cross-section A-A' oriented in an east-west direction, and cross-section B-B' oriented in a north-south direction across the Site were prepared based on the data collected. The location of the profiles is presented on **Figure 3.1**, and the profiles are shown on **Figures 4.1** and **4.2**.

4.1 Site Geology

The following surficial materials and geologic deposits underlie the Site (see **Figures 4.1** and **4.2**):

- **Fill (0 to 6 mBGS)** - silty sand, silt, sand, sand and gravel and topsoil
- **Peat (3 to 6 mBGS)** - peat with organics, gravel, sand and trace silt
- **Glaciolacustrine Deposit (6 to 28 mBGS)** - silt, sandy silt to sand, with clayey silt to silty clay layers

The Site is underlain by a thin layer of topsoil (less than 10 cm thick) and fill comprised of silt, silty sand, sand and sand and gravel, which is typically loose, moist and contains trace organics. The fill material extends to depths varying from near ground surface to approximately 6 mBGS.

The fill is locally underlain by a peat layer, which was observed at two of the boreholes MW1-19 and MW2-19. The peat is wet and contains trace gravel, trace sand, trace silt and organics. The peat is less than 1 m to approximately 3.5 meters thick.

The fill and peat is underlain by a glaciolacustrine deposit comprised of sand, silt, and silty sand that is light brown to grey and is generally loose and wet. The deposit typically has low blow counts, the SPT 'N' values within the layer varied between 4 to 25 blows per 0.3 m of penetration, indicating a loose to compact condition. The deposit was encountered to depths of up to 28 mBGS.

At MW3-19, the SPT 'N' values below a depth of 20 mBGS increased to greater than 50 blows per 0.3 m of penetration, indicating a dense condition within the silty sand and silt deposit at this depth.

The glaciolacustrine deposit contains a clayey silt to silty clay layer that is thin, up to approximately 4m thick, and is grey, wet and stiff. The silty clay layer was encountered in MW4-19, MW5-19, and



MW6-19 at depths between approximately 13 to 17 mBGS. The layer has low blow counts, the SPT 'N' values varied between 3 to 15 blows per 0.3 m of penetration, indicating a stiff condition.

4.2 Site Hydrogeology

The Site is primarily underlain by saturated fill, peat and a loose to compact silt and sand deposit, which forms a thick unconfined aquifer underlying the Site.

The hydrogeological field investigations completed for the Site included hydraulic testing and assessment of the hydraulic properties and conditions for the aquifer/aquitard units. The SWRTs were completed at representative groundwater monitoring wells. A summary of the hydraulic properties is presented in **Table 3.2**.

Fill (saturated) – the fill is comprised of silt, silty sand, sand, and sand and gravel and is typically moist. No testing was completed on the fill, due to the thin nature of the fill and primarily unsaturated conditions at the time of drilling. Groundwater level monitoring to date indicates the fill is locally saturated.

Peat (Aquifer) – Testing was not completed specifically on the peat, due to the thin nature of the deposit, but testing of MW2-19 screened partially within the deposit indicated a hydraulic conductivity of up to 9.4×10^{-3} cm/sec representative of aquifer conditions. Groundwater level monitoring to date indicates the peat is saturated.

Glaciolacustrine (Aquifer) – The silt and sand deposit forms an aquifer, which allows for significant groundwater flow across the Site. The hydraulic conductivity (K_h) of the silty sand ranges from 9.3×10^{-3} cm/s to 1.4×10^{-3} cm/s (geometric mean 3.0×10^{-3} cm/s), representative of the aquifer.

Groundwater Gradients and Flow

The groundwater elevation contours for monitoring wells screened within the silt and sand deposit are presented on **Figure 4.3**. Using the November 1st, 2019 water elevation data, the water table ranges in elevation from approximately 219.97 to 219.23 mAMSL (**Table 3.3a**), and groundwater flow is to the northeast and east toward Kempenfelt Bay.

The water table is present within the silt and sand deposits, peat and fill at depths ranging from approximately 0.27 to 2.85 mBGS, based on the November 2019 groundwater levels (**Table 3.3b**). Groundwater levels have declined in the range of about 0.5 metres on average over the period from September 2019 to November 2019. The seasonal fluctuations and groundwater gradients at the Site will be determined based the collection of data over a six month period.

Using the November 1, 2019 data, the average horizontal groundwater gradient is approximately 0.008 metres per metre (m/m), based on the difference in groundwater level elevations perpendicular to groundwater flow ($219.97 - 219.23$ mAMSL / 90 m = ~ 0.008 m/m).

Groundwater level monitoring will continue to be undertaken on a bi-monthly basis for manual measurements for a six month period from selected on site monitoring wells and continuously using data loggers in selected wells to demonstrate fully-recovered stable water level conditions, seasonal fluctuations and to verify groundwater gradients.



4.3 Water Taking Evaluation

The land development is anticipated to consist of buildings constructed at grade (slab on grade) with no basement or underground parking structures, and are not anticipated to require below water table excavation. The tower foundations will be constructed using deep slurry caissons. The slurry caissons will be drilled into the Lower Aquifer (185 mAMSL) and will require a customized slurry composition to assure: (1) sufficient density to balance potential groundwater pressure from the aquifer, (2) low mobility not to permeate into the groundwater regime and (3) chemical composition not to contaminate drinking water. Specialty caisson contractors will be required to provide slurry design/lab certificates to qualify (McClymont & Rak Engineers, Inc. December 2019).

GHD understands the tower foundations will be constructed using methods that require minimal, if any, groundwater takings, and on completion the building foundations will essentially be ‘sealed’ within the subsurface. The ‘sealed’ construction method would essentially eliminate the potential for any shallow impacted groundwater to ‘leak’ into the deeper subsurface.

The installation of underground utilities to the building(s) to depths of up to 1.5 mBGS, based on the site grading (SCS Consulting Group, December 2019), are considered to require groundwater takings given that the water table is encountered near ground surface and is likely to be intersected. It is anticipated that dewatering would be needed to lower groundwater levels below the base of a utility servicing trench excavation to provide safe dry working conditions based on the shallow water table across the Site.

Construction mitigation methods are anticipated to be employed to reduce the potential groundwater seepage and takings, including decreasing the size and depth of the excavations, use of wet soil mixing technology to stabilize the excavation area (McClymont & Rak Engineers, Inc. December 2019) and excavation during dryer seasonal periods. Utility trench construction groundwater takings are conservatively estimated below, assuming no construction mitigation methods are implemented to reduce the amount of groundwater seepage.

A summary of the relevant depths and corresponding elevations is provided as follows:

Table 4.1 Summary of Relevant Construction Dewatering Depths

Utility Trench Excavation	Depth (m BGS)	Elevation (m AMSL)
a) Ground	0	221
b) Water Table	1	220
d) Bottom Excavation	1.5	219.5
e) Bottom Dewatering (0.5 m below base of excavation)	2	219

The required water table drawdown is anticipated to be generally about 1 m within the excavation area, based on the above (220 mAMSL – 219 mAMSL = 1 m).

The estimated groundwater seepage rate does not take into account water contained within adjacent utilities, or other saturated fill material that may be intersected by the excavations.

The groundwater seepage was estimated using the analytical solution for unconfined flow to an excavation (trench) (CGS, 2013), as presented below.



EQUATION AND PARAMETERS

$$1) \quad Q = \frac{\pi K(H^2 - h_w^2)}{\ln R_o/r_w} + 2 \left[\frac{xK(H^2 - h_w^2)}{2L} \right] \quad (2) \quad r_w = \frac{a+b}{\pi} \quad (3) \quad L = R_o = 3000(\Delta H)\sqrt{K}$$

where:

- Q = constant pumping rate (m³/day)
- K = hydraulic conductivity (m/day)
- H = height of groundwater pressure (m)
- h_w = dewatering height (m)
- R_o = radius of influence (m)
- r_w = radius of footprint (shaft) (m)
- a = length of excavation (m)
- b = width of excavation (m)

The analytical model input parameters are provided on **Figure 4.4** (highlighted yellow), and are summarized as follows:

- Q = calculated groundwater seepage rate for an excavation with dimensions 3 x 15 m
- K = 2.6 m/day (3.0 x10⁻³ cm/s)
- H = 26 m height of water table
- h_w = 25 m dewatering height
- R_o = 55 m
- r_w = 5.7 m
- a = 3 m
- b = 15 m

Note: Height measurements are relative to base of active groundwater flow system (assumed to be dense sand at 194 mAMSL).

The analytical solution provides a reasonable estimate of potential long term (steady state) groundwater seepage. The hydraulic conductivity and thickness of the silty sand soils is used to estimate the groundwater seepage. The hydraulic conductivity was estimated to be 3 x10⁻³ cm/s (geomean).

The groundwater seepage to the excavation with out the implementation of construction mitigation methods is estimated to be approximately 397 cubic metres per day (m³/day) (**Figure 4.4**) or 397,000 litres per day (L/day), or 275 litres per minute (L/min). The relatively high water taking of 397,000 L/day is based on the high water table encountered at 220 mAMSL. Based on this pumping rate, the area of influence is estimated to be 22 metres from the construction excavation.

As the estimate above is for steady state conditions, it does not consider water taking rates at the commencement of dewatering needed to lower groundwater levels below the base of the excavation. During this period, water takings can be higher to remove water storage in the immediate vicinity of the excavation. A safety factor of 2X is applied to the estimated steady state groundwater seepage rate to account for this short term increased water taking, and is based on the loose aquifer conditions and proximity to Lake Simcoe. Without the implementation of construction



mitigation methods, the maximum short term construction water takings are estimated to be up to 794 m³/day (794,000 L/day) based on a 2X safety factor.

Actual dewatering rates will depend on the construction means and methods employed, and depth to water table at the time of construction. It is anticipated that with the implementation of construction mitigation methods including decreasing the size and depth of the excavations, use of wet soil mixing technology to stabilize the excavation area, and excavating during dryer seasonal periods, the water takings can be reduced well below 397,000 L/day. Without mitigation the groundwater takings would typically be about 397,000 L/day, but would need to be temporarily increased to lower groundwater levels quickly to the base of the excavation.

A Ministry of the Environment, Conservation and Parks (MECP) Environmental Activity and Sector Registration (EASR) is required for construction water takings between 50,000 to 400,000 litres per day (L/day), and a Permit To Take Water (PTTW) is required for construction water takings of greater than 400,000 L/day. Based on the implementation of construction mitigation methods, water takings for the utility excavations are anticipated to be less than 400,000 L/day. Based on this, a construction water taking MECP EASR for construction excavation purposes would be required.

4.4 Groundwater Management - Quality

In the event utility excavation groundwater takings are required during the development of the property options to manage the collected water include:

1. Discharge to the Sanitary Sewer.
2. Discharge to the Storm Sewer.

The groundwater quality was found to exceed Applicable Site Condition Standards for Sodium, Chloride, Metals, Polycyclic Aromatic Hydrocarbons (PAHs), Petroleum Hydrocarbons (PHCs) and Volatile Organic Compounds (VOCs) indicating shallow groundwater impacts on the property (Terraprobe September 12, 2017). Groundwater management options will need to address potentially elevated concentrations of these parameters in the groundwater, possibly through treatment (mobile ECA).

A groundwater sample was collected from monitoring well MW2-19 for laboratory analysis of the parameters listed in the City of Barrie sewer discharge criteria (Municipal Code Chapter 1047) to assess the water quality for the management of construction water discharge. Results from the laboratory analyses are presented in **Table 4.2** and the laboratory analytical report is provided in **Appendix F**.

Based on review of **Table 4.2** all of the parameters tested had concentrations below the sanitary sewer discharge criteria. Based on review of these analytical results, some construction water taking discharge may meet the sanitary sewer use criteria.

Based on review of **Table 4.2** all of the parameters tested had concentrations below the storm sewer discharge criteria except for total suspended solids (TSS). The TSS concentration was 17 mg/L, which slightly exceeds the discharge criteria of 15 mg/L. Based on review of the analytical results, with pre-treatment to reduce TSS some construction water taking discharge may also meet the storm sewer criteria.



The storm sewer is anticipated to be located within 30 metres of a water body (i.e., Bunker Creek), and as such, the quantity and quality of the discharge will need to meet additional mandatory requirements. At a minimum the turbidity of the discharge should not exceed 8 Nephelometric Turbidity Units (NTU) above the background level of the nearest water body. It will also need to be demonstrated that the discharge quantity and quality will not cause an adverse effect to this surface water feature and natural environment.

As the water that accumulates in the excavation will primarily be a combination of groundwater and precipitation, the groundwater sample analytical results alone are not representative of the actual excavation discharge water quality. Additional sample collection will be required from the construction water takings to further assess the water quality.

A City of Barrie permit for discharge of private water must be obtained, and confirmatory sampling undertaken prior to discharge to the sewer. Pre-treatment methods such as settlement, filter bags and/or other methods may be required to meet the sanitary and/or storm sewer use criteria.

4.5 Water Balance Calculation

At the time that the water balance calculation was completed, the drainage areas for existing and proposed Site conditions were not available. Therefore, GHD estimated the post-development pervious and impervious areas based on the available Site Plan by Turner Fleischer dated September 9, 2019. The estimated post-development areas are presented in **Table 4.3** and estimated pervious and impervious areas are presented in **Table 4.4**. The underlying soil type selected to use in the LID TTT was “silt loam”.

Table 4.3 Estimated Post-Development Areas

	Tower 1 (m ²)	Tower 2 (m ²)	Tower 3 (m ²)	Total Area (m ²)	Total Percent Area (%)
Building	3579.2	9502.7	5694.9	18776.8	54.50
Residential	398.7	2148.9	555.9	3103.5	9.01
Parking	480.6	2582.3	1545	4607.9	13.38
Total Site Area:				34450	76.89

Table 4.4 Estimated Area Percentages

	Estimated Value	Value Used
Roof Areas (%) - Impervious	54.50	54.5
Paved Areas (%) - Impervious	22.38	25.5
Other/Landscape Areas (%) - Pervious	23.11	20

Water surplus is the total water available in a given month to run off as surface overland flow and/or infiltrate to the ground and recharge the groundwater table. Under the proposed development, the amount of runoff would increase as a result of the increase in impervious area and decrease in pervious surfaces. The annual average water balance volume calculations for existing and proposed Site conditions are presented in **Table 4.5** and the LID TTT results in **Appendix G**.



Table 4.5 Annual Average Water Balance

	Approximate Site Area (ha)	Rainfall Volume (m ³)	Evapotranspiration Volume (m ³)	Water Surplus (m ³)	Infiltration Volume (m ³)	Runoff Volume (m ³)
Pre-Development	3.45	32,544.92	17,682.84	14,862.08	6,633	8,200
Post-Development	3.45	32,544.92	8,863.64	23,681.28	1,626.04	22,000
Difference				8,819.20	-5,006.96	13,800

Based on the water balance calculations, it is estimated that the average annual water surplus for existing Site conditions is approximately 14,862 cubic metres (m³). The water surplus of 14,862 m³ is determined by subtracting the existing conditions total rainfall volume of approximately 32,545 m³ from the existing conditions total evapotranspiration volume of 17,683 m³ (32,545 m³ - 17,683 m³ = 14,862 m³).

It is estimated that there will be an increase in the amount of water surplus from existing conditions to the proposed conditions of approximately 8,819 m³ annually. The increase in water surplus of 8,819 m³ is determined by subtracting the existing conditions water surplus of 14,862 m³ from the proposed conditions water surplus of 23,681 m³.

It should be noted that the total infiltration plus the runoff volume does not exactly equal the calculated water surplus (i.e., 6,633 m³ + 8,200 m³ ≠ 14,833 m³). This is because the 'external outflow' result (which represents the runoff volume) from the TRCA/CVC LID TTT does not include the surface water runoff that is stored within the voids of the soil.

Under the proposed development, the amount of runoff would increase as a result of the increase in impervious area and decrease in pervious surfaces. In addition to addressing the increase in peak flow and volume, additional stormwater management controls would need to be considered to enhance infiltration and evapotranspiration within the proposed development area and reduce runoff. The proposed stormwater management controls would need to maximize the infiltration of runoff during minor storm event, with additional surface runoff from larger storm events directed overland for water quality and quantity control.

The stormwater management controls should maintain existing drainage patterns and provide similar hydrologic contributions to maintain the downstream surface water features. It is important to allow additional runoff to replicate the slow contribution of groundwater and slowly compensate for the loss in infiltration that would have ultimately discharged to the downstream watercourse (i.e., Bunker's Creek and ultimately Lake Simcoe).

By working at a treatment train approach, the stormwater management controls would also minimize the potential for slope erosion, reduce water quality loadings and degradation of aquatic habitat in the receiving surface water feature, improving water quality of the discharge to the surface water features.

The location, design, and construction of the stormwater management controls should be in accordance with, at a minimum, the following guidelines:



- Stormwater Management Planning and Design Manual (MECP, 2003).
- Low Impact Development Stormwater Management Planning and Design Guide (CVC & TRCA, 2010).
- Infiltration Low Impact Development Screening Process (City of Barry, 2017).

These guidelines include maintaining a minimum of 1.0 m buffer from the seasonally high groundwater table and 4.0 m buffer from building foundations for infiltrative LID measures. The following stormwater management controls could be further evaluated for feasibility at the site:

- Roof-top stormwater storage on the proposed buildings would store and evapotranspire initial precipitation, acting as a stormwater management control and reducing overall peak flow discharge and pollutants to the proposed storm sewer system. The roofs could be designed to maximize evapotranspiration and manage potentially increased loads associated with the green roof. The stormwater management storage could also be used for rain harvesting and be used within the building structures for wastewater use. Larger storm events would overflow into roof leaders and could drain overland towards enhanced grassed swales, or all water could be directed to an underground infiltration gallery.
- Permeable pavement in the proposed parking lot areas and/or sidewalks would allow precipitation to drain from the surface to a stone reservoir where it can infiltrate into the underlying soils. The parking lots could be designed to be completely encompassed with permeable pavers or only the parking spaces surrounded by impervious drive lanes. During major storm events, the surface runoff would drain overland towards vegetative berms.
- Directing excess surface runoff from the proposed parking lot areas and landscaped areas to enhanced grassed swales or bioretention facilities located within and/or between the parking lot areas or to underground infiltration galleries. Within the parking lot area, enhanced grassed swales or bioretention facilities could be located between the rows designated for parked cars. Rock check dams could be installed to allow for ponding within the swales. The swales would be vegetative and sized to store minor storm events, enhancing storage and evapotranspiration on-site. Underground storage chambers could be designed beneath the parking lots to provide stormwater detention and allow for infiltration into the underlying soils. During major storm events, the surface runoff would drain overland towards vegetative berms.

Additional construction measures that could enhance infiltration and evapotranspiration include:

- Reduction of grading to 0.5 - 1.0% slope in parking lot, landscape areas, and swales to allow for additional evapotranspiration and infiltration.
- Scarification, or tilling of the soil to a depth of approximately 300 mm, would enhance evapotranspiration and infiltration within the landscaped areas to overcome soil compaction that occurs during construction.

Under proposed development conditions, it is anticipated that a portion of the urban lawn area will consist of tree cover, resulting in additional evapotranspiration and less runoff and further decrease runoff volumes similar to current conditions.



5. Impact Assessment

The proposed development includes up to four high-rise combined residential/commercial buildings with no basement structures (slab-on-grade), and heights of up to 42 storeys with paved parking areas and associated driveways. The proposed development will be serviced with municipal water and sewers.

The tower foundations will be constructed using methods that require minimal, if any, groundwater takings. On completion, the building foundations will essentially be 'sealed' within the subsurface. The 'sealed' construction method would essentially eliminate the potential for any shallow impacted groundwater to 'leak' into the deeper subsurface.

Construction Groundwater Takings

Site servicing (water, sewer) are anticipated to require temporary groundwater takings based on the relatively shallow water table (1 to 3 mBGS). It is anticipated that with the implementation of construction mitigation methods including decreasing the size and depth of the excavations, use of wet soil mixing technology to stabilize the excavation area, and excavating during dryer seasonal periods, the water takings are anticipated to be much less than 400,000 L/day. Based on this, a construction water taking MECP EASR for construction excavation purposes would be required.

Water Balance

The amount of impervious surfaces (roofs, parking lots) is anticipated to increase from the existing pre-development condition to the post development condition. Based on this, the volume of runoff will increase resulting in an annual water surplus of approximately 8,819 cubic metres (m³).

Re-development of the Site is anticipated to increase the runoff from the Site, and as such it is anticipated mitigation will be required to address increased stormwater runoff, and improve infiltration. Mitigation will also include assessing the most appropriate locations to direct stormwater runoff and infiltration in order to support desirable surface features that are to be maintained.

Stormwater Management

The proposed development will consist of commercial and residential use buildings. Runoff from rooftops, access and parking areas is anticipated to either infiltrate or be captured and directed to the stormwater management features located on the property. Control of surface water runoff (quantity and quality) will be addressed through the stormwater management plan.

The Site is located adjacent to Bunker Creek, which is zoned environmental protection. The stormwater management features designed for the Site should direct infiltration and surface water flow consistent with the current flow patterns. Mitigating primarily groundwater contributions to the surface water features, Bunkers Creek and Kempenfelt Bay through infiltration and shallow groundwater flow, via the peat layer will assist with maintaining the functioning of these features.

WHPA

The Site is situated within the City of Barrie Wellhead Protection Area B (WHPA B) for Wells 11, 12, 14, and 15. The Site also falls within the source water protection issues contributing area for sodium



and chloride. Road salt, snow storage, stormwater and sewage works were identified as potential municipal drinking water threats (Exp July 13, 2013).

There is limited downward pathway into the deep underlying municipal aquifer, based on the semi confined nature of the aquifer, and given that Kempenfelt Bay is generally a groundwater discharge area. The potential threats are considered to be low given the semi-confined nature of the aquifer.

6. Summary and Conclusions

Based on the results of the hydrogeological investigation and monitoring undertaken to date, the following summary and conclusions are provided:

- 1) The Site is primarily underlain by saturated fill, peat and a loose to compact silt and sand deposit, which forms a thick unconfined aquifer underlying the Site.
- 2) The water table ranges from approximately 0.27 to 2.85 mBGS, based on the November 2019 groundwater levels. The seasonal groundwater fluctuations and groundwater gradients will be determined, based on six months of monitoring.
- 3) The horizontal hydraulic conductivity (K_h) is estimated to be 3.0×10^{-3} cm/s (geomean), representative of the unconfined silt and sand aquifer.
- 4) It is anticipated that with the implementation of construction mitigation methods including decreasing the size and depth of the excavations, use of wet soil mixing technology to stabilize the excavation area, and excavating during dryer seasonal periods, the water takings are anticipated to be much less than 400,000 L/day. Based on this, a construction water taking MECP EASR for construction excavation purposes would be required.
- 5) In the event that water takings are required during development construction activities, groundwater management options will need to address potentially elevated concentrations of sodium, chloride, metals, PAHs, PHCs and VOCs.
- 6) Based on the water balance calculations, it is estimated that the difference between the average annual water surplus for existing and proposed Site conditions is approximately 8,819 m³. Under the proposed development, the amount of runoff would increase as a result of the increase in impervious area and decrease in permeable surfaces. In addition to addressing the increase in peak flow and volume, storm water management controls should concentrate on enhancing infiltration and evapotranspiration within the proposed development area to maintain the hydrological conditions of the downstream surface water features.
- 7) GHD recommends that the water balance be updated once the post-development drainage areas have been finalized as part of the SWM report to ensure accurate water surplus and infiltration volumes for LID sizing and design.



All of Which is Respectfully Submitted,
GHD

A handwritten signature in blue ink that reads 'Andreou'.



Sean Andreou, MSc, P.Geo.

A handwritten signature in blue ink that reads 'Philip J. Smart'.



Philip J. Smart, MSc, P. Geo.



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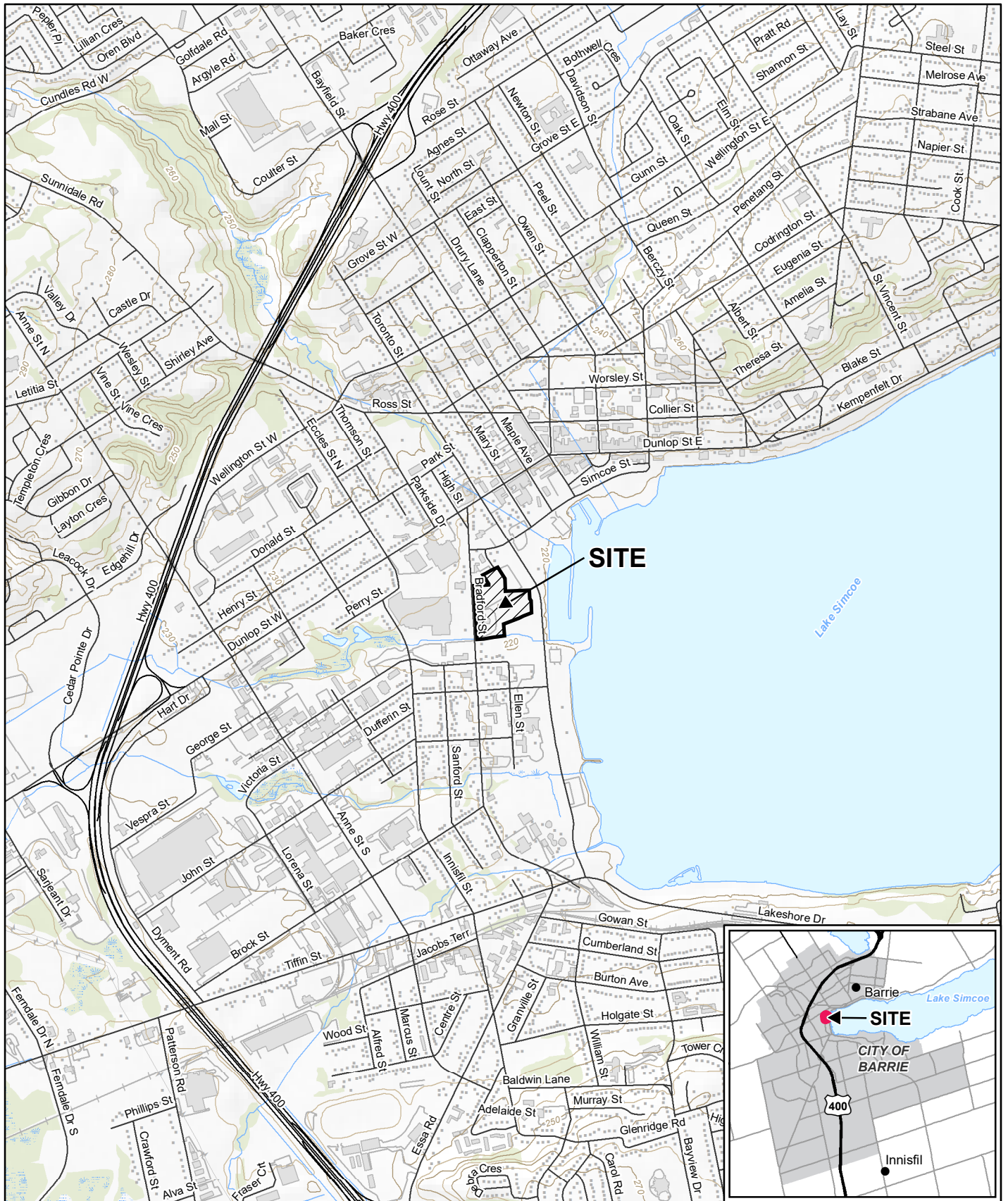
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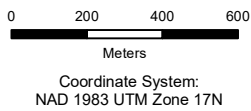
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Figures



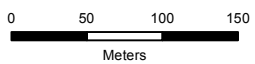
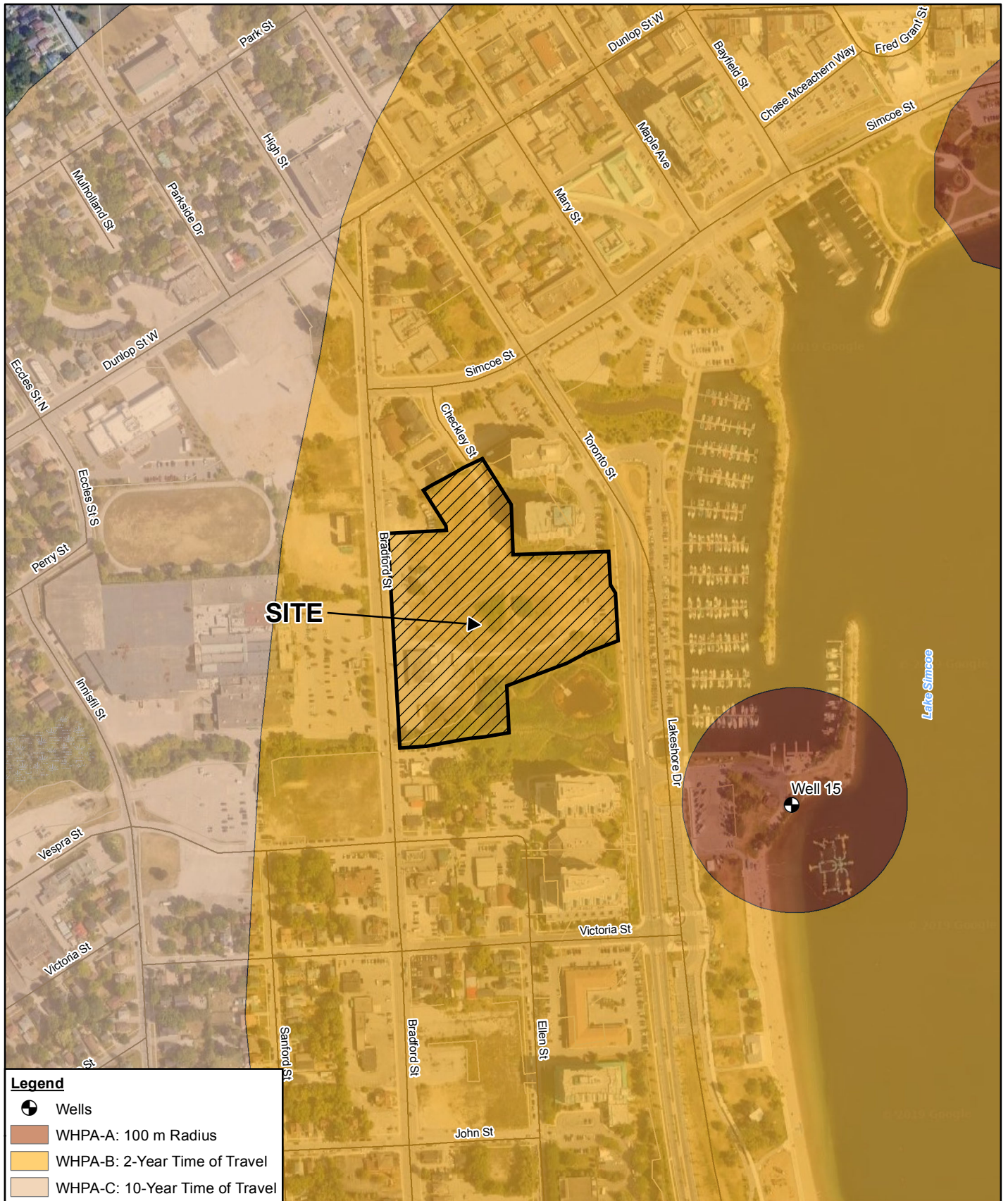
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BARRIE LAKESHORE DEVELOPMENTS
 PROPOSED RESIDENTIAL DEVELOPMENT
 51-75 BRADFORD STREET, BARRIE, ONTARIO
 HYDROGEOLOGICAL ASSESSMENT
 SITE LOCATION MAP

11201680-00
 Nov 21, 2019

FIGURE 1.1



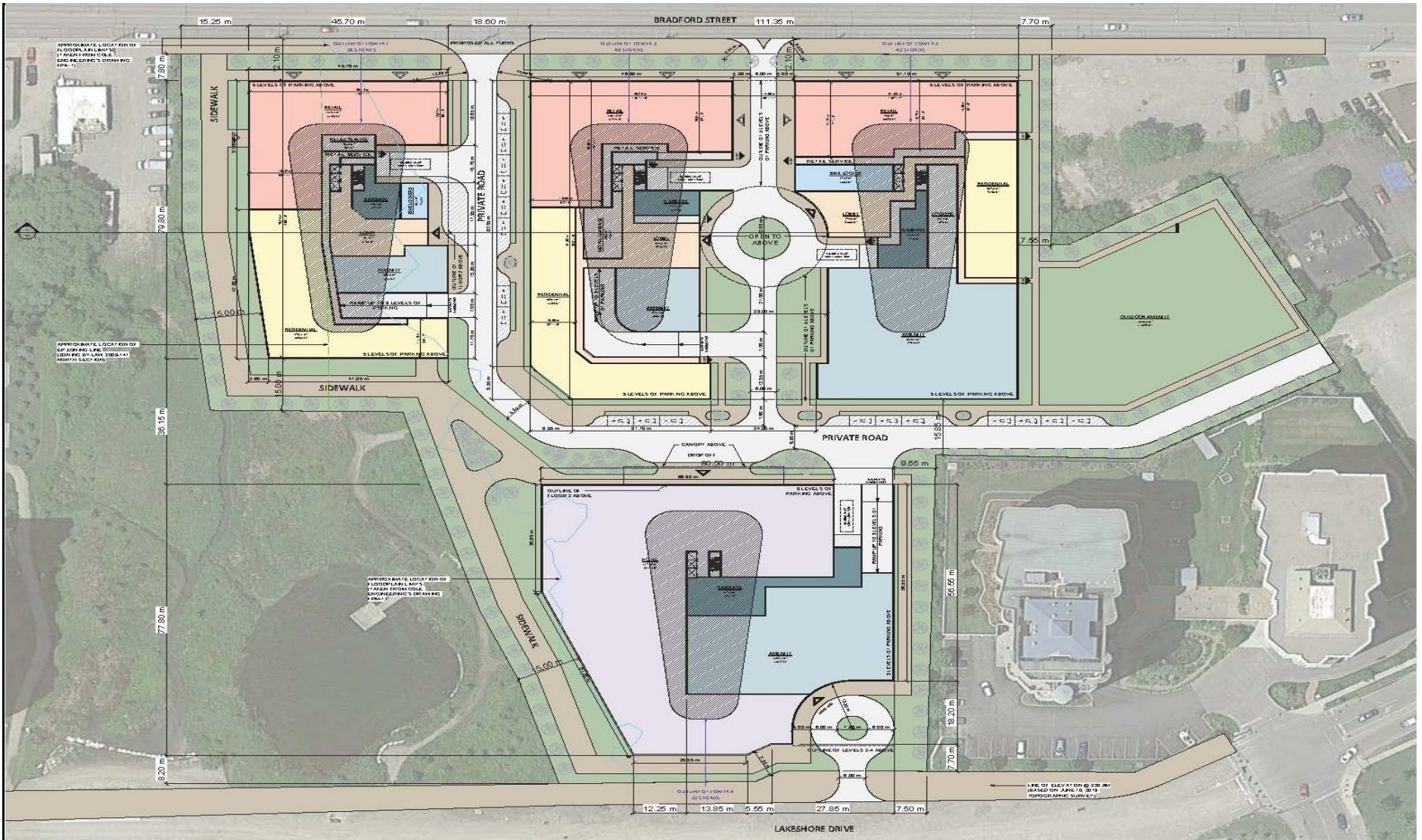
Coordinate System:
NAD 1983 UTM Zone 17N



BARRIE LAKESHORE DEVELOPMENTS
 PROPOSED RESIDENTIAL DEVELOPMENT
 51-75 BRADFORD STREET, BARRIE, ONTARIO
 HYDROGEOLOGICAL ASSESSMENT
 AERIAL IMAGE

11201680-00
 Dec 2, 2019

FIGURE 1.2



Source: Turner Fleischer, Turner Fleischer Architects Inc., drawing No. A004, 2019-09-09

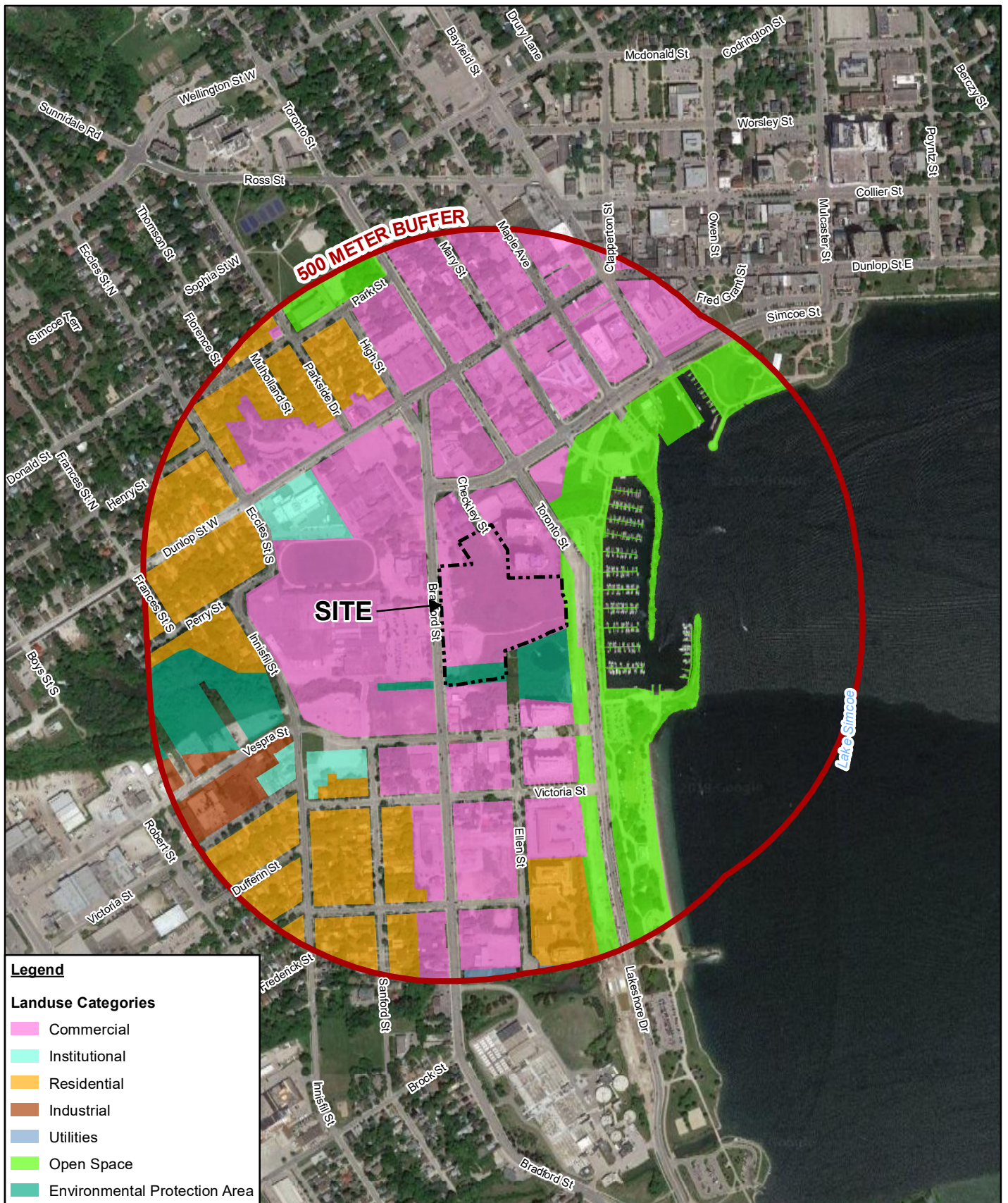


**BARRIE LAKESHORE DEVELOPMENTS
 PROPOSED RESIDENTIAL DEVELOPMENT
 51-75 BRADFORD STREET, BARRIE, ONTARIO
 HYDROGEOLOGICAL ASSESSMENT
 SITE PLAN**

11201680

28-Nov-19

FIGURE 1.3

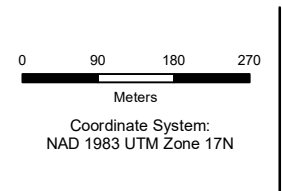


Legend

Landuse Categories

- Commercial
- Institutional
- Residential
- Industrial
- Utilities
- Open Space
- Environmental Protection Area

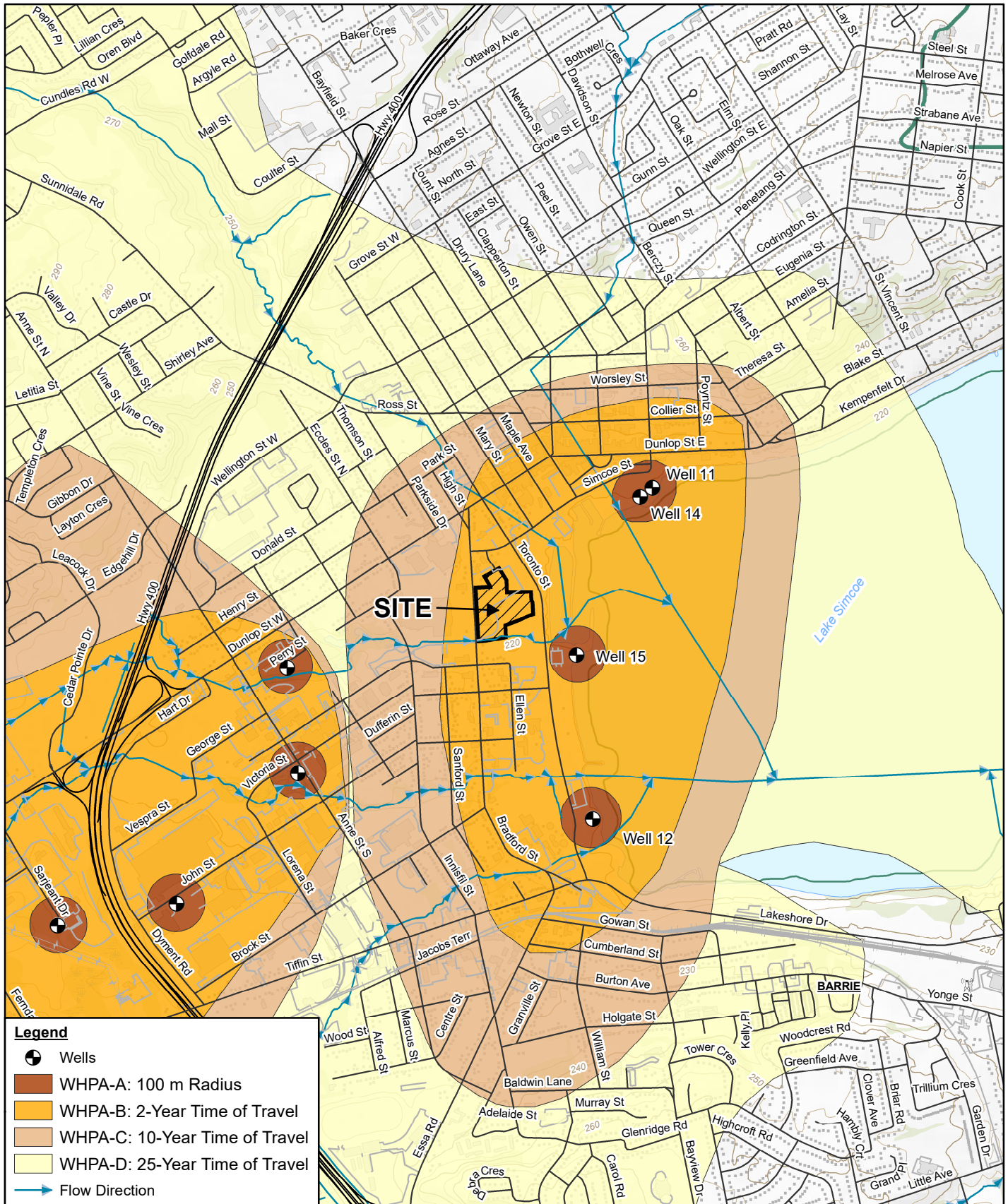
Source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2019; Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Zoning Information acquired from City of Barrie Comprehensive Zoning By-Law 2009-141



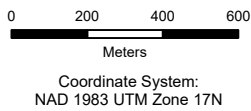
**BARRIE LAKESHORE DEVELOPMENTS
 PROPOSED RESIDENTIAL DEVELOPMENT
 51-75 BRADFORD STREET, BARRIE, ONTARIO
 HYDROGEOLOGICAL ASSESSMENT
 LAND USE ZONING MAP**

11201680-00
 Nov 25, 2019

FIGURE 2.1

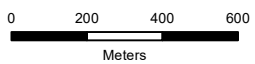
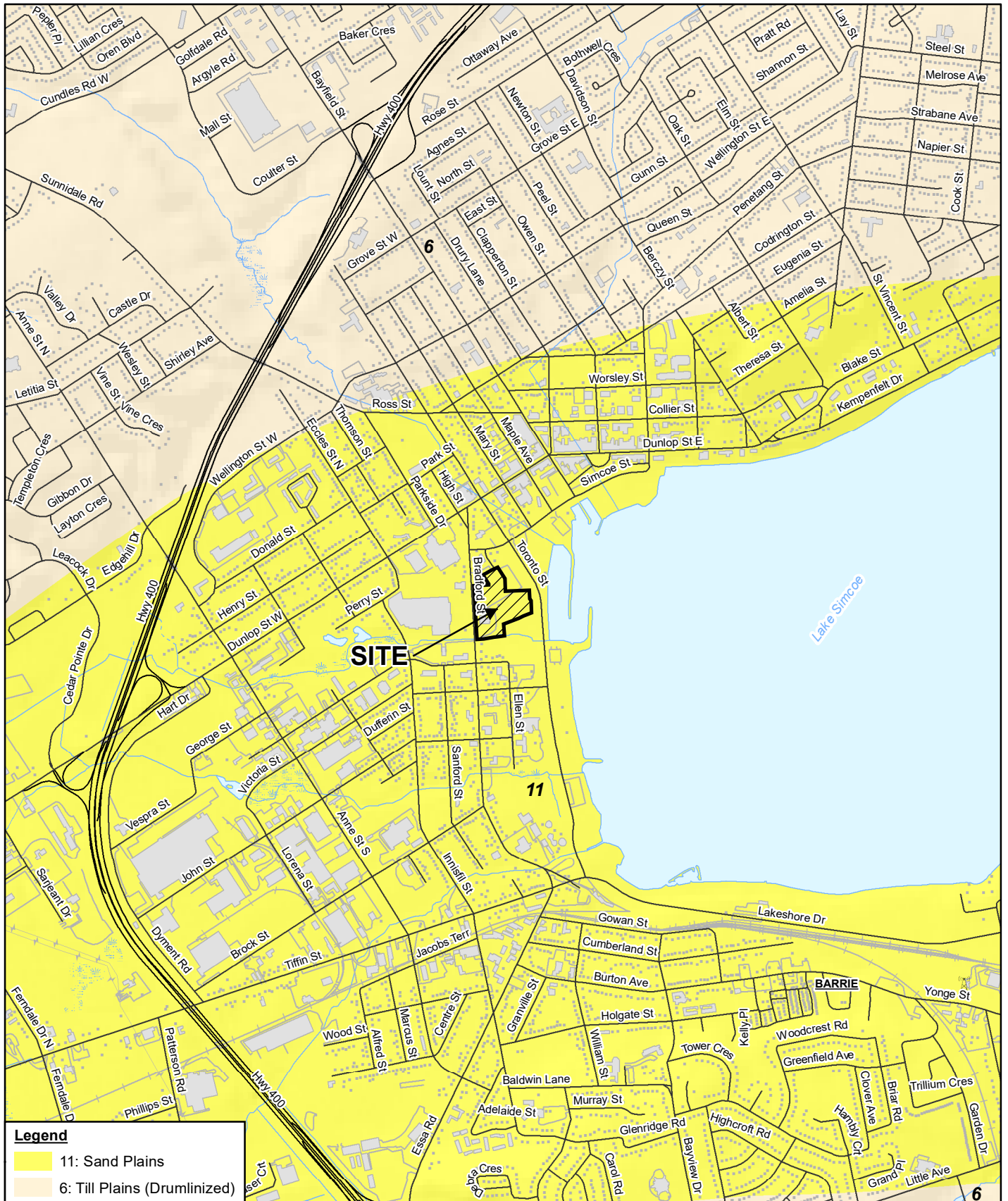


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BARRIE LAKESHORE DEVELOPMENTS
 PROPOSED RESIDENTIAL DEVELOPMENT
 51-75 BRADFORD STREET, BARRIE, ONTARIO
 HYDROGEOLOGICAL ASSESSMENT
 WELLHEAD PROTECTION ZONES FIGURE 2.2

11201680-00
 Nov 27, 2019



Coordinate System:
NAD 1983 UTM Zone 17N

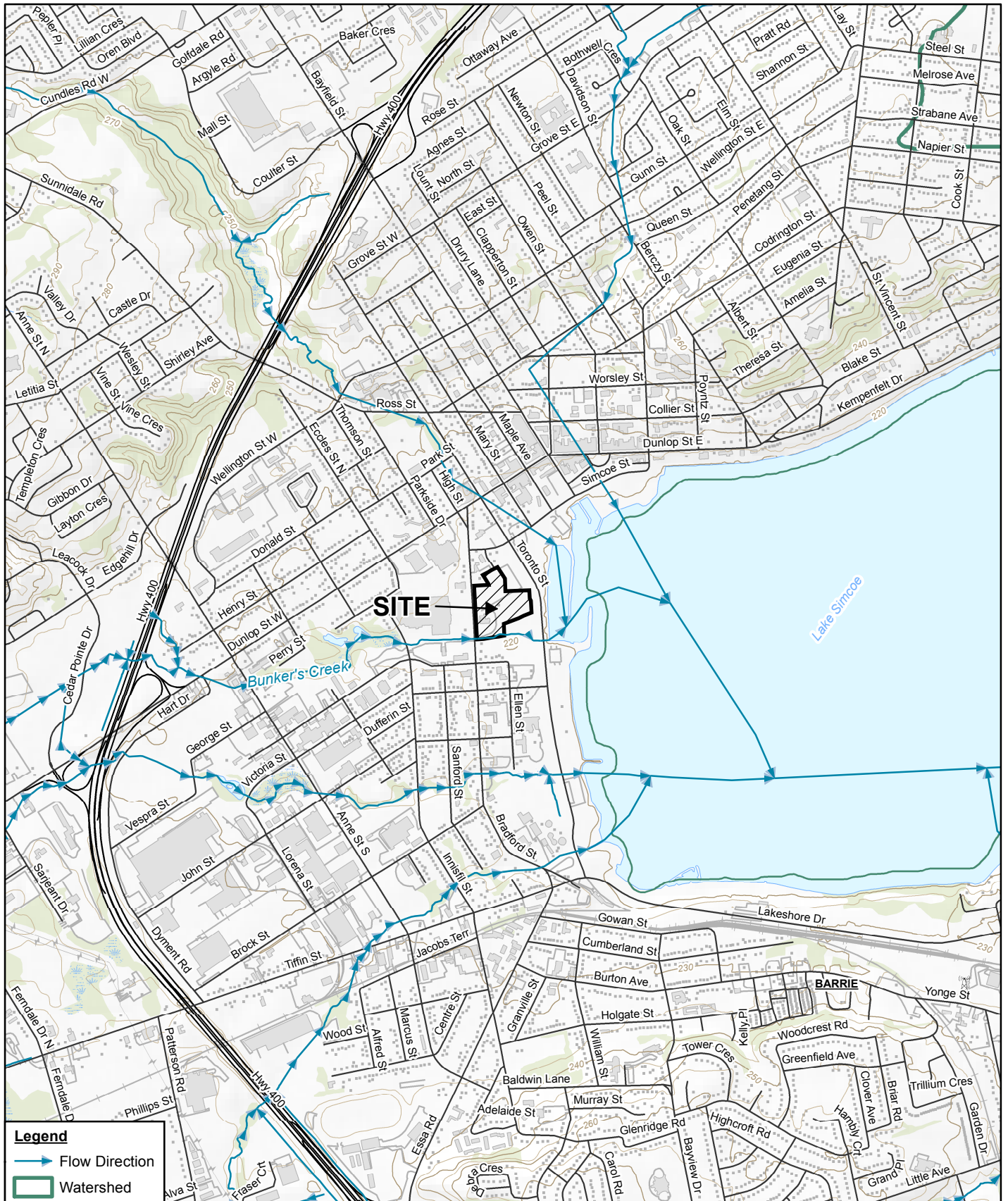


PROPOSED RESIDENTIAL DEVELOPMENT
51-75 BRADFORD STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

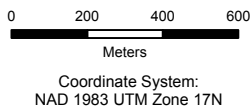
11201680-00
Dec 4, 2019

PHYSIOGRAPHY

FIGURE 2.3



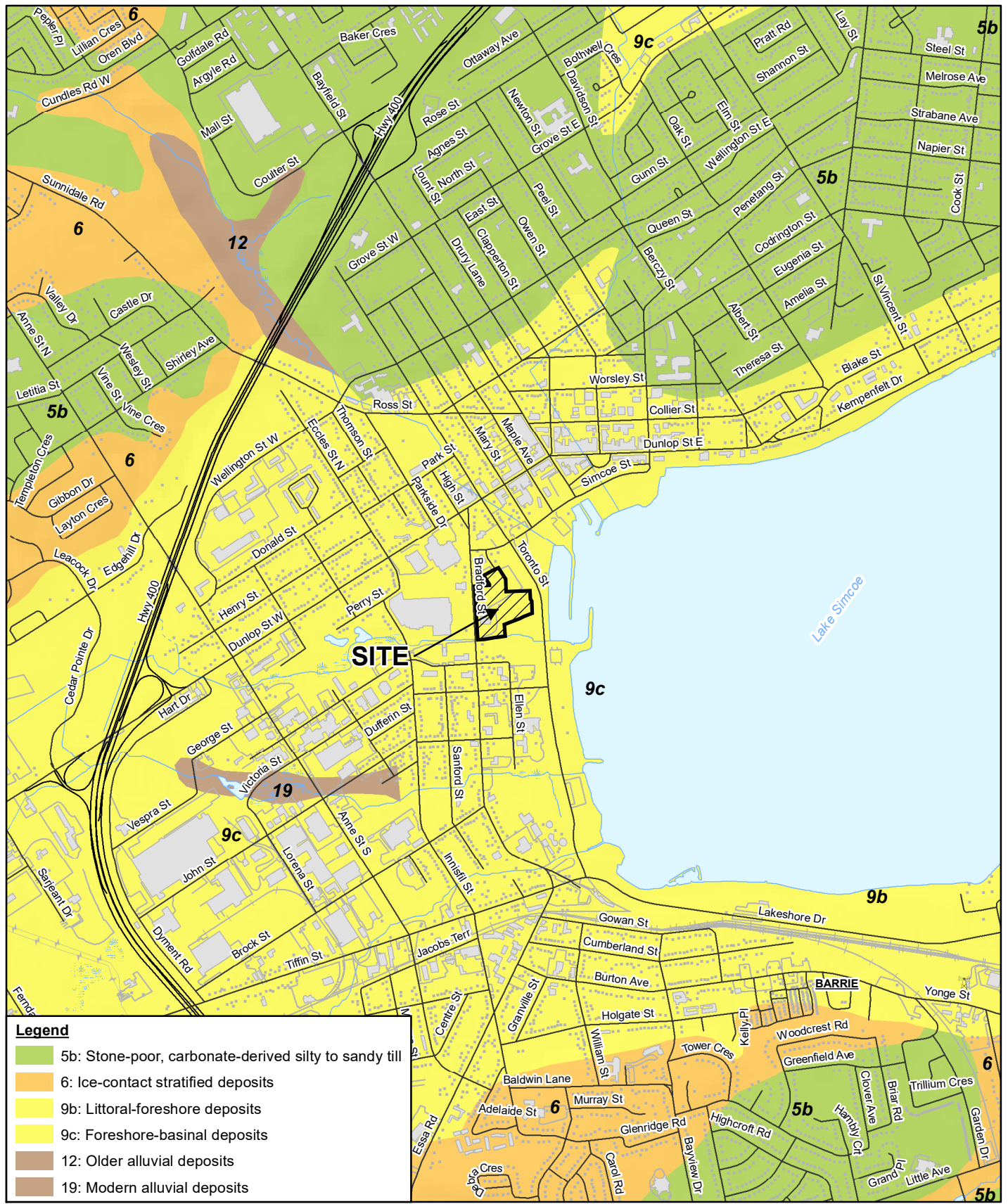
Source: MNRF NRVIS, 2017. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2019.



BARRIE LAKESHORE DEVELOPMENTS
PROPOSED RESIDENTIAL DEVELOPMENT
51-75 BRADFORD STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT
DRAINAGE

11201680-00
Nov 27, 2019

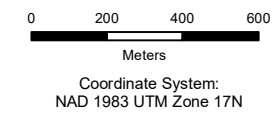
FIGURE 2.4

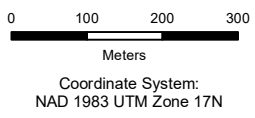


**BARRIE LAKESHORE DEVELOPMENTS
 PROPOSED RESIDENTIAL DEVELOPMENT
 51-75 BRADFORD STREET, BARRIE, ONTARIO
 HYDROGEOLOGICAL ASSESSMENT
 SURFICIAL GEOLOGY**

11201680-00
 Nov 21, 2019

FIGURE 2.5





BARRIE LAKESHORE DEVELOPMENTS
 PROPOSED RESIDENTIAL DEVELOPMENT
 51-75 BRADFORD STREET, BARRIE, ONTARIO
 HYDROGEOLOGICAL ASSESSMENT
 MECP WATER WELLS

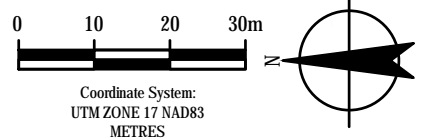
11201680-00
 Nov 29, 2019

FIGURE 2.6



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- MW 5-19 ● MONITORING WELL (GHD)
- BH 204 ⊕ BOREHOLE/MONITORING WELL (TERRAPROBE)
- MW 4-09 ● MONITORING WELL (OTHER)
- TBH 120 ⊕ BOREHOLE/MONITORING WELL (PETO MACCALLUM)
- TP27-09 □ TEST PIT LOCATION



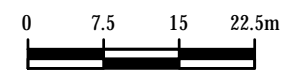
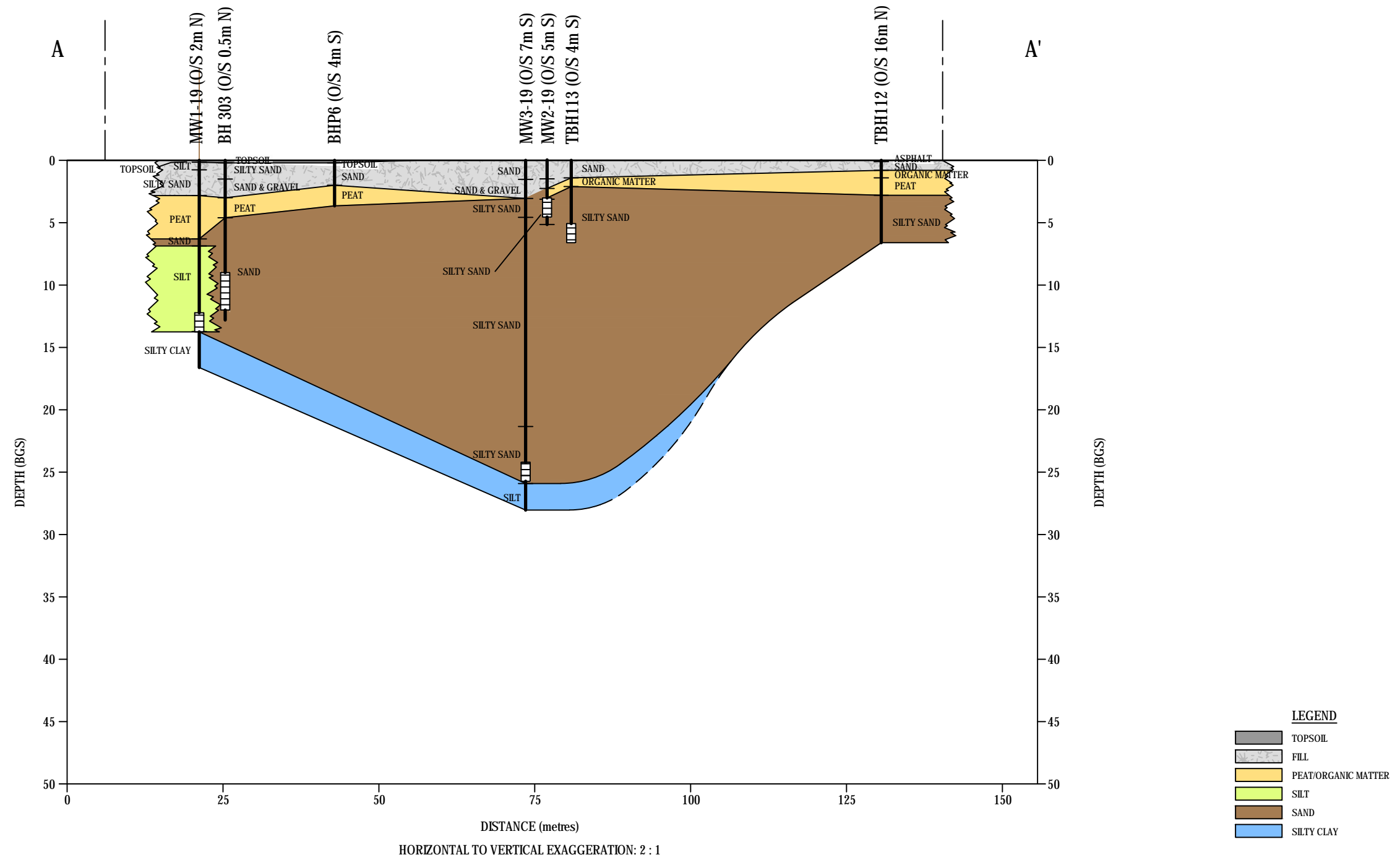
PROPOSED RESIDENTIAL DEVELOPMENT
51-75 BRADFORD STREET, BARRIE, ONTARIO
HYDROGEOLOGIC ASSESSMENT

INVESTIGATIVE LOCATIONS

Project No. 11201680
Date November 2019

FIGURE 3.1

Filename: N:\CA\Waterloo\Projects\662\11201680\Digital_Design\ACAD 2018\Figures\RPT-4\11201680(RPT-4)GN-WA001.DWG
Plot Date: 22 November 2019 2:42 PM

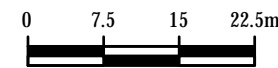
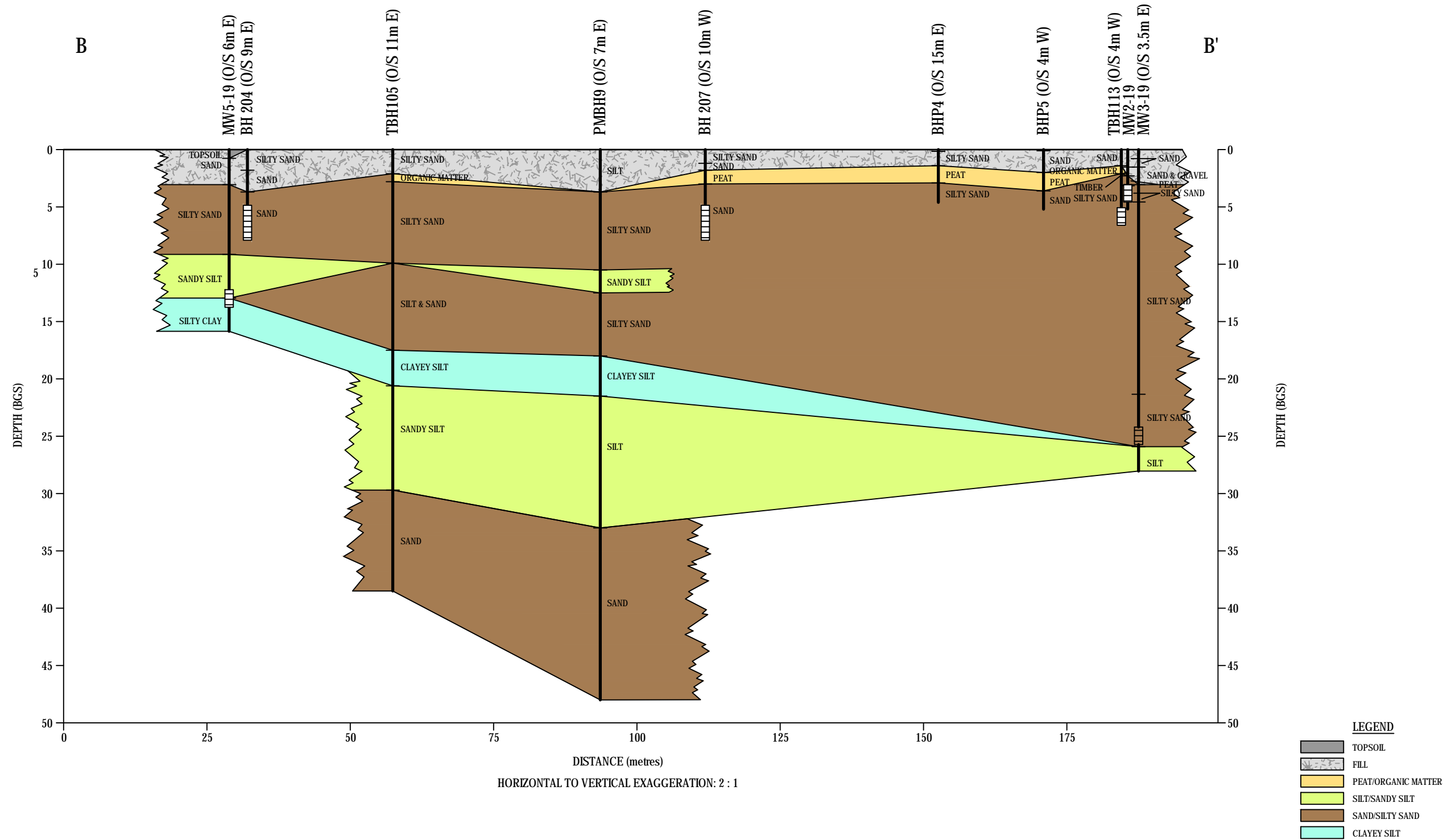


PROPOSED RESIDENTIAL DEVELOPMENT
51-75 BRADFORD STREET, BARRIE, ONTARIO
HYDROGEOLOGIC ASSESSMENT

Project No. 11201680
Date November 2019

CROSS-SECTION A-A'

FIGURE 4.1



PROPOSED RESIDENTIAL DEVELOPMENT
51-75 BRADFORD STREET, BARRIE, ONTARIO
HYDROGEOLOGIC ASSESSMENT

Project No. 11201680
Date November 2019

CROSS-SECTION B-B'

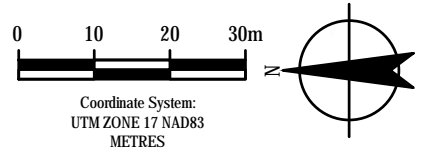
FIGURE 4.2



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LEGEND	
---	APPROXIMATE PROPERTY BOUNDARY
MW 5-19 ●	MONITORING WELL (GHD)
BH 204 ●	BOREHOLE/MONITORING WELL (TERRAPROBE)
MW 4-09 ●	MONITORING WELL (OTHER)
TBH 120 ⊕	BOREHOLE/MONITORING WELL (PETO MACCALLUM)
TP27-09 □	TEST PIT LOCATION
(219.97)	GROUNDWATER ELEVATION (m AMSL)
—219.80—	GROUNDWATER ELEVATION CONTOUR
→	GROUNDWATER FLOW DIRECTION

TP27-09 □	TEST PIT LOCATION
(219.97)	GROUNDWATER ELEVATION (m AMSL)
—219.80—	GROUNDWATER ELEVATION CONTOUR
→	GROUNDWATER FLOW DIRECTION



PROPOSED RESIDENTIAL DEVELOPMENT
51-75 BRADFORD STREET, BARRIE, ONTARIO
HYDROGEOLOGIC ASSESSMENT

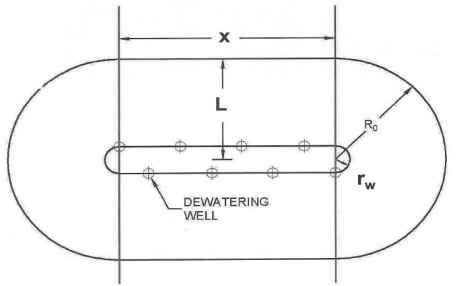
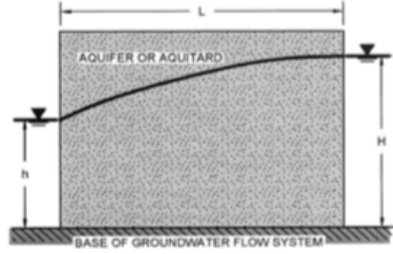
GROUNDWATER CONTOURS

Project No. 11201680
Date November 2019

FIGURE 4.3

FIGURE 4.4
ESTIMATED WATER TAKINGS AND AREA OF INFLUENCE (STEADY STATE)
HYDROGEOLOGICAL ASSESSMENT
51-57 BRADFORD STREET, BARRIE ON
BARRIE LAKESHORE DEVELOPMENTS

Flow to a Trench for a Unconfined Aquifer

<p>Information Steady State flow to a trench for an unconfined aquifer. Use this equation when $a/b > 1.5$.</p> <p>Equation 4.0</p> $Q = \frac{\pi K(H^2 - h^2)}{\ln R_0/r_w} + 2 \left[\frac{xK(H^2 - h^2)}{2L} \right]$ <p>Equation 4.1</p> $r_w = \frac{a+b}{\pi}$ <p>Ro is determined by the Siechartd Equation: $Ro = 3000(H-hw)K^{0.5}$ when K is in m/s</p>  	<p>Enter Parameters</p> <p>Shaft or Trench Eq'n Check: 5.0 This number must be greater than 1.5; if not, then use a Shaft equation.</p> <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:15%;">K=</td> <td style="width:15%; border: 1px dashed black;">3.00E-03</td> <td style="width:15%;">cm/s</td> <td style="width:15%;">Input Hydraulic Conductivity in cm/s</td> <td style="width:15%;"></td> <td style="width:15%;"></td> </tr> <tr> <td>=></td> <td>2.592</td> <td>m/day</td> <td>Hydraulic Conductivity converted to m/day</td> <td></td> <td></td> </tr> <tr> <td>H=</td> <td>26</td> <td>m</td> <td>Input height of groundwater pressure</td> <td></td> <td></td> </tr> <tr> <td>h=</td> <td>25</td> <td>m</td> <td>Input dewatering height</td> <td></td> <td></td> </tr> <tr> <td>x=</td> <td>15</td> <td>m</td> <td>Input length of trench</td> <td></td> <td></td> </tr> <tr> <td>a=</td> <td>15</td> <td>m</td> <td>Input length of excavation</td> <td></td> <td></td> </tr> <tr> <td>b=</td> <td>3</td> <td>m</td> <td>Input width of excavation</td> <td></td> <td></td> </tr> <tr> <td>r_w=</td> <td>5.73</td> <td>m</td> <td>Input/calculate radius of trench</td> <td></td> <td></td> </tr> <tr> <td>π=</td> <td>3.141592654</td> <td></td> <td>Pi</td> <td></td> <td></td> </tr> </table> <p>*Note: L and Ro are the same distance* *Note: Height measurements are relative to base of active groundwater</p> <p align="right">Calculating L and Ro using: $R_0 = 1.5(Tt/S)^{0.5}$</p> <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:15%;">T=</td> <td style="width:15%; border: 1px dashed black;">67.392</td> <td style="width:15%;">m²/day</td> <td style="width:15%;">Input transmissivity in m²/day</td> <td style="width:15%;"></td> <td style="width:15%;"></td> </tr> <tr> <td>t=</td> <td>30</td> <td>days</td> <td>Input pumping duration in days</td> <td></td> <td></td> </tr> <tr> <td>S=</td> <td>0.3</td> <td></td> <td>Input storage coefficient</td> <td></td> <td></td> </tr> <tr> <td>L=Ro=</td> <td>123.14</td> <td>m</td> <td>Line source distance; distance of influence</td> <td></td> <td></td> </tr> </table> <p align="right"><small>Alternative equation by Bear (Bear, J., 1979. Hydraulics of Groundwater, McGraw-Hill, New York, 569p) $R_0 = 1.5(Tt/S)^{0.5}$ where T is transmissivity in m²/day, t is pumping duration in days. R₀ will be in metres.</small></p> <p align="right">*Note: The above Ro is for comparison. It is not the Ro used to calculate Q below.</p> <p>Enter additional K values (optional)</p> <table style="width:100%; border-collapse: collapse;"> <tr> <td style="width:15%;">K=</td> <td style="width:15%; border: 1px dashed black;">3.00E-03</td> <td style="width:15%;">cm/s</td> <td style="width:15%;"></td> <td style="width:15%;">K=</td> <td style="width:15%; border: 1px dashed black;">2.592</td> <td style="width:15%;">m/day</td> </tr> <tr> <td>K2=</td> <td>1.00E-06</td> <td>cm/s</td> <td></td> <td>K2=</td> <td>0.000864</td> <td>m/day</td> </tr> <tr> <td>K3=</td> <td>1.00E-05</td> <td>cm/s</td> <td></td> <td>K3=</td> <td>0.00864</td> <td>m/day</td> </tr> <tr> <td>K4=</td> <td>1.00E-04</td> <td>cm/s</td> <td></td> <td>K4=</td> <td>0.0864</td> <td>m/day</td> </tr> <tr> <td>K5=</td> <td>1.00E-03</td> <td>cm/s</td> <td></td> <td>K5=</td> <td>0.864</td> <td>m/day</td> </tr> <tr> <td>K6=</td> <td>1.00E-02</td> <td>cm/s</td> <td></td> <td>K6=</td> <td>8.64</td> <td>m/day</td> </tr> <tr> <td>K7=</td> <td>1.00E-01</td> <td>cm/s</td> <td></td> <td>K7=</td> <td>86.4</td> <td>m/day</td> </tr> <tr> <td>K8=</td> <td>1.00E+00</td> <td>cm/s</td> <td></td> <td>K8=</td> <td>864</td> <td>m/day</td> </tr> <tr> <td>K9=</td> <td>1.00E+01</td> <td>cm/s</td> <td></td> <td>K9=</td> <td>8640</td> <td>m/day</td> </tr> <tr> <td>K10=</td> <td>1.00E+02</td> <td>cm/s</td> <td></td> <td>K10=</td> <td>86400</td> <td>m/day</td> </tr> </table>	K=	3.00E-03	cm/s	Input Hydraulic Conductivity in cm/s			=>	2.592	m/day	Hydraulic Conductivity converted to m/day			H=	26	m	Input height of groundwater pressure			h=	25	m	Input dewatering height			x=	15	m	Input length of trench			a=	15	m	Input length of excavation			b=	3	m	Input width of excavation			r _w =	5.73	m	Input/calculate radius of trench			π=	3.141592654		Pi			T=	67.392	m ² /day	Input transmissivity in m ² /day			t=	30	days	Input pumping duration in days			S=	0.3		Input storage coefficient			L=Ro=	123.14	m	Line source distance; distance of influence			K=	3.00E-03	cm/s		K=	2.592	m/day	K2=	1.00E-06	cm/s		K2=	0.000864	m/day	K3=	1.00E-05	cm/s		K3=	0.00864	m/day	K4=	1.00E-04	cm/s		K4=	0.0864	m/day	K5=	1.00E-03	cm/s		K5=	0.864	m/day	K6=	1.00E-02	cm/s		K6=	8.64	m/day	K7=	1.00E-01	cm/s		K7=	86.4	m/day	K8=	1.00E+00	cm/s		K8=	864	m/day	K9=	1.00E+01	cm/s		K9=	8640	m/day	K10=	1.00E+02	cm/s		K10=	86400	m/day
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L5= Ro5=	9.49	m	Q5=	344.47	m ³ /day	Q5=	239.20	L/min	Q5=	52.62	gal/min																																																																																																																																										
L6= Ro6=	35.73	m	Q6=	941.47	m ³ /day	Q6=	653.75	L/min	Q6=	143.81	gal/min																																																																																																																																										
L7= Ro7=	100.60	m	Q7=	5,488.80	m ³ /day	Q7=	3,811.42	L/min	Q7=	838.39	gal/min																																																																																																																																										
L8= Ro8=	305.73	m	Q8=	36,973.66	m ³ /day	Q8=	25,674.51	L/min	Q8=	5,647.60	gal/min																																																																																																																																										
L9= Ro9=	954.42	m	Q9=	277,565.52	m ³ /day	Q9=	192,741.50	L/min	Q9=	42,397.15	gal/min																																																																																																																																										
L10= R10=	3005.73	m	Q10=	2,232,598.69	m ³ /day	Q10=	1,550,316.53	L/min	Q10=	341,021.58	gal/min																																																																																																																																										

Tables

Table 3.1

Monitoring Well Completion Details
Barrie Lakeshore Developments
51-75 Bradford Street, Barrie, Ontario
Proposed Residential Development
Hydrogeological Assessment

Well ID	Easting	Northing	Ground Elevation (m AMSL)	Top of Riser Elevation (m AMSL)	Total Depth Drilled (m BGS)	Screened Interval				Sandpack Interval				Screened Material
						(m BGS)		(m AMSL)		(m BGS)		(m AMSL)		
						Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	
MONITORING WELLS														
MW1-19	604170.25	4915323	220.06	221.16	16.61	12.22	13.74	207.84	206.32	11.89	14.02	208.17	206.04	Silt trace sand
MW2-19	604114.01	4915326	220.11	221.15	5.18	3.05	4.57	217.06	215.54	2.74	4.57	217.37	215.54	Silty Sand
MW3-19	604117.05	4915323	220.08	221.11	28.04	24.20	25.73	195.88	194.35	23.93	26.21	196.15	193.87	Silty Sand
MW4-19	604096.14	4915409	220.97	222.08	16.61	12.26	13.78	208.71	207.19	11.89	14.94	209.08	206.03	Sandy Silt
MW5-19	604147.55	4915479	222.09	223.22	15.85	10.67	12.19	211.42	209.90	10.36	12.50	211.73	209.59	Sandy Silt
MW6-19	604199.3	4915405	221.50	222.56	17.37	15.85	17.37	205.65	204.13	15.54	17.37	205.96	204.13	Silty Clay
MW 1-09D	604135.06	4915278	219.31	220.31	-	-	-	-	-	-	-	-	-	-
MW 1-09S	604138.21	4915279	219.28	220.23	-	-	-	-	-	-	-	-	-	-
MW 4-09	604162.96	4915345	220.46	221.20	-	-	-	-	-	-	-	-	-	-
MW 5-09	604198.26	4915389	221.58	222.46	-	-	-	-	-	-	-	-	-	-
MW 6-09	604142.63	4915330	219.94	220.61	-	-	-	-	-	-	-	-	-	-
BH105	-	-	222.30	-	38.50	2.70	4.70	219.60	217.60	2.20	4.70	220.10	217.60	Silty to Fine Sand
BH109	-	-	221.80	-	37.00	2.90	4.60	218.90	217.20	2.60	4.90	219.20	216.90	Silty to Fine Sand
BH111	-	-	222.60	-	37.20	3.60	5.10	219.00	217.50	3.10	5.55	219.50	217.05	Silty to Fine Sand
BH112	-	-	220.90	-	6.60	3.85	5.30	217.05	215.60	3.00	6.50	217.90	214.40	Silty to Fine Sand
BH113	-	-	220.70	-	6.60	4.10	5.60	216.60	215.10	3.50	6.60	217.20	214.10	Silty to Fine Sand
BH114	-	-	220.10	-	6.60	2.10	3.60	218.00	216.50	1.60	6.50	218.50	213.60	Silty to Fine Sand
BH116	604094.14	4915287	219.863	220.928	5.10	2.76	4.36	217.10	215.50	1.86	4.86	218.00	215.00	Fine to Medium Sand
BH117	-	-	220.60	-	5.10	2.60	4.10	218.00	216.50	2.10	5.10	218.50	215.50	Fine to Medium Sand/Fill
BH120	604125.61	4915306	219.987	221.085	5.10	1.89	3.19	218.10	216.80	1.19	4.79	218.80	215.20	Organic Matter/Fill
BH 201	604245.79	4915391	220.40	221.42	7.90	4.85	7.90	215.55	212.50	4.25	7.90	216.15	212.50	Sand, trace silt, trace gravel
BH 202	604191.63	4915414	221.48	222.57	7.90	3.00	6.05	218.48	215.43	2.50	6.05	218.98	215.43	Sand, trace silt, trace gravel
BH 203	604165.31	4915416	221.81	222.85	7.90	4.55	7.60	217.26	214.21	4.00	7.60	217.81	214.21	Sand, trace silt, trace gravel
BH 204	604150.16	4915475	222.06	223.08	7.90	4.55	7.60	217.51	214.46	4.00	7.60	218.06	214.46	Sand, trace silt, trace gravel
BH 205	604108.22	4915454	222.14	223.17	7.90	4.55	7.60	217.59	214.54	4.00	7.60	218.14	214.54	Sand, trace silt, trace gravel
BH 206	604092.77	4915410	220.98	221.98	7.90	4.55	7.60	216.43	213.38	4.00	7.60	216.98	213.38	Sand, trace silt, trace gravel
BH 207	604117.23	4915400	221.58	222.60	7.90	4.55	7.60	217.03	213.98	4.00	7.60	217.58	213.98	Sand, trace silt, trace gravel
BH 209	604182.96	4915335	219.97	220.89	11.00	7.60	10.60	212.37	209.37	7.00	11.00	212.97	208.97	Sand and Sandy Silt
BH 210	604216.66	4915367	220.95	221.99	9.80	6.10	9.15	214.85	211.80	5.50	9.80	215.45	211.15	Sand, trace silt, trace gravel
BH 301	604240.93	4915354	219.70	220.65	12.80	9.15	12.20	210.55	207.50	8.50	12.20	211.20	207.50	Sand, some silt
BH 303	604165.85	4915322	220.03	220.82	12.80	8.95	12.00	211.08	208.03	8.25	12.00	211.78	208.03	Sand, some silt
BH 304	604128.61	4915270	219.46	220.39	12.80	9.15	12.20	210.31	207.26	8.55	12.20	210.91	207.26	Sand and Silt
MW1	-	-	222.90	-	6.10	3.00	6.10	219.90	216.80	2.70	6.10	220.20	216.80	Sand/Sand Fill
PMMW1	604097.67	4915478	222.472	223.279	-	-	-	-	-	-	-	-	-	-
PMBH8/MW2	-	-	222.40	-	52.30	3.00	6.10	219.40	216.30	2.70	6.10	219.70	216.30	Silty Sand/Fill
PMBH1/MW3	604223.28	4915408	220.97	221.85	45.80	2.70	5.80	218.27	215.17	2.40	5.80	218.57	215.17	Silty Sand/Fill
EMW 3	604141.5	4915291	219.635	220.285	-	-	-	-	-	-	-	-	-	-
EMW 5	604136.6	4915320	219.876	220.747	-	-	-	-	-	-	-	-	-	-
EMW10	604116.69	4915368	220.189	220.902	-	-	-	-	-	-	-	-	-	-

Table 3.1
Monitoring Well Completion Details
Barrie Lakeshore Developments
51-75 Bradford Street, Barrie, Ontario
Proposed Residential Development
Hydrogeological Assessment

Well ID	Easting	Northing	Ground Elevation (m AMSL)	Top of Riser Elevation (m AMSL)	Total Depth Drilled (m BGS)	Screened Interval				Sandpack Interval				Screened Material
						(m BGS)		(m AMSL)		(m BGS)		(m AMSL)		
						Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	
<u>GEOTECHNICAL BOREHOLES</u>														
PMBH2	-	-	220.60	-	40.00	-	-	-	-	-	-	-	-	-
PMBH3	-	-	221.40	-	50.20	-	-	-	-	-	-	-	-	-
PMBH4	-	-	222.00	-	47.20	-	-	-	-	-	-	-	-	-
PMBH5	-	-	220.50	-	40.00	-	-	-	-	-	-	-	-	-
PMBH6	-	-	222.60	-	37.00	-	-	-	-	-	-	-	-	-
PMBH7	-	-	222.50	-	38.00	-	-	-	-	-	-	-	-	-
PMBH9	-	-	222.00	-	46.90	-	-	-	-	-	-	-	-	-
PMBH10	-	-	222.30	-	6.70	-	-	-	-	-	-	-	-	-
BH100	-	-	220.60	-	40.10	-	-	-	-	-	-	-	-	-
BH102	-	-	222.00	-	20.00	-	-	-	-	-	-	-	-	-
BH103	-	-	221.50	-	40.10	-	-	-	-	-	-	-	-	-
BH104	-	-	220.50	-	20.00	-	-	-	-	-	-	-	-	-
BH108	-	-	222.40	-	38.20	-	-	-	-	-	-	-	-	-
BH110	-	-	221.10	-	20.00	-	-	-	-	-	-	-	-	-
BH115	-	-	219.90	-	5.10	-	-	-	-	-	-	-	-	-
BH118	-	-	220.40	-	20.00	-	-	-	-	-	-	-	-	-
BH119	-	-	220.90	-	34.70	-	-	-	-	-	-	-	-	-
BH 209A	604192.32	4915354	220.377	221.418	-	-	-	-	-	-	-	-	-	-
BH 302	604200.36	4915409	221.549	222.444	-	-	-	-	-	-	-	-	-	-
<u>TEST PITS</u>														
Terraprobe Test Pit 1	-	-	-	-	2.50	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 2	-	-	-	-	2.00	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 3	-	-	-	-	2.70	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 4	-	-	-	-	3.00	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 5	-	-	-	-	3.10	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 6	-	-	-	-	3.20	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 7	-	-	-	-	2.10	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 8	-	-	-	-	2.80	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 9	-	-	-	-	3.40	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 10	-	-	-	-	2.30	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 11	-	-	-	-	3.00	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 12	-	-	-	-	2.50	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 13	-	-	-	-	2.80	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 14	-	-	-	-	3.50	-	-	-	-	-	-	-	-	-
Terraprobe Test Pit 15	-	-	-	-	1.40	-	-	-	-	-	-	-	-	-
Peto MacCallum Test Pit 1	-	-	-	-	0.90	-	-	-	-	-	-	-	-	-
Peto MacCallum Test Pit 2	-	-	-	-	0.60	-	-	-	-	-	-	-	-	-
Peto MacCallum Test Pit 3	-	-	-	-	1.20	-	-	-	-	-	-	-	-	-

Note:

Table 3.2

**Summary of Hydraulic Conductivity
Barrie Lakeshore Developments
51-75 Bradford Street, Barrie, Ontario
Proposed Residential Development
Hydrogeological Assessment**

Borehole ID	Geologic Unit (Screened):	Depth (mBGS)	Hydraulic Conductivity (m/s)		Hydraulic Conductivity (cm/s)		Method
			Falling	Rising	Falling	Rising	
Silty Sand							
MW2-19	Peat, and Silty Sand	5.2	4.24E-05 6.42E-05	7.05E-05 9.44E-05	4.24E-03 6.42E-03	7.05E-03 9.44E-03	Bouwer-Rice Hvorslev
MW5-19	Sandy Silt	15.9	1.39E-05 1.53E-05	1.39E-05 1.76E-05	1.4E-03 1.5E-03	1.39E-03 1.76E-03	Bouwer-Rice Hvorslev
MW6-19	Silty Clay	17.4	2.26E-05 2.46E-05	2.90E-05 3.18E-05	2.3E-03 2.46E-03	2.90E-03 3.18E-03	Bouwer-Rice Hvorslev
Geomean						2.98E-03	

Table 3.3a

**Groundwater Elevations (mAMSL)
Barrie Lakeshore Developments
51-75 Bradford Street, Barrie, Ontario
Proposed Residential Development
Hydrogeological Assessment**

	MW1-19	MW2-19	MW3-19	MW4-19	MW5-19	MW6-19
Top of Riser (mAMSL)	221.16	221.15	221.11	222.08	223.22	222.56
Ground Surface (mAMSL)	220.06	220.11	220.08	220.97	222.09	221.50
18-Sep-19	219.73	219.41	221.08	219.81	219.17	221.52
1-Nov-19	219.53	219.85	219.74	219.97	219.23	219.33

Notes:

- No data available
- mBGS metres below ground surface
- mAMSL metres above mean sea level

Table 3.3b

**Groundwater Levels (mBGS)
Barrie Lakeshore Developments
51-75 Bradford Street, Barrie, Ontario
Proposed Residential Development
Hydrogeological Assessment**

	MW1-19	MW2-19	MW3-19	MW4-19	MW5-19	MW6-19
Top of Riser (mAMSL)	221.16	221.15	221.11	222.08	223.22	222.56
Ground Surface (mAMSL)	220.06	220.11	220.08	220.97	222.09	221.50
18-Sep-19	0.36	0.71	-0.99	1.18	2.91	-0.01
1-Nov-19	0.56	0.27	0.36	1.02	2.85	2.18

Notes:

- No data available
- mBGS metres below ground surface
- mAMSL metres above mean sea level

Table 4.2

**Summary of Groundwater Analytical Results
Barrie Lakeshore Developments
51-75 Bradford Street, Barrie, Ontario
Proposed Residential Development
Hydrogeological Assessment**

Sample Location: Sample ID: Sample Date: BV Lab COA:	MW2-19 GW-11201680-112219-MM-MW2A-19		MW2-19 GW-11201680-112219-MM-MW2A-19		MW2-19 RW-11201680-112219-MM-MW2A-19	
	11/22/2019 B9X1273		11/22/2019 B9X1275		11/22/2019 B9X1272	
Parameters	Units	a City of Barrie Sanitary Sewer	b City of Barrie Storm Sewer			
Volatiles						
1,1,2,2-Tetrachloroethane	mg/L	0.06	-	ND(0.001)	-	-
1,2-Dichlorobenzene	mg/L	0.05	-	ND(0.001)	-	-
1,4-Dichlorobenzene	mg/L	0.08	-	ND(0.001)	-	-
Benzene	mg/L	0.01	-	ND(0.0004)	-	-
Ethylbenzene	mg/L	0.06	-	ND(0.0004)	-	-
m&p-Xylenes	mg/L	-	-	ND(0.0004)	-	-
Methylene chloride	mg/L	0.09	-	ND(0.004)	-	-
o-Xylene	mg/L	-	-	ND(0.0004)	-	-
Tetrachloroethene	mg/L	0.06	-	ND(0.0004)	-	-
Toluene	mg/L	0.02	-	ND(0.0004)	-	-
Trichloroethene	mg/L	0.05	-	ND(0.0004)	-	-
Xylenes (total)	mg/L	0.03	-	ND(0.0004)	-	-
PAH						
1-Methylnaphthalene	mg/L	-	-	ND(0.00005)	-	-
2-Methylnaphthalene	mg/L	-	-	ND(0.00005)	-	-
Acenaphthene	mg/L	-	-	ND(0.00005)	-	-
Acenaphthylene	mg/L	-	-	ND(0.00005)	-	-
Anthracene	mg/L	-	-	ND(0.00005)	-	-
Benzo(a)anthracene	mg/L	-	-	ND(0.00005)	-	-
Benzo(a)pyrene	mg/L	-	-	ND(0.00001)	-	-
Benzo(b)fluoranthene/Benzo(j)fluoranthene	mg/L	-	-	ND(0.00005)	-	-
Benzo(g,h,i)perylene	mg/L	-	-	ND(0.00005)	-	-
Benzo(k)fluoranthene	mg/L	-	-	ND(0.00005)	-	-
Chrysene	mg/L	-	-	ND(0.00005)	-	-
Dibenz(a,h)anthracene	mg/L	-	-	ND(0.00005)	-	-
Fluoranthene	mg/L	-	-	ND(0.00005)	-	-
Fluorene	mg/L	-	-	ND(0.00005)	-	-
Indeno(1,2,3-cd)pyrene	mg/L	-	-	ND(0.00005)	-	-
Naphthalene	mg/L	-	-	ND(0.00005)	-	-
Phenanthrene	mg/L	-	-	ND(0.00003)	-	-
Pyrene	mg/L	-	-	ND(0.00005)	-	-
Total PAH	mg/L	0.05	-	ND(0.0002)	-	-
Metals						
Aluminum	mg/L	50	-	0.161	-	0.12
Aluminum (dissolved)	mg/L	50	-	-	0.0029	-
Antimony	mg/L	5	-	0.000057	-	ND(0.0005)
Antimony (dissolved)	mg/L	5	-	-	0.000028	-
Arsenic	mg/L	1	-	0.00214	-	0.0025
Arsenic (dissolved)	mg/L	1	-	-	0.00237	-
Barium	mg/L	5	-	0.0241	-	0.028
Barium (dissolved)	mg/L	5	-	-	0.0283	-
Beryllium	mg/L	-	-	-	-	ND(0.0005)
Bismuth	mg/L	5	-	ND(0.00001)	-	-
Bismuth (dissolved)	mg/L	5	-	-	ND(0.000005)	-
Boron	mg/L	-	-	-	-	0.019
Cadmium	mg/L	0.7	0.001	ND(0.000005)	-	ND(0.0001)
Cadmium (dissolved)	mg/L	0.7	0.001	-	ND(0.000005)	-
Calcium (dissolved)	mg/L	-	-	-	-	120
Chromium	mg/L	2	0.08	0.00027	-	ND(0.005)
Chromium (dissolved)	mg/L	2	0.08	-	ND(0.0001)	-

Table 4.2

**Summary of Groundwater Analytical Results
Barrie Lakeshore Developments
51-75 Bradford Street, Barrie, Ontario
Proposed Residential Development
Hydrogeological Assessment**

Sample Location: Sample ID: Sample Date: BV Lab COA:	MW2-19 11/22/2019 B9X1273		MW2-19 11/22/2019 B9X1275		MW2-19 11/22/2019 B9X1272	
	Units	a City of Barrie	b City of Barrie			
Parameters						
Cobalt	mg/L	5	-	0.000188	-	ND(0.0005)
Cobalt (dissolved)	mg/L	5	-	-	0.000145	-
Copper	mg/L	2	0.01	0.00024	-	ND(0.001)
Copper (dissolved)	mg/L	2	0.01	-	0.000492	-
Gold	mg/L	5	-	ND(0.0001)	-	-
Gold (dissolved)	mg/L	5	-	-	ND(0.0001)	-
Iron	mg/L	50	-	0.372	-	0.47
Iron (dissolved)	mg/L	50	-	-	0.33	-
Lead	mg/L	0.7	0.05	0.000146	-	ND(0.0005)
Lead (dissolved)	mg/L	0.7	0.05	-	0.000025	-
Magnesium (dissolved)	mg/L	-	-	-	-	17
Manganese	mg/L	5	-	0.555	-	0.68
Manganese (dissolved)	mg/L	5	-	-	0.714	-
Mercury	mg/L	0.01	-	ND(0.0001)	-	-
Mercury (dissolved)	mg/L	0.01	-	-	ND(0.00001)	-
Molybdenum	mg/L	5	-	0.0012	-	0.0013
Molybdenum (dissolved)	mg/L	5	-	-	0.00147	-
Nickel	mg/L	2	0.05	0.00036	-	ND(0.001)
Nickel (dissolved)	mg/L	2	0.05	-	0.000306	-
Phosphorus	mg/L	10	-	0.0142	-	ND(0.1)
Phosphorus (dissolved)	mg/L	10	-	-	0.0092	-
Platinum	mg/L	5	-	ND(0.0001)	-	-
Platinum (dissolved)	mg/L	5	-	-	ND(0.0001)	-
Potassium (dissolved)	mg/L	-	-	-	-	1.4
Rhodium	mg/L	5	-	ND(0.0005)	-	-
Selenium	mg/L	1	-	ND(0.00004)	-	ND(0.002)
Selenium (dissolved)	mg/L	1	-	-	ND(0.00004)	-
Silver	mg/L	0.4	-	ND(0.00001)	-	ND(0.0001)
Silver (dissolved)	mg/L	0.4	-	-	ND(0.000005)	-
Sodium	mg/L	-	-	-	-	66
Sodium (dissolved)	mg/L	-	-	-	-	66
Thallium	mg/L	-	-	-	-	ND(0.00005)
Tin	mg/L	5	-	ND(0.0002)	-	-
Tin (dissolved)	mg/L	5	-	-	ND(0.0002)	-
Tungsten	mg/L	-	-	-	-	ND(0.001)
Uranium	mg/L	-	-	-	-	0.00093
Vanadium	mg/L	5	-	0.00049	-	ND(0.0005)
Vanadium (dissolved)	mg/L	5	-	-	ND(0.0002)	-
Zinc	mg/L	2	0.04	0.001	-	ND(0.005)
Zinc (dissolved)	mg/L	2	0.04	-	0.00161	-
Zirconium	mg/L	-	-	-	-	ND(0.001)
Pesticides						
Hexachlorobenzene	mg/L	0.0001	-	ND(0.000005)	-	-
Misc						
Oil and grease, animal	mg/L	150	-	1.3	-	-
Oil and grease, mineral/synthetic	mg/L	15	-	ND(0.50)	-	-
Oil and grease	mg/L	-	-	1.3	-	-
General Chemistry						
%difference/ion balance	%	-	-	-	-	1.91
Alkalinity, bicarbonate (calculated)	mg/L	-	-	-	-	240
Alkalinity, carbonate (calculated)	mg/L	-	-	-	-	1.5

Table 4.2

**Summary of Groundwater Analytical Results
Barrie Lakeshore Developments
51-75 Bradford Street, Barrie, Ontario
Proposed Residential Development
Hydrogeological Assessment**

Sample Location: Sample ID: Sample Date: BV Lab COA:	MW2-19 11/22/2019 B9X1273		MW2-19 11/22/2019 B9X1275		MW2-19 11/22/2019 B9X1272	
	a City of Barrie	b City of Barrie				
Parameters	Units					
Alkalinity, total (as CaCO3)	mg/L	-	-	-	-	240
Ammonia-N	mg/L	-	-	-	-	ND(0.050)
Biochemical oxygen demand (total BOD5)	mg/L	-	-	ND(2)	-	-
Chemical oxygen demand (COD)	mg/L	600	-	ND(4.0)	-	-
Chloride (dissolved)	mg/L	1500	-	150	-	160
Color	TCU	-	-	-	-	ND(2)
Cyanide (total)	mg/L	1.2	-	ND(0.0050)	-	-
Dissolved organic carbon (DOC) (dissolved)	mg/L	-	-	-	-	0.99
Fluoride	mg/L	10	-	ND(0.10)	-	ND(0.10)
Hardness	mg/L	-	-	-	-	370
Hydrogen sulfide (calculated)	mg/L	-	-	-	-	0.058
Nitrate (as N)	mg/L	-	-	-	-	ND(0.10)
Nitrite (as N)	mg/L	-	-	-	-	ND(0.010)
Nitrite/Nitrate	mg/L	-	-	-	-	ND(0.10)
Nitrogen, organic	mg/L	-	-	-	-	0.12
Orthophosphate	mg/L	-	-	-	-	ND(0.010)
pH, field	s.u.	-	6.0-9.5	-	-	6.9
pH, lab	s.u.	6.0-9.5	6.0-9.5	7.87	-	7.84
Phenolics (total)	mg/L	0.1	-	ND(0.0010)	-	-
Phosphorus	mg/L	10	-	-	-	0.012
Sulfate (dissolved)	mg/L	1500	-	30	-	30
Sulfide	mg/L	1	-	ND(0.020)	-	0.054
Temperature, field	Deg C	60	30	-	-	5.6
Total dissolved solids (TDS)	mg/L	-	-	-	-	625
Total kjeldahl nitrogen (TKN)	mg/L	100	-	ND(0.10)	-	0.12
Total suspended solids (TSS)	mg/L	350	15	17 ^b	-	6
Turbidity	NTU	-	-	-	-	3.2
Un-ionized ammonia	mg/L	-	-	-	-	ND(0.00061)

Footnotes:
 ND Not detected at the associated reporting limit.
 10 Exceedance of City of Barrie Sanitary and Storm Sewer Use By-Law (By-Law 2012-172)

Appendices

Appendix A

MECP Well Records

MECP Well Report

MECP Water Well Record - Formation Report



Well ID: **5700230**
 Concession (Lot): ()
 UTM Zone (Easting, Northing) [RC]: 17 (604216.4,4915751) [5]
 Depth to bedrock (m):
 Elevation (masl): 222.11798

County / Township: SIMCOE / BARRIE CITY
 Completion Date: 7/21/1937 12:00 AM
 Primary Use: Not Used
 Secondary Use: <null>
 Final Status: Test Hole

Layer Colour	Description	Top - Bottom Depth (m)	
	<i>FILL</i>	0	1.52
	<i>PEAT</i>	1.52	7.92
	<i>MEDIUM SAND GRAVEL</i>	7.92	12.8
	<i>MEDIUM SAND GRAVEL BOULDERS</i>	12.8	17.07
	<i>MEDIUM SAND GRAVEL CLAY</i>	17.07	22.86
	<i>CLAY GRAVEL</i>	22.86	25.91
	<i>FINE SAND</i>	25.91	29.26
	<i>MEDIUM SAND GRAVEL</i>	29.26	38.1
	<i>HARDPAN</i>	38.1	39.32
	<i>GRAVEL MEDIUM SAND</i>	39.32	45.11
	<i>CLAY MEDIUM SAND</i>	45.11	45.42

Well ID: **5700238**
 Concession (Lot): ()
 UTM Zone (Easting, Northing) [RC]: 17 (603693.4,4915629) [9]
 Depth to bedrock (m):
 Elevation (masl): 227.144958

County / Township: SIMCOE / BARRIE CITY
 Completion Date: 11/21/1953 12:00 AM
 Primary Use: Commerical
 Secondary Use: <null>
 Final Status: Water Supply

Layer Colour	Description	Top - Bottom Depth (m)	
	<i>MEDIUM SAND</i>	0	42.67
	<i>MEDIUM SAND GRAVEL</i>	42.67	45.72
	<i>GRAVEL</i>	45.72	51.82

Well ID: **5700290**
 Concession (Lot): ()
 UTM Zone (Easting, Northing) [RC]: 17 (604270.4,4915921) [5]
 Depth to bedrock (m):
 Elevation (masl): 225.702926

County / Township: SIMCOE / BARRIE CITY
 Completion Date: 12/20/1966 12:00 AM
 Primary Use: Cooling And A/C
 Secondary Use: <null>
 Final Status: Water Supply

Layer Colour	Description	Top	Bottom	Depth (m)
	<i>CLAY BOULDERS</i>	0	5.49	
	<i>BOULDERS CLAY</i>	5.49	7.92	
	<i>GRAVEL CLAY</i>	7.92	35.97	
	<i>COARSE SAND</i>	35.97	39.62	

Well ID: **5704773**
 Concession (Lot): CON 05(025)
 UTM Zone (Easting, Northing) [RC]: 17 (604255.4,4914885) [5]
 Depth to bedrock (m):
 Elevation (masl): 222.389572

County / Township: SIMCOE / BARRIE CITY (VESPra)
 Completion Date: 11/26/1964 12:00 AM
 Primary Use: Industrial
 Secondary Use: <null>
 Final Status: Water Supply

Layer Colour	Description	Top	Bottom	Depth (m)
	<i>FILL STONES</i>	0	2.74	
<i>GREY</i>	<i>SILT</i>	2.74	11.58	
<i>BLUE</i>	<i>CLAY MEDIUM SAND</i>	11.58	21.34	
<i>BROWN</i>	<i>MEDIUM SAND</i>	21.34	32.31	
<i>BLUE</i>	<i>CLAY</i>	32.31	41.15	
<i>BROWN</i>	<i>MEDIUM SAND</i>	41.15	44.81	
	<i>COARSE SAND GRAVEL</i>	44.81	46.33	
<i>BLUE</i>	<i>CLAY</i>	46.33	47.85	
	<i>MEDIUM SAND</i>	47.85	52.43	
	<i>FINE SAND</i>	52.43	68.58	
	<i>FINE SAND COARSE SAND</i>	68.58	78.64	
	<i>MEDIUM SAND</i>	78.64	83.82	
	<i>GRAVEL MEDIUM SAND</i>	83.82	85.95	

BLUE CLAY 85.95 87.17

Well ID: **5712847** County / Township: SIMCOE / BARRIE CITY
 Concession (Lot): () Completion Date: 8/28/1975 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604164.4,4915423) [5] Primary Use: Industrial
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): 221.829254 Final Status: Water Supply

Layer Colour	Description	Top - Bottom Depth (m)	
	FILL	0	1.22
	SAND GRAVEL	1.22	16.46
	CLAY SAND LAYERED	16.46	40.23
	FINE SAND	40.23	42.98
	CLAY	42.98	44.5
	CLAY	44.5	51.21
	MEDIUM SAND COARSE SAND	51.21	56.39

Well ID: **5717577** County / Township: SIMCOE / BARRIE CITY
 Concession (Lot): () Completion Date: 7/1/1981 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604364.4,4915223) [5] Primary Use: Not Used
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): 220.032745 Final Status: Test Hole

Layer Colour	Description	Top - Bottom Depth (m)	
	FILL	0	4.27
	SAND GRAVEL SILT	4.27	12.8
	SAND CLAY GRAVEL	12.8	21.34
	CLAY GRAVEL SANDY	21.34	22.86
GREY	CLAY SILTY	22.86	26.52
	CLAY GRAVEL HARD	26.52	30.18
	CLAY FINE GRAVEL SANDY	30.18	38.4
	CLAY SAND LAYERED	38.4	43.28
	MEDIUM SAND	43.28	45.11

SAND GRAVEL CLAY	45.11	45.72
SAND GRAVEL	45.72	46.63
CLAY	46.63	47.85
SAND GRAVEL CLAY	47.85	53.64
COARSE SAND CLAY SILTY	53.64	56.08
SAND GRAVEL	56.08	60.35
SAND GRAVEL SILT	60.35	67.06
SAND SILTY	67.06	69.49

Well ID: **5717579**

Concession (Lot): ()

UTM Zone (Easting, Northing) [RC]: 17 (604414.4,4915173) [5]

Depth to bedrock (m):

Elevation (masl): 219.690826

County / Township: SIMCOE / BARRIE CITY

Completion Date: 4/29/1981 12:00 AM

Primary Use: Not Used

Secondary Use: <null>

Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
		FILL	0	4.88
GREY		CLAY GRAVEL SILTY	4.88	8.53
		GRAVEL SILT FINE SAND	8.53	11.58
		CLAY SAND SILTY	11.58	21.64
GREY		CLAY FINE GRAVEL SILTY	21.64	25.91
		GRAVEL CLAY SAND	25.91	31.7
GREY		CLAY FINE GRAVEL SILTY	31.7	44.81
		GRAVEL SAND BOULDERS	44.81	47.24
		SAND	47.24	47.85
		SAND GRAVEL BOULDERS	47.85	53.34
		FINE SAND SILTY	53.34	55.47
		SAND GRAVEL BOULDERS	55.47	67.67
		SAND CLAY LAYERED	67.67	74.07

<i>GREY</i>	<i>CLAY SILTY</i>	74.07	83.52
	<i>SAND FINE GRAVEL BOULDERS</i>	83.52	85.95
	<i>SAND GRAVEL BOULDERS</i>	85.95	89.92

Well ID: **5717580**

Concession (Lot): ()

UTM Zone (Easting, Northing) [RC]: 17 (604414.4,4915023) [5]

Depth to bedrock (m): 290

Elevation (masl): 219.340179

County / Township: SIMCOE / BARRIE CITY

Completion Date: 5/8/1981 12:00 AM

Primary Use: Not Used

Secondary Use: <null>

Final Status: Observation Wells

Layer Colour	Description	Top - Bottom Depth (m)	
	<i>FILL</i>	0	3.35
	<i>SAND FINE GRAVEL</i>	3.35	4.57
	<i>SAND SILT WOOD FRAGMENTS</i>	4.57	9.75
<i>GREY</i>	<i>CLAY SILTY</i>	9.75	16.76
<i>GREY</i>	<i>CLAY SANDY</i>	16.76	20.12
	<i>FINE SAND</i>	20.12	20.42
<i>GREY</i>	<i>CLAY SANDY HARD</i>	20.42	33.53
<i>GREY</i>	<i>CLAY FINE SAND SILT</i>	33.53	38.4
<i>GREY</i>	<i>CLAY SILTY SOFT</i>	38.4	42.06
	<i>SAND GRAVEL CLAY</i>	42.06	43.28
	<i>FINE GRAVEL SAND SILT</i>	43.28	44.2
	<i>CLAY SILTY</i>	44.2	46.94
	<i>MEDIUM SAND COARSE GRAVEL</i>	46.94	55.17
	<i>FINE SAND</i>	55.17	73.15
	<i>MEDIUM SAND</i>	73.15	78.64
	<i>MEDIUM SAND</i>	78.64	79.25
	<i>FINE SAND CLAY SILTY</i>	79.25	85.04

GRAVEL SAND CLAY	85.04	86.87
GRAVEL CLAY MARL	86.87	87.48
GRAVEL CLAY	87.48	88.39
FINE SAND GRAVEL MARL	88.39	92.05

Well ID: **5719338**

Concession (Lot): ()

UTM Zone (Easting, Northing) [RC]: 17 (604464.4,4915774) [5]

Depth to bedrock (m):

Elevation (masl): 218.994506

County / Township: SIMCOE / BARRIE CITY

Completion Date: 8/9/1983 12:00 AM

Primary Use: Not Used

Secondary Use: <null>

Final Status: Observation Wells

Layer Colour	Description	Top - Bottom Depth (m)	
	TILL	0	5.79
	CLAY GRAVEL WOOD FRAGMENTS	5.79	13.41
	CLAY GRAVEL	13.41	26.21
	SAND GRAVEL	26.21	38.1
	SAND GRAVEL BOULDERS	38.1	44.81
	CLAY STICKY	44.81	56.39
	CLAY GRAVEL	56.39	71.32
	SAND GRAVEL BOULDERS	71.32	75.9
	CLAY BOULDERS SILTY	75.9	91.44

Well ID: **5736742**

Concession (Lot): (024)

UTM Zone (Easting, Northing) [RC]: 17 (604384,4915176) [3]

Depth to bedrock (m): 246

Elevation (masl): 220.759979

County / Township: SIMCOE / BARRIE CITY

Completion Date: 3/26/2002 12:00 AM

Primary Use: Not Used

Secondary Use: <null>

Final Status: Abandoned-Other

Layer Colour	Description	Top - Bottom Depth (m)	
	FILL	0	3.66
	SAND SILT	3.66	20.12
	CLAY SILTY	20.12	48.77
	GRAVEL SAND MARL	48.77	52.12

	<i>SAND GRAVEL BOULDERS</i>	52.12	58.52
	<i>SAND GRAVEL MARL</i>	58.52	64.01
	<i>GRAVEL SAND BOULDERS</i>	64.01	74.98
	<i>GRAVEL SAND MARL</i>	74.98	76.5
<i>GREY</i>	<i>CLAY</i>	76.5	77.72
	<i>GRAVEL SAND</i>	77.72	79.55

Well ID: **5740454** County / Township: SIMCOE / BARRIE CITY (VESPra)
 Concession (Lot): () Completion Date: 11/16/2005 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604083,4915595) [3] Primary Use: Not Used
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): 222.90184 Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
	<i>BROWN</i>	<i>GRAVEL SAND TOPSOIL</i>	0	2.13
	<i>BROWN</i>	<i>FINE SAND</i>	2.13	3.05
	<i>BROWN</i>	<i>FINE SAND GRAVEL</i>	3.05	7.6
	<i>BROWN</i>	<i>SAND GRAVEL</i>	7.6	10.6
	<i>BROWN</i>	<i>FINE SAND CLAY</i>	10.6	12.2

Well ID: **5740457** County / Township: SIMCOE / BARRIE CITY (VESPra)
 Concession (Lot): () Completion Date: 11/16/2005 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604045,4915618) [3] Primary Use: Not Used
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): 223.416625 Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
	<i>BROWN</i>	<i>FINE SAND GRAVEL</i>	0	1.5
	<i>BLACK</i>	<i>TOPSOIL</i>	1.5	1.83
	<i>BROWN</i>	<i>FINE SAND WOOD FRAGMENTS</i>	1.83	3.05
	<i>BROWN</i>	<i>FINE SAND CLAY</i>	3.05	8.54
	<i>BROWN</i>	<i>FINE SAND</i>	8.54	11.59

Well ID: **7048372**
 Concession (Lot): ()
 UTM Zone (Easting, Northing) [RC]: 17 (604338,4915739) [3]
 Depth to bedrock (m):
 Elevation (masl): 221.561737

County / Township: SIMCOE / BARRIE CITY
 Completion Date: 7/12/2007 12:00 AM
 Primary Use: <null>
 Secondary Use: <null>
 Final Status: Observation Wells

Layer Colour	Description	Top - Bottom Depth (m)	
	<i>FILL</i>	0	3
<i>BROWN</i>	<i>SAND SILT WATER-BEARING</i>	3	5.4

Well ID: **7108757**
 Concession (Lot): ()
 UTM Zone (Easting, Northing) [RC]: 17 (604281,4915720) [3]
 Depth to bedrock (m):
 Elevation (masl): 221.308746

County / Township: SIMCOE / BARRIE CITY
 Completion Date: 7/18/2008 12:00 AM
 Primary Use: Monitoring
 Secondary Use: <null>
 Final Status: Abandoned-Other

Layer Colour	Description	Top - Bottom Depth (m)	
<i>BROWN</i>	<i>TOPSOIL SAND</i>	0	0.6
<i>BROWN</i>	<i>FILL SAND</i>	0.6	5.5
<i>BROWN</i>	<i>SILT SAND</i>	5.5	6.7
<i>BROWN</i>	<i>TOPSOIL SAND</i>	0	0.6
<i>BROWN</i>	<i>FILL SAND</i>	0.6	5.5
<i>BROWN</i>	<i>SILT SAND</i>	5.5	6.7
<i>BROWN</i>	<i>TOPSOIL SAND</i>	0	0.6
<i>BROWN</i>	<i>FILL SAND</i>	0.6	5.5
<i>BROWN</i>	<i>SILT SAND</i>	5.5	6.7
<i>BROWN</i>	<i>TOPSOIL SAND</i>	0	0.6
<i>BROWN</i>	<i>FILL SAND</i>	0.6	5.5
<i>BROWN</i>	<i>SILT SAND</i>	5.5	6.7
<i>BROWN</i>	<i>TOPSOIL SAND</i>	0	0.6
<i>BROWN</i>	<i>FILL SAND</i>	0.6	5.5
<i>BROWN</i>	<i>SILT SAND</i>	5.5	6.7

<i>BROWN</i>	<i>TOPSOIL SAND</i>	0	0.6
<i>BROWN</i>	<i>FILL SAND</i>	0.6	5.5
<i>BROWN</i>	<i>SILT SAND</i>	5.5	6.7
<i>BROWN</i>	<i>TOPSOIL SAND</i>	0	0.6
<i>BROWN</i>	<i>FILL SAND</i>	0.6	5.5
<i>BROWN</i>	<i>SILT SAND</i>	5.5	6.7

Well ID: 7110081		County / Township: SIMCOE / BARRIE CITY	
Concession (Lot): ()		Completion Date: 5/12/2008 12:00 AM	
UTM Zone (Easting, Northing) [RC]: 17 (604460,4915886) [3]		Primary Use: Monitoring	
Depth to bedrock (m):		Secondary Use: <null>	
Elevation (masl): 223.006088		Final Status: Observation Wells	
Layer Colour	Description	Top - Bottom Depth (m)	
<i>BROWN</i>	<i>SAND GRAVEL</i>	0	3.81
<i>BROWN</i>	<i>SAND SILT WATER-BEARING</i>	3.81	5.33

Well ID: 7117031		County / Township: SIMCOE / BARRIE CITY	
Concession (Lot): ()		Completion Date: 8/14/2008 12:00 AM	
UTM Zone (Easting, Northing) [RC]: 17 (604251,4915534) [3]		Primary Use: Monitoring	
Depth to bedrock (m):		Secondary Use: <null>	
Elevation (masl): 220.455184		Final Status: Test Hole	
Layer Colour	Description	Top - Bottom Depth (m)	
<i>BROWN</i>	<i>TOPSOIL SAND</i>	0	0.15
<i>BROWN</i>	<i>FILL SAND GRAVEL</i>	0.15	2.2
<i>BROWN</i>	<i>PEAT SOFT</i>	2.2	4.9

Well ID: 7118162		County / Township: SIMCOE / BARRIE CITY	
Concession (Lot): ()		Completion Date: 11/14/2008 12:00 AM	
UTM Zone (Easting, Northing) [RC]: 17 (604278,4915927) [4]		Primary Use: Other	
Depth to bedrock (m):		Secondary Use: <null>	
Elevation (masl): 225.78862		Final Status: Observation Wells	
Layer Colour	Description	Top - Bottom Depth (m)	
<i>BROWN</i>	<i>SAND CLAY HARD</i>	0	7.62

Well ID: 7122331	County / Township: SIMCOE / BARRIE CITY
Concession (Lot): ()	Completion Date: 4/4/2009 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604389,4914899) [4]	Primary Use: Dewatering
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): 220.669311	Final Status: Dewatering

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>FILL</i>	0	2	
<i>BROWN</i>	<i>SAND SILT</i>	2	7	

Well ID: 7128381	County / Township: SIMCOE / BARRIE CITY
Concession (Lot): ()	Completion Date: 12/12/2007 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604336,4915902) [4]	Primary Use: Other
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): 224.996337	Final Status: <null>

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>FILL PACKED</i>	0	3	
<i>BROWN</i>	<i>SAND DENSE</i>	3	8	

Well ID: 7132876	County / Township: SIMCOE / VESPRA TOWNSHIP
Concession (Lot): CON 05(024)	Completion Date: 9/24/2009 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604110,4915323) [4]	Primary Use: <null>
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): 222.421783	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>SAND GRAVEL LOOSE</i>	0	6.1	
<i>BROWN</i>	<i>PEAT LOOSE</i>	6.1	8.53	
<i>GREY</i>	<i>SAND SILT DENSE</i>	8.53	9.14	

Well ID: 7153852	County / Township: SIMCOE / BARRIE CITY (VESPRA)
Concession (Lot): ()	Completion Date: 10/30/2010 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604160,4914895) [3]	Primary Use: <null>
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): 224.051223	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BLACK</i>	<i>TOPSOIL</i>	0	0.3	
<i>BROWN</i>	<i>FINE SAND LOOSE</i>	0.3	14.63	
<i>GREY</i>	<i>CLAY HARD</i>	14.63	33.83	
<i>GREY</i>	<i>CLAY SILT LAYERED</i>	33.83	42.06	

<i>BROWN</i>	<i>SAND SILT GRAVEL</i>	42.06	45.72
<i>GREY</i>	<i>FINE SAND SILT CEMENTED</i>	45.72	66.45
<i>BROWN</i>	<i>FINE SAND LOOSE</i>	66.45	83.82
<i>GREY</i>	<i>CLAY HARD</i>	83.82	85.34

Well ID: **7153854** County / Township: SIMCOE / BARRIE CITY (VESPRA)
 Concession (Lot): () Completion Date: 10/31/2010 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604155,4914896) [3] Primary Use: <null>
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): 224.141601 Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
	<i>BLACK</i>	<i>TOPSOIL</i>	0	0.3
	<i>BROWN</i>	<i>FINE SAND LOOSE</i>	0.3	14.63
	<i>GREY</i>	<i>CLAY</i>	14.63	33.83
	<i>GREY</i>	<i>CLAY SILT LAYERED</i>	33.83	42.06
	<i>BROWN</i>	<i>SAND SILT GRAVEL</i>	42.06	45.72
	<i>GREY</i>	<i>FINE SAND SILT CEMENTED</i>	45.72	54.86

Well ID: **7153855** County / Township: SIMCOE / BARRIE CITY (VESPRA)
 Concession (Lot): () Completion Date: 10/27/2010 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (603863,4915089) [3] Primary Use: <null>
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): 225.239547 Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
	<i>BROWN</i>	<i>FINE SAND LOOSE</i>	0	19.2
	<i>GREY</i>	<i>CLAY SILT HARD</i>	19.2	22.25
	<i>GREY</i>	<i>CLAY SILT SOFT</i>	22.25	27.43
	<i>GREY</i>	<i>CLAY HARD</i>	27.43	30.78
	<i>GREY</i>	<i>CLAY GRAVEL HARD</i>	30.78	36.27
	<i>GREY</i>	<i>CLAY HARD</i>	36.27	39.93
	<i>BROWN</i>	<i>SAND SILT LOOSE</i>	39.93	48.77

BROWN GRAVEL SAND LOOSE

48.77

57.91

Well ID: **7153856**

County / Township: SIMCOE / BARRIE CITY (VESPRA)

Concession (Lot): ()

Completion Date: 10/24/2008 12:00 AM

UTM Zone (Easting, Northing) [RC]: 17 (603867,4915092) [3]

Primary Use: <null>

Depth to bedrock (m):

Secondary Use: <null>

Elevation (masl): 225.219802

Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
	<i>BROWN</i>	<i>FINE SAND LOOSE</i>	0	19.2
	<i>GREY</i>	<i>CLAY SILT HARD</i>	19.2	22.25
	<i>GREY</i>	<i>CLAY SILT SOFT</i>	22.25	27.43
	<i>GREY</i>	<i>CLAY HARD</i>	27.43	30.78
	<i>GREY</i>	<i>CLAY GRAVEL HARD</i>	30.78	36.27
	<i>GREY</i>	<i>CLAY HARD</i>	36.27	39.93
	<i>BROWN</i>	<i>SAND SILT LOOSE</i>	39.93	48.77
	<i>BROWN</i>	<i>GRAVEL SAND LOOSE</i>	48.77	76.2
	<i>BROWN</i>	<i>FINE SAND LOOSE</i>	76.2	95.1

Well ID: **7166918**

County / Township: SIMCOE / BARRIE CITY (VESPRA)

Concession (Lot): ()

Completion Date: 6/2/2011 12:00 AM

UTM Zone (Easting, Northing) [RC]: 17 (604403,4915858) [3]

Primary Use: Test Hole

Depth to bedrock (m):

Secondary Use: <null>

Elevation (masl): <null>

Final Status: Test Hole

Layer	Colour	Description	Top - Bottom Depth (m)	
	<i>BROWN</i>	<i>FILL</i>	0	1.52
	<i>BROWN</i>	<i>SAND WATER-BEARING</i>	1.52	6.1

Well ID: **7174709**

County / Township: SIMCOE / BARRIE CITY (VESPRA)

Concession (Lot): ()

Completion Date: 11/4/2011 12:00 AM

UTM Zone (Easting, Northing) [RC]: 17 (604168,4914893) [4]

Primary Use: <null>

Depth to bedrock (m):

Secondary Use: <null>

Elevation (masl): <null>

Final Status: Abandoned-Other

Layer	Colour	Description	Top - Bottom Depth (m)	
			0	<null>

Well ID: 7179174	County / Township: SIMCOE / BARRIE CITY (VESPra)
Concession (Lot): ()	Completion Date: 3/14/2012 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (603997,4915581) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>SAND GRAVEL</i>	0	4.57	
<i>BROWN</i>	<i>SAND GRAVEL WATER-BEARING</i>	4.57	7.62	

Well ID: 7179175	County / Township: SIMCOE / BARRIE CITY (VESPra)
Concession (Lot): ()	Completion Date: 3/15/2012 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (603961,4915443) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BLACK</i>		0	0.76	
<i>BROWN</i>		0.76	0.15	
<i>BROWN</i>	<i>SAND WATER-BEARING</i>	0.15	6.1	

Well ID: 7179204	County / Township: SIMCOE / BARRIE CITY (VESPra)
Concession (Lot): CON 05(024)	Completion Date: 1/3/2012 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604099,4915351) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>SAND GRAVEL</i>	0	6.86	

Well ID: 7180074	County / Township: SIMCOE / BARRIE CITY (VESPra)
Concession (Lot): ()	Completion Date: 2/2/2012 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (603821,4915192) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>TOPSOIL SAND SOFT</i>	0	0.3	
<i>BROWN</i>	<i>SAND GRAVEL SOFT</i>	0.3	1.52	
<i>BLACK</i>	<i>SAND SILT SOFT</i>	1.52	5.18	

Well ID: **7180077** County / Township: SIMCOE / BARRIE CITY (VESPRA)
 Concession (Lot): () Completion Date: 1/11/2012 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (603778,4915239) [3] Primary Use: Monitoring
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): <null> Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
BROWN	TOPSOIL SOFT	0	0.61	
BROWN	SAND SOFT	0.61	1.22	
BLACK	SAND SILT SOFT	1.22	3.96	

Well ID: **7180078** County / Township: SIMCOE / BARRIE CITY (VESPRA)
 Concession (Lot): () Completion Date: 1/26/2012 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (603906,4915157) [4] Primary Use: Monitoring
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): <null> Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
BROWN	SAND GRAVEL SOFT	0	0.3	
BLACK	SAND GRAVEL SOFT	0.3	5.33	

Well ID: **7183973** County / Township: SIMCOE / BARRIE CITY (VESPRA)
 Concession (Lot): () Completion Date: 6/5/2012 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (603606,4915311) [4] Primary Use: Monitoring
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): <null> Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
BROWN	TOPSOIL CLAY LOOSE	0	3	
GREY	SILT CLAY LOOSE	3	4.5	

Well ID: **7203227** County / Township: SIMCOE / BARRIE CITY (VESPRA)
 Concession (Lot): () Completion Date: 5/8/2013 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (603707,4915159) [5] Primary Use: Other
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): <null> Final Status: Other Status

Layer Colour	Description	Top	Bottom	Depth (m)
BROWN	SAND SILT GRAVEL	0	2.2	
BROWN	SAND SILT WATER-BEARING	2.2	9.7	

Well ID: 7209087	County / Township: SIMCOE / BARRIE CITY (VESPRA)
Concession (Lot): ()	Completion Date: 7/26/2013 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604007,4914882) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>SAND SILT LOOSE</i>	0	3.51	

Well ID: 7209097	County / Township: SIMCOE / BARRIE CITY (VESPRA)
Concession (Lot): ()	Completion Date: 7/26/2013 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (603968,4915162) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>SAND SILT DRY</i>	0	1.83	
<i>BROWN</i>	<i>SAND WATER-BEARING LOOSE</i>	1.83	3.96	

Well ID: 7209098	County / Township: SIMCOE / BARRIE CITY (VESPRA)
Concession (Lot): ()	Completion Date: 7/25/2013 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (603762,4915057) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BROWN</i>	<i>SAND SILT DRY</i>	0	2.13	
<i>BROWN</i>	<i>SAND SILT WATER-BEARING</i>	2.13	3.96	

Well ID: 7209558	County / Township: SIMCOE / BARRIE CITY (VESPRA)
Concession (Lot): ()	Completion Date: 9/5/2013 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604301,4915834) [4]	Primary Use: Monitoring and Test Hole
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Monitoring and Test Hole

Layer Colour	Description	Top	Bottom	Depth (m)
<i>BLACK</i>		0	0.91	
<i>BROWN</i>	<i>FILL</i>	0.91	0.61	
<i>BROWN</i>	<i>SAND</i>	0.61	5.18	
<i>GREY</i>	<i>SILT SAND</i>	5.18	7.62	

Well ID: **7231048** County / Township: SIMCOE / BARRIE CITY (VESPra)
 Concession (Lot): () Completion Date: 8/11/2014 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604214,4915661) [4] Primary Use: Monitoring
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): <null> Final Status: Observation Wells

Layer	Colour	Description	Top	Bottom	Depth (m)
	<i>BROWN</i>	<i>TOPSOIL</i>	0		0.3
	<i>BROWN</i>	<i>SAND</i>	0.3		4.27

Well ID: **7231049** County / Township: SIMCOE / BARRIE CITY (VESPra)
 Concession (Lot): () Completion Date: 8/12/2014 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604195,4915648) [4] Primary Use: Monitoring
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): <null> Final Status: Observation Wells

Layer	Colour	Description	Top	Bottom	Depth (m)
	<i>BROWN</i>	<i>TOPSOIL</i>	0		0.3
	<i>BROWN</i>	<i>SAND</i>	0.3		3.05
	<i>BROWN</i>	<i>PEAT STONES</i>	3.05		4.57

Well ID: **7231050** County / Township: SIMCOE / BARRIE CITY (VESPra)
 Concession (Lot): () Completion Date: 8/11/2014 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604187,4915642) [4] Primary Use: Monitoring
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): <null> Final Status: Observation Wells

Layer	Colour	Description	Top	Bottom	Depth (m)
	<i>BROWN</i>	<i>TOPSOIL</i>	0		0.3
	<i>BROWN</i>	<i>SAND</i>	0.3		4.27
	<i>BROWN</i>	<i>PEAT</i>	4.27		4.57

Well ID: **7231051** County / Township: SIMCOE / BARRIE CITY (VESPra)
 Concession (Lot): () Completion Date: 8/11/2014 12:00 AM
 UTM Zone (Easting, Northing) [RC]: 17 (604180,4915642) [4] Primary Use: Monitoring
 Depth to bedrock (m): Secondary Use: <null>
 Elevation (masl): <null> Final Status: Observation Wells

Layer	Colour	Description	Top	Bottom	Depth (m)
	<i>BROWN</i>	<i>TOPSOIL</i>	0		0.61
	<i>BROWN</i>	<i>SAND GRAVEL</i>	0.61		2.44
	<i>GREY</i>	<i>SAND</i>	2.44		4.57

Well ID: 7252696	County / Township: SIMCOE / BARRIE CITY (VESPRA)
Concession (Lot): ()	Completion Date: 11/2/2015 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604022,4915162) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
	<i>BROWN</i>	<i>SAND GRAVEL LOOSE</i>	0	1.22
	<i>GREY</i>	<i>SAND SILT LOOSE</i>	1.22	4.57

Well ID: 7262776	County / Township: SIMCOE / BARRIE CITY (VESPRA)
Concession (Lot): ()	Completion Date: 3/11/2016 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (603789,4915889) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Abandoned-Other

Layer	Colour	Description	Top - Bottom Depth (m)	
			0	<null>

Well ID: 7264472	County / Township: SIMCOE / BARRIE CITY (VESPRA)
Concession (Lot): ()	Completion Date: 3/11/2016 12:00 AM
UTM Zone (Easting, Northing) [RC]: 17 (604138,4915636) [4]	Primary Use: Monitoring
Depth to bedrock (m):	Secondary Use: <null>
Elevation (masl): <null>	Final Status: Observation Wells

Layer	Colour	Description	Top - Bottom Depth (m)	
	<i>GREY</i>	<i>SAND GRAVEL LOOSE</i>	0	3.05
	<i>BROWN</i>	<i>WOOD FRAGMENTS LOOSE</i>	3.05	4.57

Individual Well Records



57 No

298

UTM 17Z P6042516E

SR 4911516917 The Ontario Water Resources Commission Act

Elev. SR 017310 WATER WELL RECORD

Basin W. Simcoe Township, Village, Town or City Barrie

Con. Lot Date completed 20 Dec 6
(day month year)

Owner Bell Telephone Co Address 21 Dunlop ST Barrie
(print in block letters)

Casing and Screen Record

Pumping Test

Inside diameter of casing 6"
Total length of casing 130
Type of screen Stainless Steel
Length of screen 3 ft
Depth to top of screen 127
Diameter of finished hole 6"

Static level 28
Test-pumping rate 10 G.P.M.
Pumping level 45
Duration of test pumping 4 hr
Water clear or cloudy at end of test
Recommended pumping rate 10 G.P.M.
with pump setting of 100 feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
<u>clay & boulders</u>	<u>0</u>	<u>18</u>	<u>130</u>	
<u>boulders & clay</u>	<u>18</u>	<u>26</u>		
<u>dirty gravel & clay</u>	<u>26</u>	<u>118</u>		
<u>coarse sand</u>	<u>118</u>	<u>130</u>		

For what purpose(s) is the water to be used? Cooling office

Is well on upland, in valley, or on hillside?
Drilling or Boring Firm Douglas & Sanghera Drilling Co Ltd

Address Newmarket

Licence Number 2085

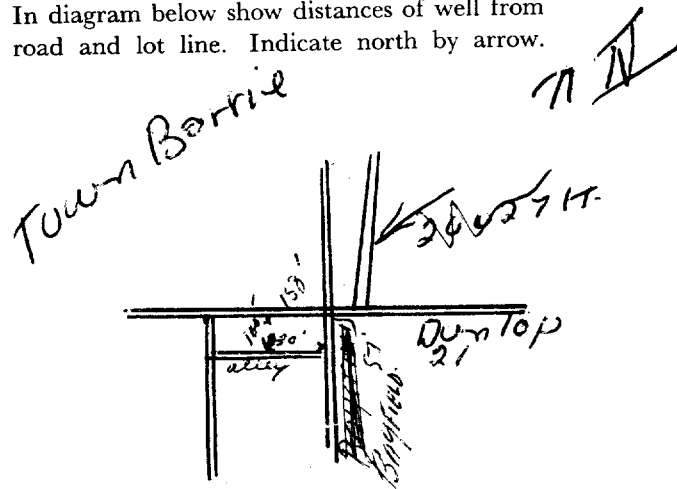
Name of Driller or Borer D. Baranishki

Address Newmarket

Date Dec 28
D. S. Sanghera
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



UTM 17 604241 E
 49 14662 N
 20 722



WATER RESOURCES COMMISSION
 DIVISION 4773
 JAN 12 1965
 ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 122 115
 County or District Simcoe Township, Village, Town of City (VESPRE)
 Con. 5 Lot 25 Date completed 26 Nov. 1964
 (day month year)
 Address P.O. Box 180 Barrie, Ont.

Casing and Screen Record
 Inside diameter of casing 3" with 7" ID liner top 173'
 Total length of casing 260'
 Type of screen Stainless Steel wirewound 50-6"
 Length of screen 21' 7" with 10' of 6" pipe on top
 Depth to top of screen 250'
 Diameter of finished hole 6 5/8" ID 7" OD

Pumping Test
 Static level flowing 6' Above G.L.
 Test-pumping rate 155 G.P.M.
 Pumping level 208'
 Duration of test pumping SIXTY 26 hrs
 Water clear or cloudy at end of test clear
 Recommended pumping rate 165 G.P.M.
 with pump setting of 245' feet below ground surface

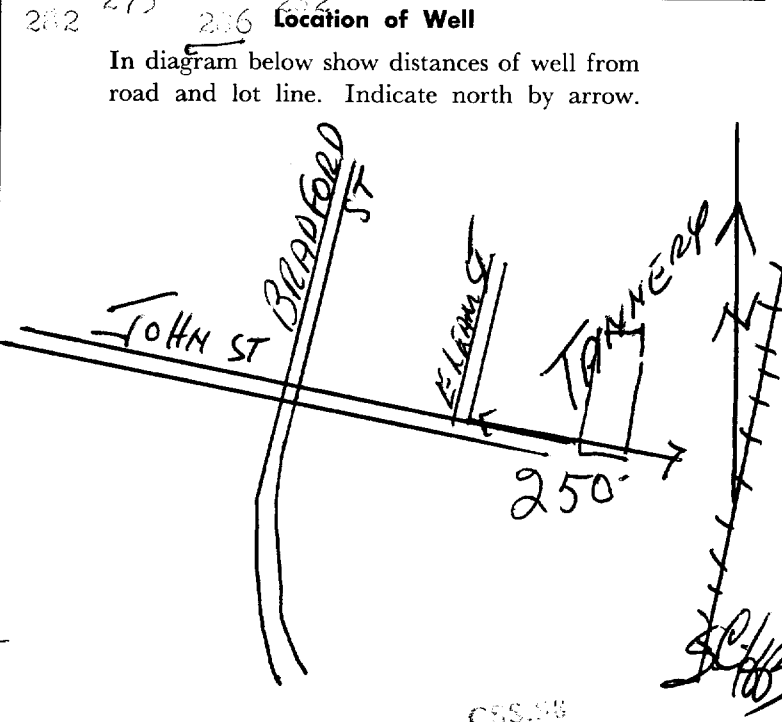
Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Fill, stones and loss	0	9		
Grey silt	9	38		
Blue sandy soft clay	38	70		
Brown dirty sand	70	106		
Blue clay	106	135		
Brown sand	135	152		
Coarse sand and gravel-dirty	152	157	135	fresh
Blue clay	157	172	157	fresh
Sand	172	225		
Fine sand	225	250		
Fine sand with streaks of coarse sand	250	275		
Medium sand (1' to 2' thick)	275	282		
Gravel and sand	282	275		

Water Record

Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
135	fresh
157	fresh

For what purpose(s) is the water to be used? Blue clay
 Industrial
 Is well on upland, in valley, or on hillside? Valley
 Drilling or Boring Firm Rutledge Water Wells Ltd.
 Address Nobleton, Ont.
 Licence Number 1464
 Name of Driller or Borer R. Kimberley
 Address Neswick
 Date December 10, 1964.
 (Signature of Licensed Drilling or Boring Contractor)





WATER WELL RECORD

3105E

1. PRINT ONLY IN SPACES PROVIDED

2. CHECK CORRECT BOX WHERE APPLICABLE

11 15712847 57501

COUNTY OR DISTRICT: **Sincoe**
 TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **City of Barrie**
 OWNER (SURNAME FIRST): **Barrie Tanning Ltd.**
 ADDRESS: **55 Bradford St., Barrie, Ont.**
 DATE COMPLETED: DAY **28** MO. **08** YR. **75**

ZONE: **17** EASTING: **604150** NORTHING: **4915200** RC: **5** ELEVATION: **0.725** RC: **5** BASIN CODE: **22**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	fill			0	4
	sand & gravel			4	54
	clay w/ sand layers			54	132
	sand		fine	132	141
	clay			141	146
	sand		fine	146	168
	sand		med. & coarse	168	185

31 0004 01 0054 2811 0132 052874 0141 08 0146 05 0168 08

32 0185 0910

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0185	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
08	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	.188	0	0170

SCREEN

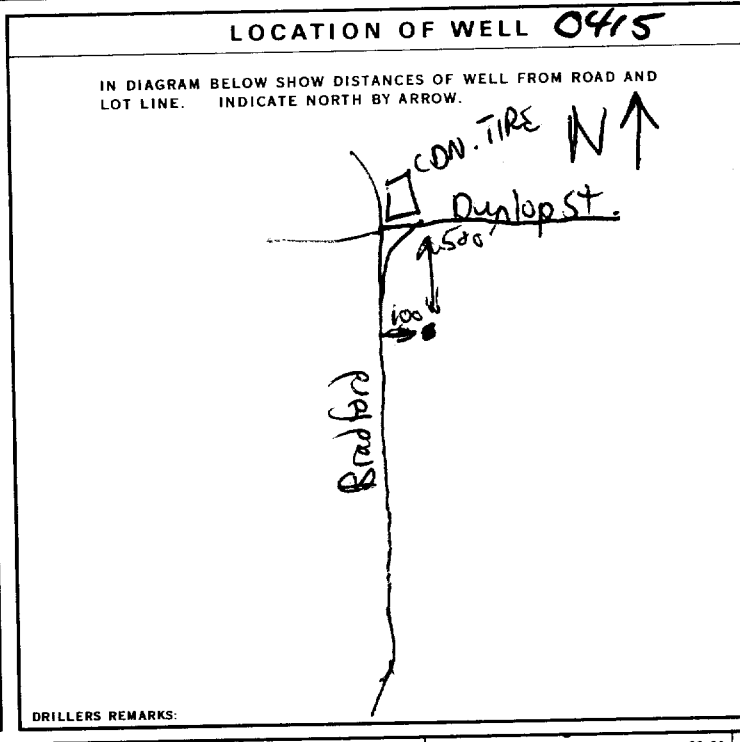
SIZE(S) OF OPENING (SLO. NO.): **030**
 DIAMETER: **08.000** INCHES
 LENGTH: **15** FEET
 MATERIAL AND TYPE: **stainless steel**
 DEPTH TO TOP OF SCREEN: **0164** FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE
10-13	14-17
18-21	22-25
26-29	30-33

71 PUMPING TEST

PUMPING TEST METHOD: 1 PUMP 2 BAILER
 PUMPING RATE: **0360** GPM
 DURATION OF PUMPING: **07** HOURS **00** MINS
 STATIC LEVEL: **004** FEET
 WATER LEVEL END OF PUMPING: **068** FEET
 WATER LEVELS DURING: 15 MINUTES: **004** FEET, 30 MINUTES: **004** FEET, 45 MINUTES: **004** FEET, 60 MINUTES: **004** FEET
 PUMP INTAKE SET AT: **160** FEET
 WATER AT END OF TEST: **0400** GPM
 RECOMMENDED PUMP TYPE: SHALLOW DEEP
 RECOMMENDED PUMP SETTING: **160** FEET
 RECOMMENDED PUMPING RATE: **0400** GPM



FINAL STATUS OF WELL

1 WATER SUPPLY
 2 OBSERVATION WELL
 3 TEST HOLE
 4 RECHARGE WELL
 5 ABANDONED, INSUFFICIENT SUPPLY
 6 ABANDONED, POOR QUALITY
 7 UNFINISHED

WATER USE

1 DOMESTIC
 2 STOCK
 3 IRRIGATION
 4 INDUSTRIAL
 5 OTHER
 6 COMMERCIAL
 7 MUNICIPAL
 8 PUBLIC SUPPLY
 9 COOLING OR AIR CONDITIONING
 10 NOT USED

METHOD OF DRILLING

1 CABLE TOOL
 2 ROTARY (CONVENTIONAL)
 3 ROTARY (REVERSE)
 4 ROTARY (AIR)
 5 AIR PERCUSSION
 6 BORING
 7 DIAMOND
 8 JETTING
 9 DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: **Snider Drilling Limited.** LICENCE NUMBER: **4816**
 ADDRESS: **Craighurst, Ont.**
 NAME OF DRILLER OR BORER: **Ronald Prince** LICENCE NUMBER:
 SIGNATURE OF CONTRACTOR: **Ralph Snider** SUBMISSION DATE: DAY _____ MO. _____ YR. _____

OFFICE USE ONLY

DATA SOURCE: **1** CONTRACTOR: **4816** DATE RECEIVED: **240270**
 DATE OF INSPECTION: **June 28/76** INSPECTOR:
 REMARKS:
 P **RO.**
 WI



Ministry of the Environment
Ontario

A

The Ontario Water Resources Act

3105E

WATER WELL RECORD

5717002

MUNICIPALITY: 57501

CONTRACTOR: 281080

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11

COUNTY OR DISTRICT: SIMCOE
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: BARRIE
OWNER (SURNAME FIRST): Bonnie Puc
ADDRESS: BARRIE ONT.
DATE COMPLETED: DAY 25 MO 08 YR 89

WELL NO: 1-2-07-0702-20
ELEVATION: 0725
BASIN CODE: 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill	Cement Blocks gravel & etc		0	15'
Grey	fine sand	& soft grey clay layers		15'	57'
Grey	clay	sandy fairly hard		57'	78'
Grey	clay	fairly hard		78'	94'
Grey	fine sand	& clay layers		94'	100'
	Fine gravel	& coarse sand & fine sand layers		100'	108'
	Gravel sand	& boulders		108'	113'
Grey	clay	hard.		113'	114'
Grey	fine sand			114'	136'
	Gravel sand	& boulders cemented		136'	141'
	Gravel sand	& grey clay layers packed		141'	149'
Grey	sand	packed		149'	153'

31 0015 011160 00572080574 00782058173 009420573 01002080574 0108 290874 1
32 0113 112813 011420573 0136208 0141 112813 0149 112805 015322879 1

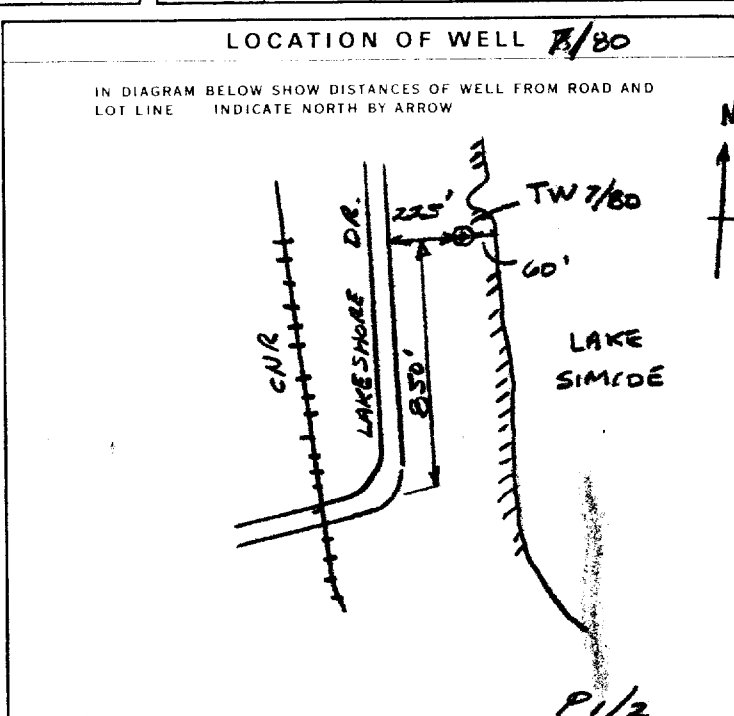
41 WATER RECORD	
WATER FOUND AT FEET	KIND OF WATER
10-13	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD				
INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10-11	1 <input checked="" type="checkbox"/> STEEL		0	0211
10-02	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		0	0066
17-18	1 <input checked="" type="checkbox"/> STEEL		66	0211
17-14	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		66	0211
24-25	1 <input checked="" type="checkbox"/> STEEL		219	0214
10-01	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		219	66

61 PLUGGING & SEALING RECORD

DEPTH SET AT FEET: FROM 10-13 TO 14-17
MATERIAL AND TYPE: 66 cement in 10" casing

71 PUMPING TEST METHOD		PUMPING RATE	DURATION OF PUMPING
1 <input checked="" type="checkbox"/> PUMP	2 <input type="checkbox"/> BAILER	0060 GPM	02 HOURS 00 MINS
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	
19-21	22-24	15 MINUTES	30 MINUTES
+7.0 004 FEET	-4.45 004 FEET	3.34 003 FEET	3.65 004 FEET
IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST	
	GPM	FEET	
RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE	RECOMMENDED PUMPING RATE
<input type="checkbox"/> SHALLOW <input type="checkbox"/> DEEP	FEET	FEET	GPM



FINAL STATUS OF WELL: 2

WATER USE: 09

METHOD OF DRILLING: 2

CONTRACTOR: INTERNATIONAL WATER SUPPLY LTD 2801
ADDRESS: BOX 310 BARRIE
NAME OF DRILLER OR BORER: A. Magill
SIGNATURE OF CONTRACTOR: [Signature]
SUBMISSION DATE: DAY 23 MO OCT YR 89

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 2801
DATE RECEIVED: 281080
DATE OF INSPECTION: [Blank]
INSPECTOR: [Blank]
REMARKS: [Blank]

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11

5717393

MUNICIPALITY 57501

CON. 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

COUNTY OR DISTRICT **SIMCOE** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE **Barrie** CON. BLOCK TRACT SURVEY ETC. LOT 25-27
OWNER (SURNAME FIRST) **City of Barrie (P.U.C.)** ADDRESS **Bayfield St** DATE COMPLETED DAY **01** MO **04** YR **81**

ZONE **17** EASTING **604400** NORTHING **4914350** RC **5** ELEVATION **0725** RC **5** B.P. CODE **22** # **1**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	12
black	Muck clay	sand	silty	12	16
	sand	gravel clay		16	21
Grey	clay		soft	21	27
Grey	clay		stoney	27	46
Grey	clay		stoney soft	46	51
Grey	clay		soft	51	68
Grey	clay		hard	68	85
Grey	clay		soft	85	91
Grey	clay		hard	91	93
Grey	clay		soft	93	100
	clay	silty	soft	100	110

31 0012 01 0016803 0021 052884 0027 281405 0031 052884 0037 052884
32 00682058587 008520585 009120573 009320585 010020573 0110 058485

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0020	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
12	1 <input checked="" type="checkbox"/> STEEL		0100
10"	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	.365	110
10	1 <input checked="" type="checkbox"/> STEEL		0214
8	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	.322	216
08	1 <input checked="" type="checkbox"/> STEEL		0242
24-25	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE	.375	242
12	4 <input type="checkbox"/> OPEN HOLE		100

surface casing 0

SCREEN

SIZE (S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
020 slot	06800	50

WATER AND TYPE **Johnson** DEPTH TO TOP OF SCREEN **0242**

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT (LEAD PACKER, ETC.)
0	100	Cement grout

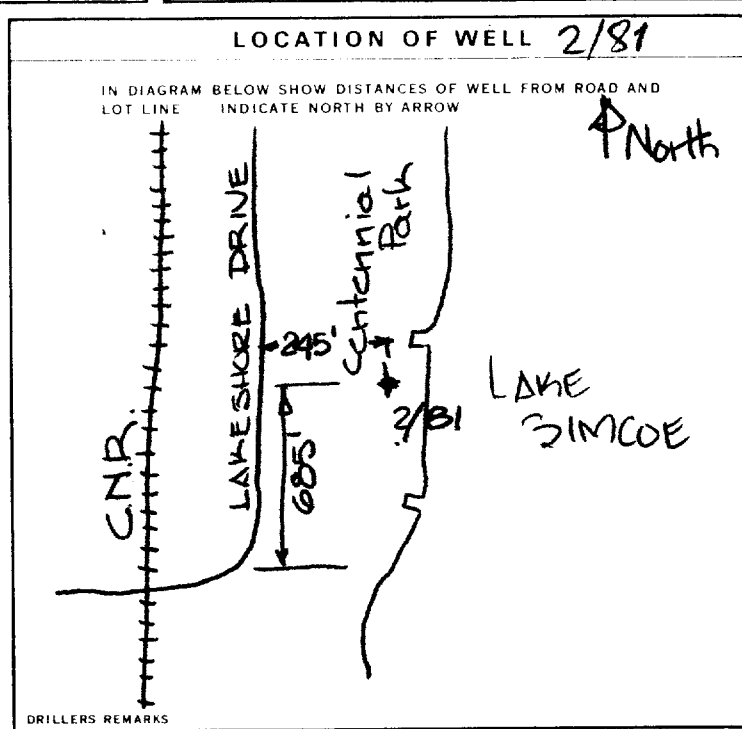
71 PUMPING TEST METHOD

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 <input checked="" type="checkbox"/> PUMP 2 <input type="checkbox"/> BAILER	0600 GPM	24 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	1 <input type="checkbox"/> PUMPING 2 <input checked="" type="checkbox"/> RECOVERY
+6.00 FEET	4.32 FEET	08.1 FEET 00.1 FEET 1.55 FEET	00.1 FEET 0.81 FEET

IF FLOWING GIVE RATE _____ PUMP INTAKE SET AT _____ FEET WATER AT END OF TEST _____ FEET

RECOMMENDED PUMP TYPE SHALLOW DEEP RECOMMENDED PUMP SETTING _____ FEET RECOMMENDED PUMPING RATE _____ GPM



FINAL STATUS OF WELL 3

WATER USE 09

METHOD OF DRILLING 2

CONTRACTOR NAME OF WELL CONTRACTOR **International Water Supply** LICENCE NUMBER **2801**
ADDRESS **P.O. Box 310 Barrie Ontario**
NAME OF DRILLER OR BORER **J. Gray** LICENCE NUMBER _____
SIGNATURE OF CONTRACTOR **J. Gray** SUBMISSION DATE DAY **24** MO **4** YR **81**

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
1	2801	25 05 81

REMARKS _____

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11 5717394 57501 COP. 10 15 20 25 30 35 40 45 50 55 60

COUNTY OR DISTRICT: SIMCOE TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: BARRIE
 OWNER (SURNAME FIRST): BARRIE PUE ADDRESS: Bayfield St. Barrie DATE COMPLETED: DAY 17 MO 03 YR 81
 ZONE: 17 EASTING: 604400 NORTHING: 4914400 RC: 5 ELEVATION: 0725 RC: 5 BASIN CODE: 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	16
Grey	Sand	Clay layers	Soft	16	60
Grey	Clay	Silty, Gravel	Soft	60	100
Grey	Sand	Gravel, Boulders, clay	Loose	100	110
Grey	Sand	Fine	Loose	110	138
Grey	Gravel	Clay layers	firm	138	162
Grey	Gravel	Boulders, Sand	Packed layers	162	209
Grey	Gravel	Sand	loose	209	230
Grey	Sand	Gravel	loose	230	269
Grey	Gravel	Sand	loose	269	296
Grey	Sand	fine to med.	loose	296	306

31 0016 01 00692880585 01002051184 01102281113 013820877 01622110574 1
 32 02092111328 02962112877 030620977

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	1.54	0	240
17-18	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	1.40	210	210
24-25	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	2.80	280	280

Surface casing

SCREEN RECORD

SIZE/ST. OF OPENING: 029-33
 SLOT NO: HOWARD SS 20
 MATERIAL AND TYPE: HOWARD SMITH SS 20
 DIAM. IN: 06250
 LENGTH: 10
 DEPTH TO TOP OF SCREEN: 0280

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER ETC.)
0-13	70 Cement grout.
18-21	22-25
26-29	30-33

71 PUMPING TEST METHOD

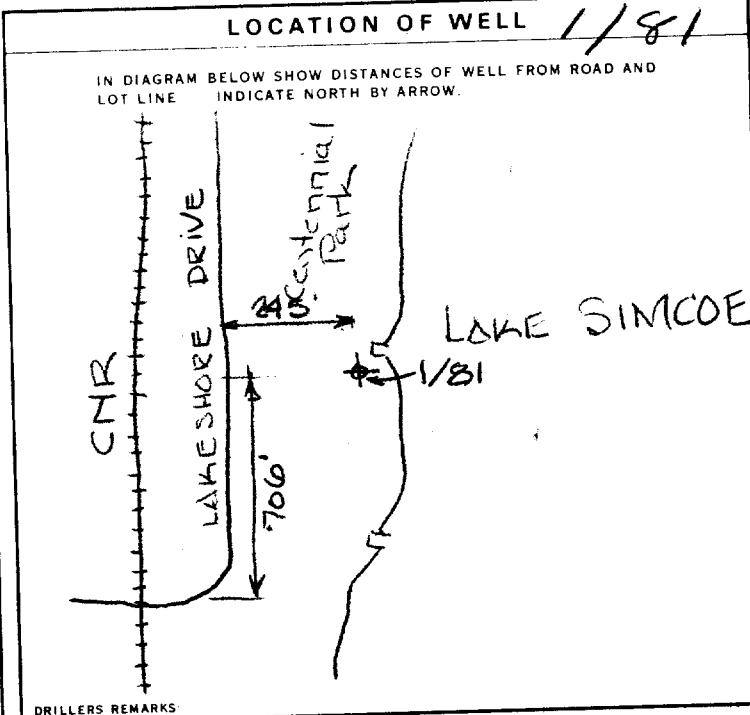
1 PUMP 2 BAILER Not Pumped

STATIC LEVEL: 19-21 +7.23 FEET
 WATER LEVEL END OF PUMPING: 2-24 -7.8 FEET

WATER LEVELS DURING OBSERVATION WELL RECOVERY

15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
26-28	29-31	32-34	35-37

RECOMMENDED PUMP TYPE: SHALLOW DEEP



FINAL STATUS OF WELL: 2

WATER USE: 09

METHOD OF DRILLING: 2

CONTRACTOR: IWS 2801
 ADDRESS: Box 310 Barrie ONT
 NAME OF DRILLER OR BORER: J.G. Gray
 SIGNATURE OF CONTRACTOR: [Signature]
 SUBMISSION DATE: DAY 24 NO. 4 YR 81

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 2801 DATE RECEIVED: 250581
 DATE OF INSPECTION: INSPECTOR:
 REMARKS:
 CSS.ES

WATER WELL RECORD

57.17578

MUNICIPALITY 57.501

CON.

1. PRINT ONLY IN SPACES PROVIDED

2. CHECK CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT: Simcoe TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Barrie
 OWNER (SURNAME FIRST): Barrie P.U.C. ADDRESS: Bayfield Street Barrie
 DATE COMPLETED: DAY 19 MO 05 YR 81

ZONE: 17 EASTING: 604400 NORTHING: 4914200 RC: 5 ELEVATION: 0.725 RC: 5 BASIN CODE: 22

5/81 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	12
Grey	clay	sand streaks		12	21
Grey	clay	sand & silt		21	41
Grey	clay	sand fine		41	52
	timbers			52	54
Grey	clay	st	striae soft silty	54	60
Grey	clay	sandy	soft	60	65
	Gravel fine			65	68
	Gravel	Sand Boulders		68	71
	clay	sand	hard	71	84
Grey	clay	Sand coarse Silt		84	93
Grey	clay		silty	93	96

31 0001 011 002 12052874 004 12052806 005 220508 005 4 35 006 02057484
 32 006 52058185 006 8 29 007 1 11 28 13 008 4 05 28 73 009 32051000 009 6 20 584

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WELL TH. INCHES	DEPTH - FEET
10-11	STEEL		13-16
12-17	GALVANIZED		20-23
17-18	CONCRETE		20-23
18-19	OPEN HOLE		20-23
20-23	STEEL		20-23
23-24	GALVANIZED		27-30
24-25	CONCRETE		27-30
25-26	OPEN HOLE		27-30
27-28	STEEL		27-30
28-29	GALVANIZED		27-30
29-30	CONCRETE		27-30
30-31	OPEN HOLE		27-30

SCREEN

SIZE OF OPENING (SCOT NO.)	DIAMETER	LENGTH
31-33	34-38	39-40
	INCHES	FEET
MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN 41-44 30
		FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	(CEMENT GROUT LEAD PACKER, ETC.)
FROM TO		
10-13	14-17	
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

1 PUMP 2 BAILER

25 WATER LEVELS DURING PUMPING

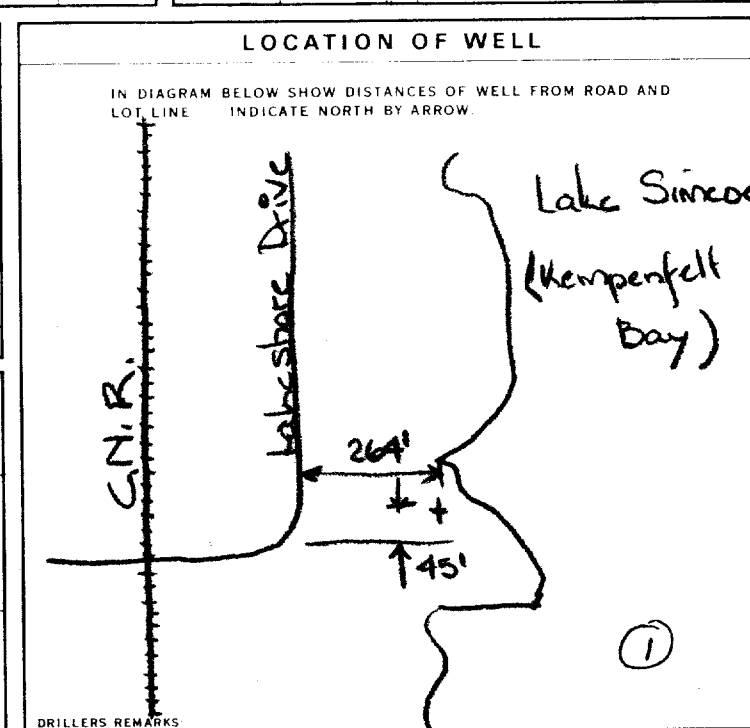
STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
19-21	22-24	26-28	29-31	32-34	35-37
FEET	FEET	FEET	FEET	FEET	FEET

38-41 PUMP INTAKE SET AT: GPM

42 WATER AT END OF TEST: 1 CLEAR 2 CLOUDY

43-45 RECOMMENDED PUMP SETTING: FEET

46-49 RECOMMENDED PUMPING RATE: GPM



FINAL STATUS OF WELL 3

WATER USE 55-56

METHOD OF DRILLING 2

CONTRACTOR: International Water Supply 2801
 ADDRESS: Box 310 Barrie Ontario
 NAME OF DRILLER OR BORER: W. Dunn
 SIGNATURE OF CONTRACTOR: [Signature]
 SUBMISSION DATE: DAY 24 MO 8 YR 81

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 2801 DATE COMPLETED: 22 09 81

DATE OF INSPECTION: INSPECTOR: [Signature]

REMARKS:

CSS.ES

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11

5717577

MUNICIPALITY 57501

CON.

COUNTY OR DISTRICT: **Simco** TOWNSHIP, BOROUGH OR VILLAGE: **Barrie** CON. BLOCK TRACT SURVEY ETC.: _____ LOT: 25-27

OWNER (SURNAME FIRST): **Barrie PUC.** ADDRESS: **Bayfield Street Barrie Ontario** DATE COMPLETED: DAY **01** MO **07** YR **81**

ZONE: **17** EASTING: **604350** NORTHING: **4915000** RC: **5** ELEVATION: **0725** RC: **5** BASIN CODE: **22**

7/8 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	14
	Sand	Gravel Silt		14	42
	Sand	clay some gravel	Silty	42	70
	clay	Gravel	sandy	70	75
Grey	clay		silty	75	87
	clay	Gravel	silty - hard streaks	87	99
	clay	Gravel fine	sandy	99	126
	clay	Sand streaks	sandy	126	142
	Sand fine → medium			142	148
	Sand	Gravel sandy clay		148	150
	Sand	Gravel		150	153
	clay		Sandy	153	157

31 0914 01 0042 281106 0070 280511 0075 051181 008720584 0099 051173 1

32 0126 052981 0142 052874 0148 09 0150 281105 0153 2811 0157 052 1

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
10-11	1 <input checked="" type="checkbox"/> STEEL		FR M TO
12	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		0 0099
17-18	1 <input checked="" type="checkbox"/> STEEL		20-23
10"	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		0 0150
24-25	1 <input checked="" type="checkbox"/> STEEL		27-30
08	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		142' 0162' 172' 0180'

SCREEN

SIZE OF OPENING (SLOT NO.): **040 slot**

MATERIAL AND TYPE: **Irrigator**

DIAMETER: **08 000** INCHES

LENGTH: **40** FEET

DEPTH TO TOP OF SCREEN: **0162** FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	(CEMENT GROUT LEAD PACKER ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST METHOD

1 PUMP 2 BAILER

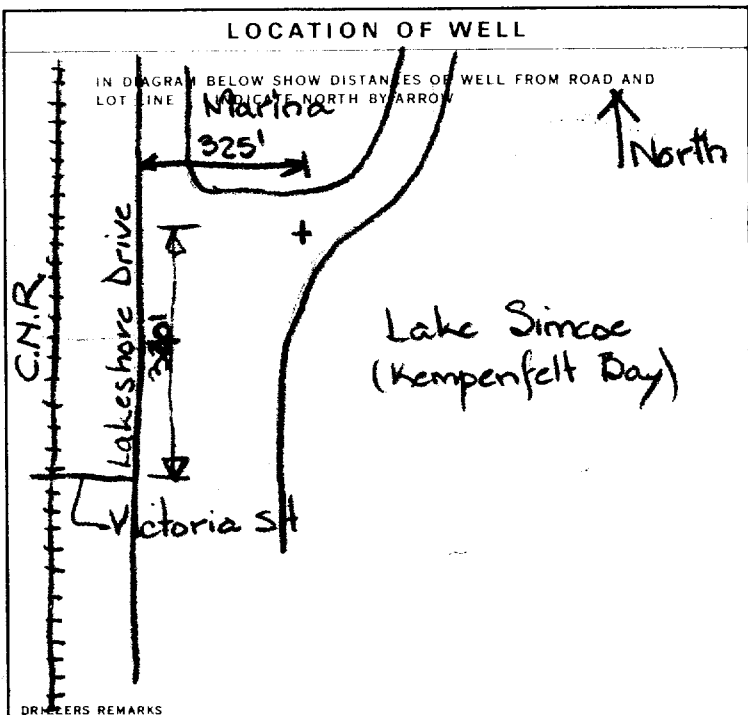
PUMPING RATE: **0650** GPM

DURATION OF PUMPING: **72** HOURS **00** MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING:
MP + 6.20 0.1 FEET	018 17.62 FEET	15 MINUTES: 008 20 MINUTES: 009 25 MINUTES: 009 30 MINUTES: 009 35 MINUTES: 00
		IF FLOWING GIVE RATE: _____

RECOMMENDED PUMP TYPE: **PIPE**

RECOMMENDED PUMP: **Roller after test.**



FINAL STATUS OF WELL

1 WATER SUPPLY 5 ABANDONED, INSUFFICIENT SUPPLY
2 OBSERVATION WELL 6 ABANDONED POOR QUALITY
3 TEST HOLE 7 UNFINISHED
4 RECHARGE WELL

WATER USE

1 DOMESTIC 5 COMMERCIAL
2 STOCK 6 MUNICIPAL
3 IRRIGATION 7 PUBLIC SUPPLY
4 INDUSTRIAL 8 COOLING OR AIR CONDITIONING
9 NOT USED

METHOD OF DRILLING

1 CABLE TOOL 6 BORING
2 ROTARY (CONVENTIONAL) 7 DIAMOND
3 ROTARY (REVERSE) 8 JETTING
4 ROTARY (AIR) 9 DRIVING
5 AIR PERCUSSION

CONTRACTOR

NAME OF WELL CONTRACTOR: **International Water Supply** LICENCE NUMBER: **2801**

ADDRESS: **P.O. Box 310 Barrie Ontario**

NAME OF DRILLER OR BORER: **W. Dunn** LICENCE NUMBER: _____

SIGNATURE OF CONTRACTOR: **[Signature]** SUBMISSION DATE: DAY **24** MO **08** YR **81**

OFFICE USE ONLY

DATA SOURCE: **1** CONTRACTOR: **2801** DATE RECEIVED: **22 09 81**

DATE OF INSPECTION: _____ INSPECTOR: _____

REMARKS: _____

CSS.ES

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11

5717578

MUNICIPALITY 57501

CON. 10 14 15 22 24 25

OR DISTRICT **Simcoe** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE **Barrie** CON. BLOCK TRACT SURVEY ETC. LOT 25-27

OWNER (SURNAME FIRST) **Barrie P.U.C.** ADDRESS **Bayfield Street Barrie** DATE COMPLETED **26 05 81**

ZONE **17** EASTING **604350** NORTHING **4914500** RC **5** ELEVATION **0725** RC **5** BASIN CODE **22**

6/81 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	19
	clay	sand strks	silty	19	64
Grey	clay		silty	64	175
Grey	clay		silty clay streaks	175	196
	Gravel	sand marl	cemented	196	200
Grey	clay	Gravel fine	sandy	200	267
Grey	clay	Gravel marl	sandy, cemented	267	280
Grey	clay	Gravel.		280	301

31 0019 01 0064 052874 017520584 019620584 0200 112833 02672052981 1

32 02802051133 030120511

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH	2 <input type="checkbox"/> SALTY	3 <input type="checkbox"/> SULPHUR	4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIA. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10-11	1 <input type="checkbox"/> STEEL	2 <input type="checkbox"/> GALVANIZED		13-16
17-18	1 <input type="checkbox"/> STEEL	2 <input type="checkbox"/> GALVANIZED		20-23
24-25	1 <input type="checkbox"/> STEEL	2 <input type="checkbox"/> GALVANIZED		27-30

SCREEN

SIZE(S) OF OPENING SLOT NO. 1	DIAMETER INCHES	LENGTH FEET
	31-33	34-38
MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN 41-44 30 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	(CEMENT GROUT LEAD PACKER ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

1 PUMP 2 BAILER

10 PUMPING RATE GPM 11-14 DURATION OF PUMPING 15-16 HOURS 17-18 MINS

25 WATER LEVELS DURING PUMPING 1 PUMPING 2 RECOVERY

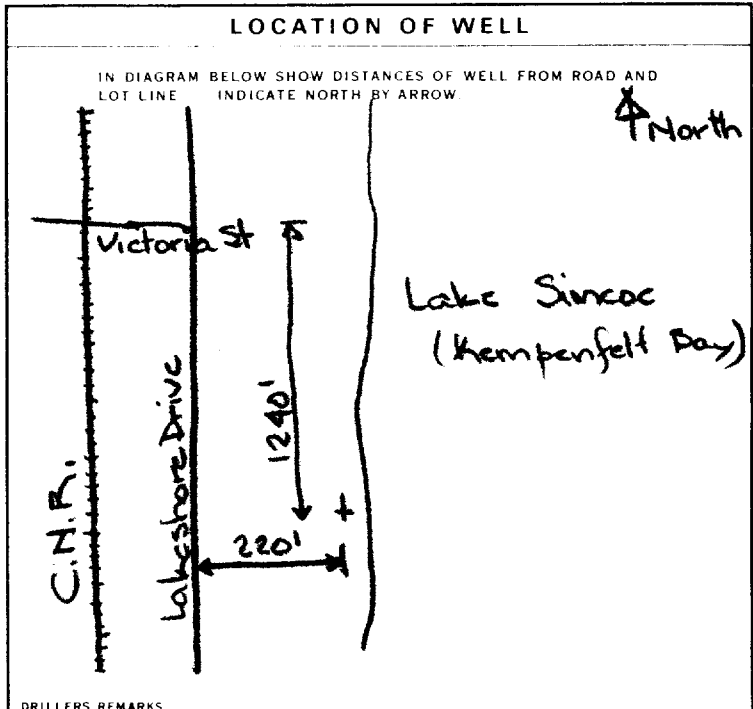
19-21 22-24 15 MINUTES 30 MINUTES 45 MINUTES 60 MINUTES 27-28 29-31 32-34 35-37

FEET FEET FEET FEET FEET FEET

IF FLOWING GIVE RATE PUMP INTAKE SET AT WATER AT END OF TEST

RECOMMENDED PUMP TYPE RECOMMENDED PUMP SETTING RECOMMENDED PUMPING RATE

SHALLOW DEEP



FINAL STATUS OF WELL

1 WATER SUPPLY 5 ABANDONED, INSUFFICIENT SUPPLY

2 OBSERVATION WELL 6 ABANDONED, POOR QUALITY

3 TEST HOLE 7 UNFINISHED

4 RECHARGE WELL

WATER USE

1 DOMESTIC 5 COMMERCIAL

2 STOCK 6 MUNICIPAL

3 IRRIGATION 7 PUBLIC SUPPLY

4 INDUSTRIAL 8 COOLING OR AIR CONDITIONING

OTHER 9 NOT USED

METHOD OF DRILLING

1 CABLE TOOL 6 BORING

2 ROTARY (CONVENTIONAL) 7 DIAMOND

3 ROTARY (REVERSE) 8 JETTING

4 ROTARY (AIR) 9 DRIVING

5 AIR PERCUSSION

CONTRACTOR

NAME OF WELL CONTRACTOR **International Water Supply** LICENCE NUMBER **2801**

ADDRESS **Box 310 Barrie Ontario**

NAME OF DRILLER OR BORER **W. Duggan** LICENCE NUMBER

SIGNATURE OF CONTRACTOR **[Signature]** SUBMISSION DATE **24 8 81**

OFFICE USE ONLY

DATA SOURCE **1** CONTRACTOR **2801** DATE RECEIVED **22 09 81**

DATE OF INSPECTION INSPECTOR

REMARKS

CSS.ES

WATER WELL RECORD

3105E

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11

5717579

MUNICIPALITY 57501

CON. 10 14 15 22 24 27

COUNTY OR DISTRICT: **Simcoe** TOWNSHIP/BOROUGH/CITY/TOWN/VILLAGE: **Barrie** CON. BLOCK TRACT SURVEY ETC.: _____ LOT: 25-27

OWNER (SURNAME FIRST): **Barrie PUC** ADDRESS: **Bayfield St. Barrie** DATE COMPLETED: DAY **29** MO **04** YR **81**

ZONE: **17** EASTING: **604400** NORTHING: **4914950** RC: **5** ELEVATION: **0.725** RC: **5** BASIN CODE: **22**

3/81 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill & Rubble			0	16
Grey	clay	gravel & logs	silty	16	28
	Gravel	silt, sand fine		28	38
	clay	sand	silty	38	71
Grey	clay	gravel fine	silty	71	85
	Gravel	clay sand		85	99
	clay	gravel, sand	hard	99	104
Grey	clay	Gravel fine	silty	104	147
	Sand	Gravel boulders		147	155
	Sand			155	157
	Sand	Gravel boulders		157	175

31 0916 01 0028 205 11 84 0038 1 10608 0071 0528 84 0085 205 2984 0104 1 10525 1

32 0147 205 29 84 9155 1 12813 0157 28 0175 28 11 13 0182 0884 0222 28 11 13 1

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
10	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	.375	0 0103
02	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		0 0210
1/4	1 <input checked="" type="checkbox"/> GALVANIZED 2 <input type="checkbox"/> CONCRETE 3 <input type="checkbox"/> OPEN HOLE		0 210

SCREEN SIZE OF OPENING (SLOT NO.): **020 slot** DIAMETER: **0250** LENGTH: **10** FEET

MATERIAL AND TYPE: **wire stain steel wrapped 0210** DEPTH TO TOP OF SCREEN: **41-44** FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	(CEMENT GROUT LEAD PACKER ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST METHOD

1 PUMP 2 BAILER

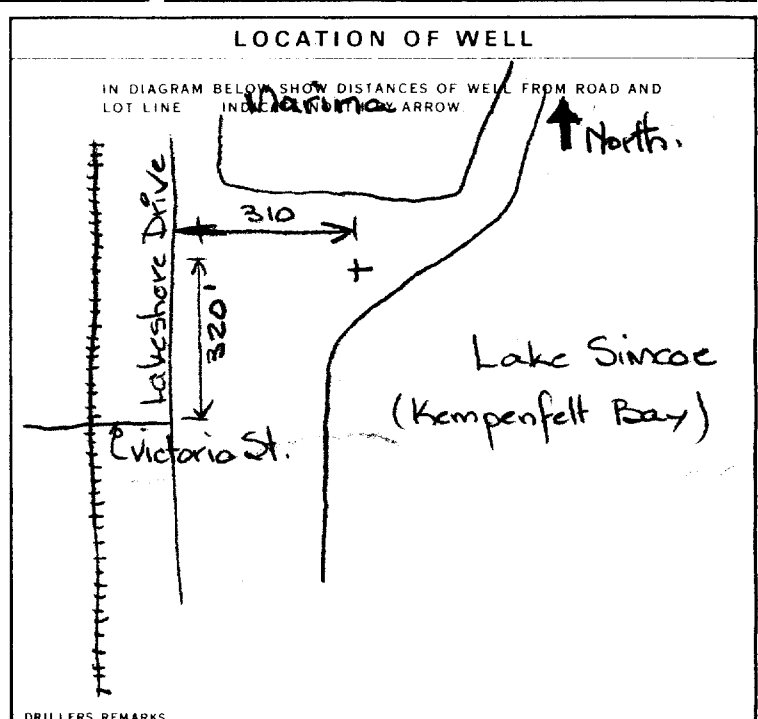
11-14 DURATION OF PUMPING: _____ HOURS _____ MINS

15-16 1 PUMPING 17-18 2 RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING			
FEET	FEET	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
AP+8.25 006 +6.25	22-24	26-28	29-31	32-34	35-37

IF FLOWING GIVE RATE: **Not Pumped** PUMP INTAKE SET AT: _____ FEET WATER AT END OF TEST: _____ FEET

RECOMMENDED PUMP TYPE: SHALLOW DEEP



FINAL STATUS OF WELL 2

1 WATER SUPPLY 5 ABANDONED - INSUFFICIENT SUPPLY
2 OBSERVATION WELL 6 ABANDONED - POOR QUALITY
3 TEST HOLE 7 UNFINISHED
4 RECHARGE WELL

WATER USE 09

1 DOMESTIC 5 COMMERCIAL
2 STOCK 6 MUNICIPAL
3 IRRIGATION 7 PUBLIC SUPPLY
4 INDUSTRIAL 8 COOLING OR AIR CONDITIONING
 OTHER 9 NOT USED

METHOD OF DRILLING 2

1 CABLE TOOL 6 BORING
2 ROTARY (CONVENTIONAL) 7 DIAMOND
3 ROTARY (REVERSE) 8 JETTING
4 ROTARY (AIR) 9 DRIVING
5 AIR PERCUSSION

CONTRACTOR NAME OF WELL CONTRACTOR: **International Water Supply 2801** LICENCE NUMBER: _____

ADDRESS: **P.O. Box 310 Barrie**

NAME OF DRILLER OR BORER: **N. Dunn** LICENCE NUMBER: _____

SIGNATURE OF CONTRACTOR: _____ SUBMISSION DATE: DAY **21** MO **8** YR **81**

OFFICE USE ONLY

DATA SOURCE: **1** CONTRACTOR: **2801** DATE RECEIVED: **22 09 81**

DATE OF INSPECTION: _____ INSPECTOR: _____

REMARKS: _____

CSS.ES

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11

5717580

MUNICIPALITY 57501

CON.

COUNTY OR DISTRICT: Simcoe TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Barrie
 OWNER (SURNAME FIRST): Barrie PUC. ADDRESS: Bayfield Street Barrie
 DATE COMPLETED: DAY 08 MO 05 YR 81

ZONE: 17 EASTING: 604400 NORTHING: 4714800 RC: 5 ELEVATION: 0.725 RC: 5 BASIN CODE: 22

4/81 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	11
	Sand	Gravel fine		11	15
	Sand	Silt, Wood clay layers		15	32
Grey	clay		silty	32	55
Grey	clay		sandy	55	66
	Sand fine			66	67
Grey	clay		sandy, hard	67	110
Grey	clay	Sand & silt		110	126
Grey	clay		silty, soft	126	138
	Sand	Gravel sandy clay	layers	138	142
	Gravel & clay	Sand & silt		142	145
			silty	145	154

31 9011 01 0015 2829 0032 280635 005520584 006629581 0067 08 1
 32 01102058173 01262050806 01382053485 0142 281105 0145 292806 0154 0584 2 1

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
10	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		0099
17-18	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		0248
24-25	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		

SCREEN SIZE OF OPENING (SLOT NO. 1) 010 DIAMETER 01250 INCHES LENGTH 06 FEET
 MATERIAL AND TYPE: 0248 DEPTH TO TOP OF SCREEN 41-44 30 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	(CEMENT GROUT LEAD PACKER ETC.)
10-13		
14-17		
18-21		
22-25		
26-29		
30-33		

71 PUMPING TEST METHOD 10 PUMPING RATE 11-14 DURATION OF PUMPING 15-16 17-18

1 PUMP 2 BAILER GPM HOURS MINS

STATIC LEVEL WATER LEVEL END OF PUMPING WATER LEVELS DURING 1 PUMPING 2 RECOVERY

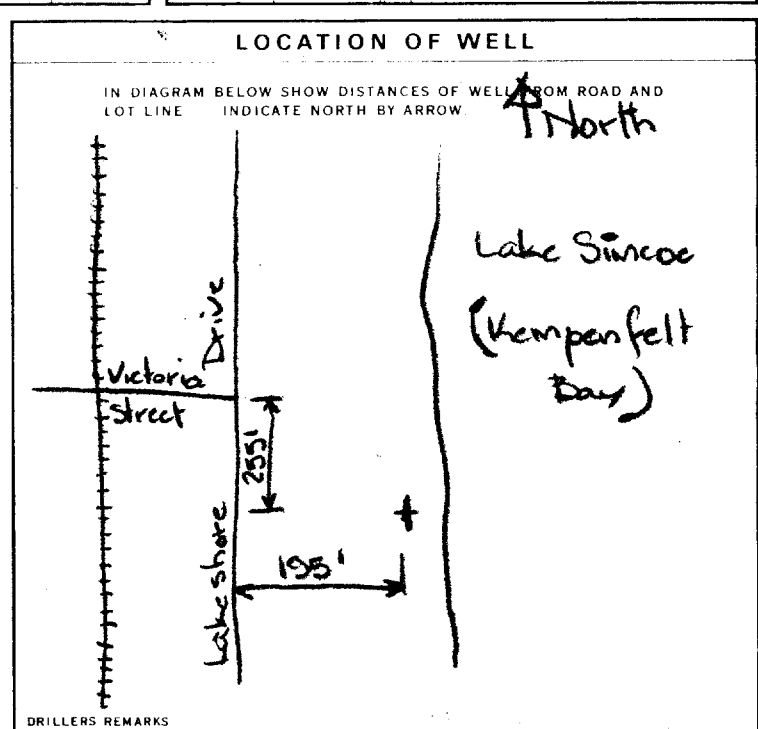
MP 9.40 2009 GL to 9.20 GL

22-24 15 MINUTES 26-28 30 MINUTES 29-31 45 MINUTES 32-34 60 MINUTES 35-37

IF FLOWING GIVE RATE 38-41 PUMP INTAKE SET AT WATER AT END OF TEST 42

RECOMMENDED PUMP TYPE 43-45 RECOMMENDED PUMP SETTING 46-49

1 SHALLOW 2 DEEP 3 CLEAR 4 CLOUDY



54 FINAL STATUS OF WELL 2

1 WATER SUPPLY 5 ABANDONED, INSUFFICIENT SUPPLY
2 OBSERVATION WELL 6 ABANDONED, POOR QUALITY
3 TEST HOLE 7 UNFINISHED
4 RECHARGE WELL

55-56 WATER USE 09

1 DOMESTIC 5 COMMERCIAL
2 STOCK 6 MUNICIPAL
3 IRRIGATION 7 PUBLIC SUPPLY
4 INDUSTRIAL 8 COOLING OR AIR CONDITIONING
9 NOT USED

57 METHOD OF DRILLING 2

1 CABLE TOOL 6 BORING
2 ROTARY (CONVENTIONAL) 7 DIAMOND
3 ROTARY (REVERSE) 8 JETTING
4 ROTARY (AIR) 9 DRIVING
5 AIR PERCUSSION

CONTRACTOR NAME OF WELL CONTRACTOR: International Water Supply LICENCE NUMBER: 2801
 ADDRESS: P.O. Box 310 Barrie
 NAME OF DRILLER OR BORER: W. Durm LICENCE NUMBER:
 SIGNATURE OF CONTRACTOR: [Signature] SUBMISSION DATE: DAY 24 MO 8 YR 81

OFFICE USE ONLY DATA SOURCE 58 CONTRACTOR 59-62 220981 RECEIVED 63-68 80
 DATE OF INSPECTION: INSPECTOR:
 REMARKS:
 CSS.ES

WATER WELL RECORD

31 P/SE

5718640 (U) MUNICIPAL 575011

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT: **SIMCOE**
 TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Barrie**
 CON. BLOCK, TRACT SURVEY ETC: **IV**
 LOT: **25-27**
 OWNER (SURNAME FIRST): **City of Barrie P.O.C.**
 ADDRESS: **Bayfield St, Barrie**
 DATE COMPLETED: DAY **21** MONTH **07** YEAR **83**
 ZONE: **17** EASTING: **604650** NORTHING: **4915600** ELEVATION: **50700** BASIN CODE: **22**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS) Page # 1

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	fill			0	23
	clay	sands, wood		23	29
	Sand	gravel & clay	RP 51R1323	29	34
	silt	clay & sand		34	37
	sand & gravel	sticky clay		37	67
	clay	sand streaks		67	82
	sand	silt, clay	FEB 16 1987	82	86
	clay	stones	firm	86	99
	sand, gravel	clay streaks		99	109
	sand, gravel & blcks			9	123
	sand, gravel & very little			5	142
	sand, gravel odd boulders			2	203

31 0023 01 | 0029 050835 0034 102905
 32 0086 280605 0099 051379 0109 281105

Card 33 on page 2.

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0100-15	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 14
100-124	2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 19
	2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 24
	2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 29
	2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 34
	2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

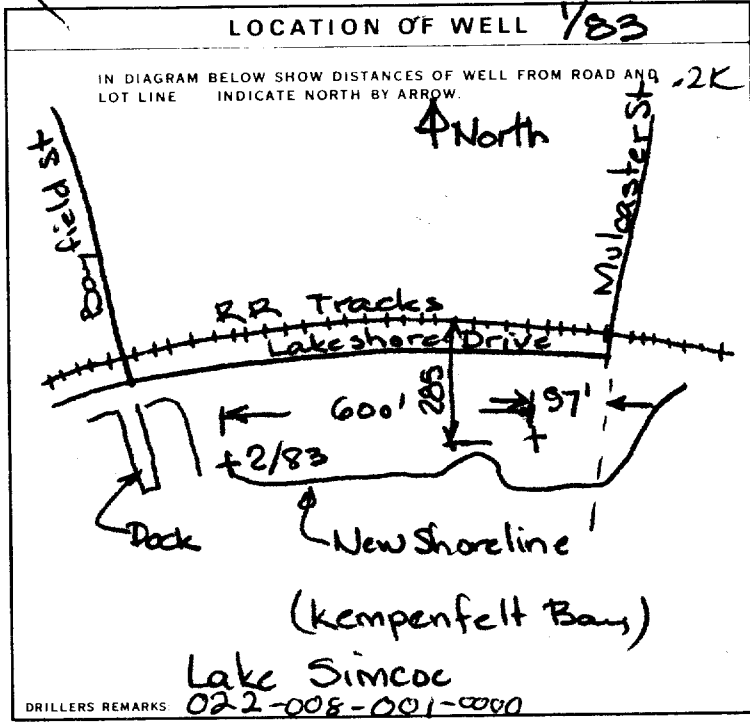
51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH FROM
10-11	1 <input checked="" type="checkbox"/> STEEL		
	2 <input type="checkbox"/> GALVANIZED		
	3 <input type="checkbox"/> CONCRETE		
	4 <input type="checkbox"/> OPEN HOLE		
18"	1 <input checked="" type="checkbox"/> STEEL	.312	41.5
10"	1 <input checked="" type="checkbox"/> STEEL	.365	5.5
	2 <input type="checkbox"/> GALVANIZED		
	3 <input type="checkbox"/> CONCRETE		
	4 <input type="checkbox"/> OPEN HOLE	.154	+2.1
02"	1 <input type="checkbox"/> STEEL		
	2 <input type="checkbox"/> GALVANIZED		
	3 <input type="checkbox"/> CONCRETE		
	4 <input type="checkbox"/> OPEN HOLE		

52874 1
 81113 1
 RECORD
 (CEMENT GROUT AND PACKER ETC.)
 between casing between

71 PUMPING TEST

PUMPING METHOD	PUMPING RATE	DURATION OF PUMPING
1 <input checked="" type="checkbox"/> PUMP 2 <input type="checkbox"/> BAILEY	0039 GPM	03 HOURS 00 MINS
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
018 17.5 FEET	020 20.2 FEET	15 MINUTES 019 19.1 FEET
		45 MINUTES 019 19.4 FEET
IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
		1 <input checked="" type="checkbox"/> CLEAR 2 <input type="checkbox"/> CLOUDY
RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
<input type="checkbox"/> SHALLOW <input type="checkbox"/> DEEP		



FINAL STATUS OF WELL: 2

WATER USE: 09

METHOD OF DRILLING: 4

CONTRACTOR: International Water Supply 2801
 ADDRESS: P.O. Box 310 Barrie
 NAME OF DRILLER OR BOREH: Wayne Dunn
 SIGNATURE OF CONTRACTOR: [Signature]
 SUBMISSION DATE: 16 Sept 83

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 2801 DATE RECEIVED: 20 09 83

DATE OF INSPECTION: INSPECTOR: [Signature]

REMARKS:

CSS.ES

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11 5718640

MUNICIP. CON. 10 14 15 22 23 24

COUNTY OR DISTRICT: **SIMCOE** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Barrie** CON. BLOCK, TRACT, SURVEY, ETC: LOT 25-27

OWNER (SURNAME FIRST): **City of Barrie P.U.C.** ADDRESS: **Dayfield St. Barrie** DATE COMPLETED: DAY **21** MO **7** YR **83**

21 ZONE EASTING NORTHING RC ELEVATION RC BASIN CODE II III IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS) **V83 Page #2**

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Sand, gravel			203	214
	clay		stoney hard	214	255
	clay	sandy gravel		255	269
	clay	gravel boulders	hard.	269	294

FEB 16 1987

33 0214 2829 0255 058773 0269 051181 0294 051113

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH	3 <input type="checkbox"/> SULPHUR	2 <input type="checkbox"/> SALTY	4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10-11	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	12		13-16
17-18	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	19		20-23
24-25	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	26		27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
31-33	34-38	39-40
MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN
		41-44
		FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET		MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
FROM	TO	
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 <input type="checkbox"/> PUMP 2 <input type="checkbox"/> BAILER	GPM	15-16 HOURS 17-18 MINS
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
19-21	22-24	15 MINUTES 26-28 30 MINUTES 29-31 45 MINUTES 32-34 60 MINUTES 35-37
FEET	FEET	FEET FEET FEET FEET
IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 <input type="checkbox"/> CLEAR 2 <input type="checkbox"/> CLOUDY
RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
<input type="checkbox"/> SHALLOW <input type="checkbox"/> DEEP	FEET	GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE INDICATE NORTH BY ARROW.

See Page #1

DRILLERS REMARKS

FINAL STATUS OF WELL

1 <input type="checkbox"/> WATER SUPPLY	5 <input type="checkbox"/> ABANDONED, INSUFFICIENT SUPPLY
2 <input checked="" type="checkbox"/> OBSERVATION WELL	6 <input type="checkbox"/> ABANDONED POOR QUALITY
3 <input type="checkbox"/> TEST HOLE	7 <input type="checkbox"/> UNFINISHED
4 <input type="checkbox"/> RECHARGE WELL	

WATER USE

1 <input type="checkbox"/> DOMESTIC	5 <input type="checkbox"/> COMMERCIAL
2 <input type="checkbox"/> STOCK	6 <input type="checkbox"/> MUNICIPAL
3 <input type="checkbox"/> IRRIGATION	7 <input type="checkbox"/> PUBLIC SUPPLY
4 <input type="checkbox"/> INDUSTRIAL	8 <input type="checkbox"/> COOLING OR AIR CONDITIONING
<input type="checkbox"/> OTHER	9 <input checked="" type="checkbox"/> NOT USED

METHOD OF DRILLING

1 <input type="checkbox"/> CABLE TOOL	6 <input type="checkbox"/> BORING
2 <input type="checkbox"/> ROTARY (CONVENTIONAL)	7 <input type="checkbox"/> DIAMOND
3 <input type="checkbox"/> ROTARY (REVERSE)	8 <input type="checkbox"/> JETTING
4 <input checked="" type="checkbox"/> ROTARY (AIR)	9 <input type="checkbox"/> DRIVING
5 <input type="checkbox"/> AIR PERCUSSION	

CONTRACTOR

NAME OF WELL CONTRACTOR: **International Water Supply** LICENCE NUMBER: **2801**

ADDRESS: **P.O. Box 310 Barrie Ont**

NAME OF DRILLER OR BORER: **Wayne Dunn** LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: *[Signature]* SUBMISSION DATE: DAY **16** MO **9** YR **83**

OFFICE USE ONLY

DATA SOURCE: 58 CONTRACTOR: 59-62 DATE RECEIVED: **20 09 83** 63-68 80

DATE OF INSPECTION: INSPECTOR: **JK**

REMARKS:

CSS.ES

WATER WELL RECORD

310/SE

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

(11)

5719264

MUNICIPALITY 57501

CON.

COUNTY OR DISTRICT: **Simcoe** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Barrie** CON. BLOCK TRACT, SURVEY ETC: **TV** LOT: **25 or 24**

OWNER (SURNAME FIRST): **Barrie PUC** ADDRESS: **Bayfield St., Barrie** DATE COMPLETED: DAY **14** MO **06** YR **84**

ZONE: **17** EASTING: **604600** NORTHING: **4915650** RC: **5** ELEVATION: **0700** BC: **5** BASIN CODE: **22**

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	22
	Clay	Sand and wood		22	30
	Sand	Clay layers		30	47
	Silty Clay	Stones		47	84
	Clay	Stones		84	101
	Sand	Gravel Boulders		101	106
	Gravel	Boulders	Hard Packed	106	121
	Sand	Gravel, Clay		121	145
	Gravel	Sand Boulders	Hard Packed Layers	145	202
RPSIR 1323				FEB 13 1987	

31 0022 01 0030 052835 0047 280574 0084 051281 0101 0512 0106 281113 1

32 0121 111373 0145 281105 0202 112813

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
24	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	.375	0	0107
16	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	.375	0	0154

SCREEN

SIZE(S) OF OPENING (SLOT NO.): **050 slot**

DIAMETER: **01200** INCHES

LENGTH: **46** FEET

MATERIAL AND TYPE: **telescope stainless steel**

DEPTH TO TOP OF SCREEN: **0155** FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE
0 - 107	Cement Grout
200 - 22-25	SS plate

71 PUMPING TEST METHOD

1 PUMP 2 BAILER

PUMPING RATE: **1204** GPM

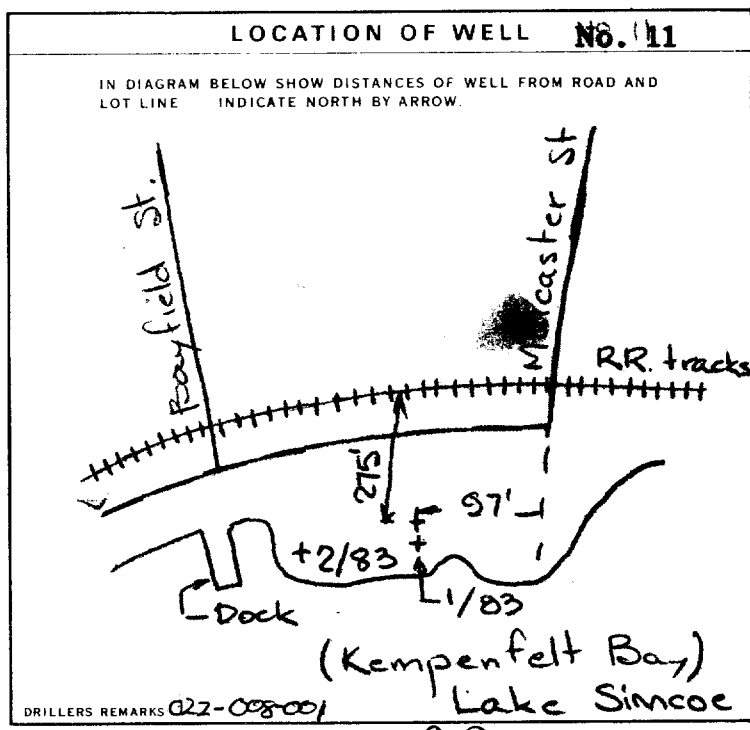
DURATION OF PUMPING: **72** HOURS **00** MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
42.0'	085'	070' 073' 073' 073'
		71.6' 72.12' 72.87' 73.00'

PUMP INTAKE SET AT: **1.3' BPP (Mary St. on)**

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: CLEAR CLOUDY



FINAL STATUS OF WELL: **1**

WATER USE: **07**

METHOD OF DRILLING: **3**

CONTRACTOR: **International Water Supply, Ltd.** LICENCE NUMBER: **2801**

ADDRESS: **P.O. Box 310, Barrie, Ontario.**

NAME OF DRILLER OR BORER: **J. Gray** LICENCE NUMBER: _____

SIGNATURE OF CONTRACTOR: _____ SUBMISSION DATE: DAY **30** NO. **7** YR. **84**

OFFICE USE ONLY

DATA SOURCE: **1** CONTRACTOR: **2801** DATE OF INSPECTION: _____ INSPECTOR: **JK**

REMARKS: _____

CSS.ES



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COUNTY OR DISTRICT SIMCOE	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE CITY OF BARRIE (Vespra)	CON. BLOCK, TRACT, SURVEY, ETC. IV	LOT 25
OWNER (SURNAME FIRST) BARRIE P.U.C.	ADDRESS P.O. BOX 7000, BARRIE, ONT.	DATE COMPLETED DAY 30 MO 7 YR 90	

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	32
	Sand	Gravel, Silty Clay		32	58
Grey	Clay		Soft	58	68
	Silty Clay	Fine Sand, Some Gravel		68	91
Grey	Clay		Hard	91	109
Grey	Clay	Sand (Fine-Very Fine)		109	130
Grey	Clay	Sand Streaks, Gravel	Packed	130	162
Grey	Clay(Hard)	Marl, Sand, Some Fine Gravel		162	195
	Sand	Fine Gravel, Clay, Marl		195	202
Grey	Clay(Very Hard)	Marl, Sand, Gravel		202	219
Grey	Clay(Very Hard)	Gravel		219	226
Grey	Clay(Very Hard)			226	237

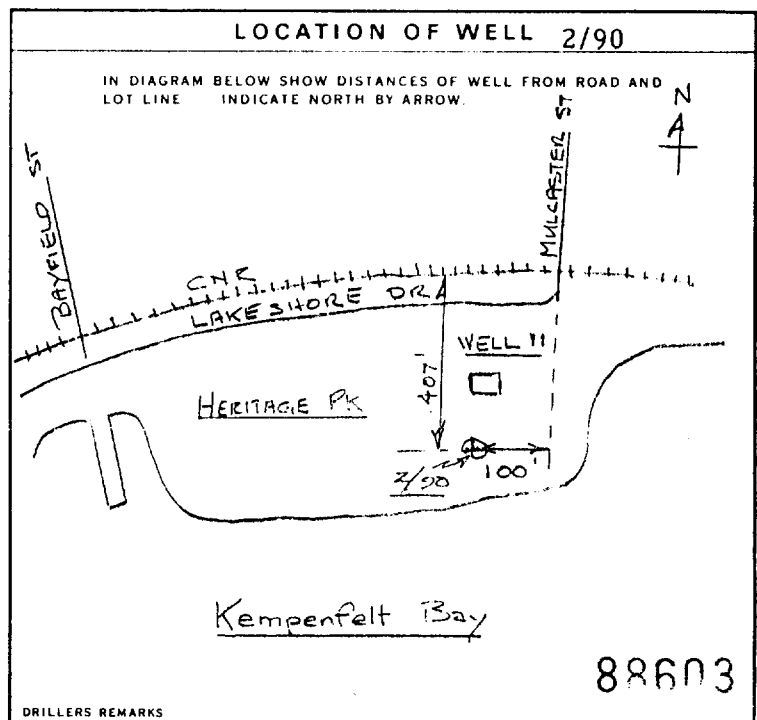
WATER RECORD	
WATER FOUND AT - FEET	KIND OF WATER
	<input type="checkbox"/> FRESH <input type="checkbox"/> SULPHUR <input type="checkbox"/> SALTY <input type="checkbox"/> MINERALS <input type="checkbox"/> GAS
	<input type="checkbox"/> FRESH <input type="checkbox"/> SULPHUR <input type="checkbox"/> SALTY <input type="checkbox"/> MINERALS <input type="checkbox"/> GAS
	<input type="checkbox"/> FRESH <input type="checkbox"/> SULPHUR <input type="checkbox"/> SALTY <input type="checkbox"/> MINERALS <input type="checkbox"/> GAS
	<input type="checkbox"/> FRESH <input type="checkbox"/> SULPHUR <input type="checkbox"/> SALTY <input type="checkbox"/> MINERALS <input type="checkbox"/> GAS

CASING & OPEN HOLE RECORD				
INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10	<input checked="" type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC		(-)2	58'
	<input type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC			
	<input type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC			

SCREEN	SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
		INCHES	FEET
	MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN

PLUGGING & SEALING RECORD		
DEPTH SET AT - FEET		MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
FROM	TO	
2	237	Hole tremie filled with Grout

PUMPING TEST	PUMPING TEST METHOD		PUMPING RATE	DURATION OF PUMPING		
	<input type="checkbox"/> PUMP	<input type="checkbox"/> BAILER	GPM	HOURS	MIN.	
	STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING			
			15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
	FEET	FEET	FEET	FEET	FEET	FEET



FINAL STATUS OF WELL	<input type="checkbox"/> WATER SUPPLY <input type="checkbox"/> OBSERVATION WELL <input type="checkbox"/> TEST HOLE <input type="checkbox"/> RECHARGE WELL	<input checked="" type="checkbox"/> ABANDONED, INSUFFICIENT SUPPLY <input type="checkbox"/> ABANDONED, POOR QUALITY <input type="checkbox"/> UNFINISHED <input type="checkbox"/> DEWATERING
WATER USE	<input type="checkbox"/> DOMESTIC <input type="checkbox"/> STOCK <input type="checkbox"/> IRRIGATION <input type="checkbox"/> INDUSTRIAL <input type="checkbox"/> OTHER	<input type="checkbox"/> COMMERCIAL <input type="checkbox"/> MUNICIPAL <input type="checkbox"/> PUBLIC SUPPLY <input type="checkbox"/> COOLING OR AIR CONDITIONING <input checked="" type="checkbox"/> NOT USED
METHOD OF CONSTRUCTION	<input type="checkbox"/> CABLE TOOL <input checked="" type="checkbox"/> ROTARY (CONVENTIONAL) <input type="checkbox"/> ROTARY (REVERSE) <input type="checkbox"/> ROTARY (AIR) <input type="checkbox"/> AIR PERCUSSION	<input type="checkbox"/> BORING <input type="checkbox"/> DIAMOND <input type="checkbox"/> JETTING <input type="checkbox"/> DRIVING <input type="checkbox"/> DIGGING <input type="checkbox"/> OTHER

CONTRACTOR	NAME OF WELL CONTRACTOR International Water Supply, Ltd.	WELL CONTRACTOR'S LICENCE NUMBER 2801
	ADDRESS 342 Bayview Dr., Barrie, Ont. L4M 4T5	
	NAME OF WELL TECHNICIAN G. Kaplinski	WELL TECHNICIAN'S LICENCE NUMBER T0038
	SIGNATURE OF TECHNICIAN/CONTRACTOR <i>G. Kaplinski</i>	SUBMISSION DATE DAY _____ MO _____ YR _____

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COUNTY OR DISTRICT SIMCOE	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE CITY OF BARRIE (Vespra)	CON. BLOCK, TRACT, SURVEY ETC IV	LOT 25
OWNER (SURNAME FIRST) BARRIE P.U.C.	ADDRESS P.O. BOX 7000, BARRIE, ONT.	DATE COMPLETED DAY 31 MO 7 YR 90	

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	Fill			0	31
	Sand	Gravel, Silty Clay		31	53
Grey	Clay		Soft	53	67
Grey	Silty Clay	Sand, Some Fine Gravel		67	89
Grey	Clay(hard)			89	95
	Clay	Sand	Layers	95	125
	Gravel	Sand, Marl		125	151
	Gravel	Some Clay		151	154
	Gravel			154	161
	Sand (sc)	Gravel		161	196
	Gravel	Sand		196	220
Grey	Clay	Gravel Boulders		220	230

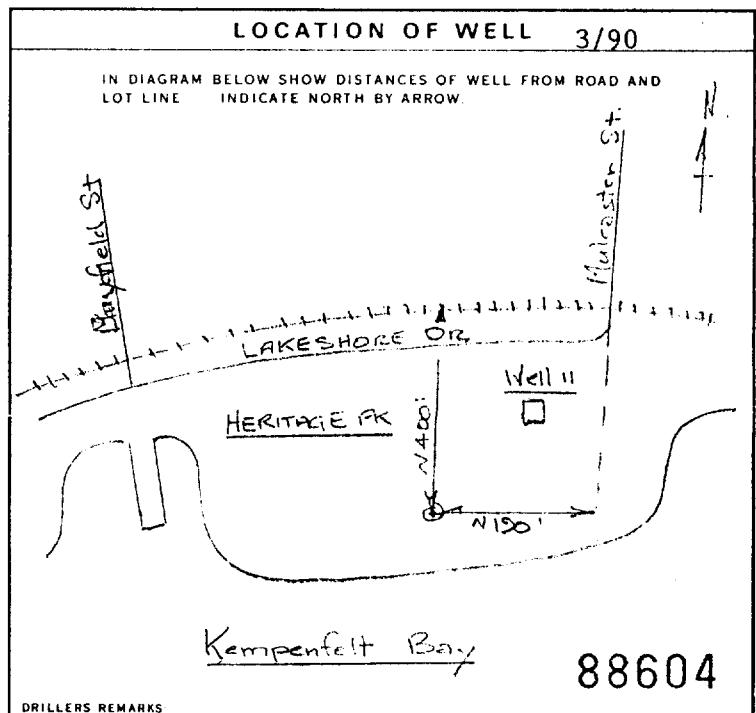
WATER RECORD	
WATER FOUND AT - FEET	KIND OF WATER
125-230	<input checked="" type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERALS <input type="checkbox"/> GAS
	<input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERALS <input type="checkbox"/> GAS
	<input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERALS <input type="checkbox"/> GAS
	<input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERALS <input type="checkbox"/> GAS

CASING & OPEN HOLE RECORD				
INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
2"	<input checked="" type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC		170	
1 1/4"	<input checked="" type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC		180	
	<input type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC			

SCREEN	SIZE(S) OF OPENING (SLOT NO.) 1/8" slot	DIAMETER 1 1/4" INCHES	LENGTH 30' FEET
	MATERIAL AND TYPE steel pipe(slotted)	DEPTH TO TOP OF SCREEN 1 1/4"-180' FEET	

PLUGGING & SEALING RECORD		
DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER, ETC.
10	Annulus tremie filled with Grout	

PUMPING TEST		PUMPING RATE	DURATION OF PUMPING	
PUMPING TEST METHOD <input checked="" type="checkbox"/> Air PUMP <input type="checkbox"/> BAILER		45 GPM	3	HOURS - MINS
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING		
11.09 FEET	14.96 FEET	15 MINUTES	30 MINUTES	45 MINUTES
		14.04 FEET	14.14 FEET	- FEET
				60 MINUTES
				14.37 FEET
IF FLOWING GIVE RATE		PUMP INTAKE SET AT		
		WATER AT END OF TEST		
		<input checked="" type="checkbox"/> CLEAR <input type="checkbox"/> CLOUDY		
RECOMMENDED PUMP TYPE		RECOMMENDED PUMP SETTING		
<input type="checkbox"/> SHALLOW <input type="checkbox"/> DEEP		FEET RATE GPM		



FINAL STATUS OF WELL	<input type="checkbox"/> WATER SUPPLY <input checked="" type="checkbox"/> OBSERVATION WELL <input type="checkbox"/> TEST HOLE <input type="checkbox"/> RECHARGE WELL	<input type="checkbox"/> ABANDONED, INSUFFICIENT SUPPLY <input type="checkbox"/> ABANDONED, POOR QUALITY <input type="checkbox"/> UNFINISHED <input type="checkbox"/> DEWATERING
WATER USE	<input type="checkbox"/> DOMESTIC <input type="checkbox"/> STOCK <input type="checkbox"/> IRRIGATION <input type="checkbox"/> INDUSTRIAL <input type="checkbox"/> OTHER	<input type="checkbox"/> COMMERCIAL <input type="checkbox"/> MUNICIPAL <input type="checkbox"/> PUBLIC SUPPLY <input type="checkbox"/> COOLING OR AIR CONDITIONING <input checked="" type="checkbox"/> NOT USED
METHOD OF CONSTRUCTION	<input type="checkbox"/> CABLE TOOL <input checked="" type="checkbox"/> ROTARY (CONVENTIONAL) <input type="checkbox"/> ROTARY (REVERSE) <input type="checkbox"/> ROTARY (AIR) <input type="checkbox"/> AIR PERCUSSION	<input type="checkbox"/> BORING <input type="checkbox"/> DIAMOND <input type="checkbox"/> JETTING <input type="checkbox"/> DRIVING <input type="checkbox"/> DIGGING <input type="checkbox"/> OTHER

CONTRACTOR	NAME OF WELL CONTRACTOR International Water Supply, Ltd.	WELL CONTRACTOR'S LICENCE NUMBER 2801
	ADDRESS 342 Bayview Dr., Barrie, Ont. L4M 4T5	
	NAME OF WELL TECHNICIAN G. Kaplinski	WELL TECHNICIAN'S LICENCE NUMBER T0038
	SIGNATURE OF TECHNICIAN/CONTRACTOR <i>[Signature]</i>	SUBMISSION DATE DAY _____ MO. _____ YR. _____

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Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11

5736742

Municipality
57501

Con. 10 14 15 22 23 24

County or District SIMCOE	Township, Borough, City or Village VESPRE (CITY OF BARRIE)	Con. block tract survey , etc. V	Lot 24
Owner's surname CITY OF BARRIE	First Name	Address P.O. BOX 400 BARRIE L4M4T5	Date completed 9 01 02 day month year

21

Zone Easting Northing RC Elevation RC Basin Code ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)					
General colour	Most common material	Other materials	General description	Depth - feet	
				From	To
	FILL			0	12
	SAND	SILT		12	66
GREY	CLAY	SILTY		66	160
	GRAVEL	SAND & MARL		160	171
	SAND GRAVEL	BOULDERS		171	192
	SAND GRAVEL	MARL & BOULDERS		192	210
	GRAVEL SAND	BOULDERS & CLAY		210	246
	GRAVEL SAND	MARL		246	251
GREY	CLAY			251	255
	GRAVEL & SAND			255	261

31

32

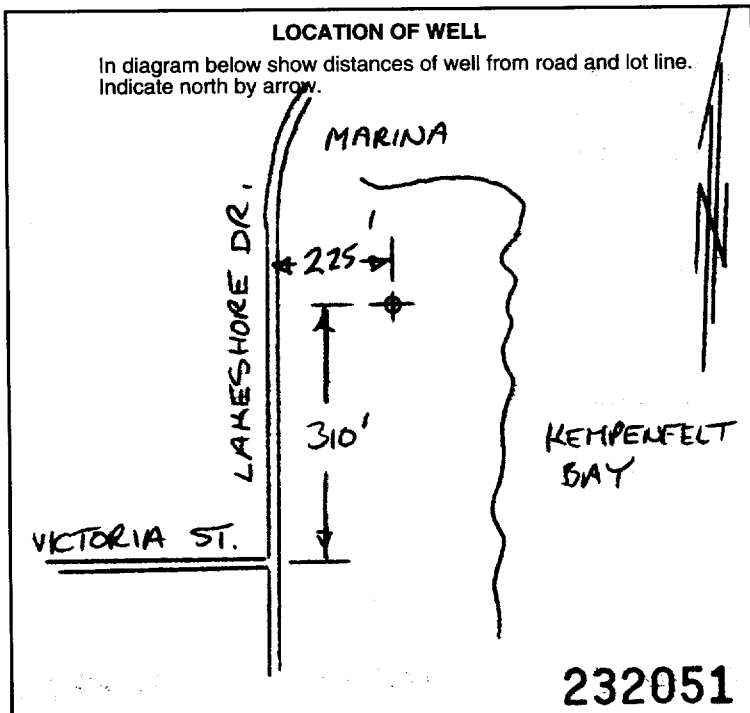
41 WATER RECORD			
Water found at - feet	Kind of water		
10-13	1 <input type="checkbox"/> Fresh 2 <input type="checkbox"/> Salty	3 <input type="checkbox"/> Sulphur 4 <input type="checkbox"/> Minerals 6 <input type="checkbox"/> Gas	14
15-18	1 <input type="checkbox"/> Fresh 2 <input type="checkbox"/> Salty	3 <input type="checkbox"/> Sulphur 4 <input type="checkbox"/> Minerals 6 <input type="checkbox"/> Gas	19
20-23	1 <input type="checkbox"/> Fresh 2 <input type="checkbox"/> Salty	3 <input type="checkbox"/> Sulphur 4 <input type="checkbox"/> Minerals 6 <input type="checkbox"/> Gas	24
25-28	1 <input type="checkbox"/> Fresh 2 <input type="checkbox"/> Salty	3 <input type="checkbox"/> Sulphur 4 <input type="checkbox"/> Minerals 6 <input type="checkbox"/> Gas	29
30-33	1 <input type="checkbox"/> Fresh 2 <input type="checkbox"/> Salty	3 <input type="checkbox"/> Sulphur 4 <input type="checkbox"/> Minerals 6 <input type="checkbox"/> Gas	34

51 CASING & OPEN HOLE RECORD				
Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
10-11	1 <input type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic			13-16
17-18	1 <input type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic			20-23
24-25	1 <input type="checkbox"/> Steel 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic			27-30

SCREEN	Sizes of opening (Slot No.)	Diameter	Length
	31-33	34-38 inches	39-40 feet
	Material and type		Depth at top of screen
			41-44 feet

61 PLUGGING & SEALING RECORD		
<input type="checkbox"/> Annular space		<input checked="" type="checkbox"/> Abandonment
Depth set at - feet		Material and type (Cement grout, bentonite, etc.)
From	To	
261	104	PEA STONE
104	3	BENTONITE
26-29	30-33	80

71 PUMPING TEST	
Pumping test method 1 <input type="checkbox"/> Pump 2 <input type="checkbox"/> Bailer	Pumping rate 11-14 GPM
Duration of pumping 15-18 Hours 17-18 Mins	
Static level 19-21 feet	Water level end of pumping 22-24 feet
Water levels during 1 <input type="checkbox"/> Pumping 2 <input type="checkbox"/> Recovery	
15 minutes 26-28 feet	30 minutes 29-31 feet
45 minutes 32-34 feet	60 minutes 35-37 feet
If flowing give rate 38-41 GPM	Pump intake set at feet
Recommended pump type <input type="checkbox"/> Shallow <input type="checkbox"/> Deep	Water at end of test <input type="checkbox"/> Clear <input type="checkbox"/> Cloudy
Recommended pump setting feet	Recommended pump rate 46-49 GPM



54 FINAL STATUS OF WELL		
1 <input type="checkbox"/> Water supply	5 <input type="checkbox"/> Abandoned, insufficient supply	9 <input type="checkbox"/> Unfinished
2 <input type="checkbox"/> Observation well	6 <input type="checkbox"/> Abandoned, poor quality	10 <input type="checkbox"/> Replacement well
3 <input type="checkbox"/> Test hole	7 <input checked="" type="checkbox"/> Abandoned (Other)	
4 <input type="checkbox"/> Recharge well	8 <input type="checkbox"/> Dewatering	

55-56 WATER USE		
1 <input type="checkbox"/> Domestic	5 <input type="checkbox"/> Commercial	9 <input checked="" type="checkbox"/> Not use
2 <input type="checkbox"/> Stock	6 <input type="checkbox"/> Municipal	10 <input type="checkbox"/> Other
3 <input type="checkbox"/> Irrigation	7 <input type="checkbox"/> Public supply	
4 <input type="checkbox"/> Industrial	8 <input type="checkbox"/> Cooling & air conditioning	

57 METHOD OF CONSTRUCTION		
1 <input type="checkbox"/> Cable tool	5 <input type="checkbox"/> Air percussion	9 <input type="checkbox"/> Driving
2 <input checked="" type="checkbox"/> Rotary (conventional)	6 <input type="checkbox"/> Boring	10 <input type="checkbox"/> Digging
3 <input type="checkbox"/> Rotary (reverse)	7 <input type="checkbox"/> Diamond	11 <input type="checkbox"/> Other
4 <input type="checkbox"/> Rotary (air)	8 <input type="checkbox"/> Jetting	

Name of Well Contractor INTERNATIONAL WATER SUPPLY	Well Contractor's Licence No. 2801
Address PO BOX 310 BARRIE ONT. L4M4T5	
Name of Well Technician R C MAGEE	Well Technician's Licence No. 78117
Signature of Technician/Contractor	Submission date 18 03 02 day mo yr

MINISTRY USE ONLY	Data source 2801	Contractor 2801	Date received MAR 26 2002
	Date of inspection	Inspector	
	Remarks		

Appendix B

Field Investigation Methodology and Protocols

Appendix B Field Investigation Methodology and Protocols

Utility Locates

Prior to initiating the subsurface investigation activities, all applicable utility companies (gas, telephone, network cables, pipelines and sewers) were contacted through Ontario One-Call. Also, a private utility locator was utilized to demarcate the location of the respective underground utilities to ensure the lines were not damaged during the investigation work.

Health and Safety

A Site-specific Health and Safety Plan (HASP) outlining specific job tasks and their related hazards was prepared and implemented by GHD prior to initiating field activities. The HASP presents the visually observed Site conditions and identifies potential physical hazards to field personnel. All GHD field and project staff working on and/or visiting the site were required to sign the HASP to document their knowledge of the potential hazards while on-site.

All drilling activities were conducted under Level D Personal Protective Equipment (PPE), which consisted of protective gloves, hard hats, safety glasses, safety boots and reflective vests at all times.

Soil Classification

The soil was logged using the Unified Soil Classification System (USGS), making special note of any visual or olfactory evidence of potential impacts.

Monitoring Well Installation

Monitoring wells were installed in selected boreholes by the licensed water well drillers consistent with Regulation 903 – Wells. GHD technical staff supervised the monitoring well construction and well development to ensure conformance with GHD's Standard Operating Procedures.

The monitoring wells were constructed with 2-inch (~50 mm) Schedule 40 PVC screen and casing. The screen length used for the monitoring wells was 1.5 or 3.0 metres on average and pre-slotted (No. 10 slot). The annular space between the monitoring well screen and surrounding geological formation were backfilled with No. 3 grade silica sand to an average height of 0.6 metres above the top of the screen. The remaining annular space was backfilled with bentonite. Some monitoring wells were installed with minor alteration to the above installation details, due to the specific conditions encountered.

To complete the instrumentation, an expandable J-plug was installed on the riser style casing to cover the top of the riser pipe to protect against debris falling into the well and surface runoff infiltration. All wells were installed in a flushmount or monument configuration with concrete collar around the protective casing. Each groundwater monitoring well was instrumented with dedicated sampling equipment consisting of polyethylene tubing and Waterra foot valves for monitoring well development and installation.

Monitoring Well Development

Subsequent to the monitoring well installation, each well was developed to ensure hydraulic connection with the screened hydrostratigraphic unit. A hydraulic connection ensures that groundwater levels and samples are representative of the subsurface condition. Development also aids in achieving low-turbidity samples.

The wells were developed using dedicated 5/8" (~16 mm) diameter polyethylene tubing with a Waterra foot valve. Well development activities were undertaken until purged water was clear. In cases where a well was purged dry before sufficient development, the well water level was allowed to recover before continuing.

Surveying

Subsequent to installation, all wells and boreholes were surveyed for vertical and lateral control, and for water table elevation reference, using a geodetic benchmark to tie in vertical elevations relative to metres above mean sea level (mAMSL) at the Site. The ground surface and top of riser pipe elevation of each of well were surveyed with respect to this benchmark.

Water Level Measurements

The measurement of groundwater levels in monitoring wells was required during the hydrogeological investigation in order to determine the presence and depth of groundwater. Water level measurements were used to determine: hydraulic head, hydraulic gradients and the direction of groundwater flow.

Since many decisions concerning the vertical and horizontal flow of groundwater through various types of geologic conditions depend on groundwater/fluid measurements, the accuracy of the measurements made at an appropriate level of precision is very important. Typically, the precision required is 1 mm, and the equipment employed had measurement resolution at this level.

Manual groundwater level measurements were measured using a Solinst water level meter. Measurements were obtained by lowering the electrode, attached to a graduated polyethylene tape, slowly into the well until the indicator sounded. To ensure accuracy, all fluid level readings were double-checked in the field when recorded.

In order to provide reliable data, each round of water level measurements was collected over as short a period of time as possible. Barometric pressure can affect groundwater levels and, therefore, observation of significant weather changes during the period of water level measurements was noted. Rainfall events and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data noted if any of these controls are in effect during the groundwater level collection period.

Groundwater Sampling

Prior to initiating groundwater sample collection, the wells were purged of the standing stagnant groundwater volume using a dedicated Waterra foot valve and polyethylene tubing. Purging was performed until the water in the well was representative of the actual conditions in the hydrostratigraphic unit. Stabilization was achieved by the removal of at least three times the volume of standing water in the well. Purging was considered complete once purged groundwater field parameters including conductivity, temperature and pH were stable. Stabilization was achieved when field measurements for conductivity and temperature were within a range of plus or minus 10 percent of the average for the last three readings and field measurements for pH were within a range of plus or minus 0.1 pH unit of the average for the last three readings.

The wells were purged using dedicated inertial pumps. In the event of a slowly recharging well, the well was pumped dry to ensure all standing water was removed from the sand pack and then allowed to recover prior to sample collection.

In the event of a well with groundwater that contains a high amount of silt or sediment after well development, a 0.75"x36" PVC water bailer was used to collect the water.

Water samples were collected directly from the dedicated tubing or bailer to laboratory supplied sample containers. Samples were relinquished to an accredited analytical laboratory under Chain of Custody protocols.

Single Well Response Tests

Single well response tests (SWRT) were completed in selected monitoring well installations to determine the hydraulic conductivity of the screened geologic formation. The SWRT consisted of falling head tests (slug tests), and rising head tests (recovery tests) as described in the sections below.

1.1 Falling Head Test (Slug Test)

The slug test involves causing a sudden change in water level in a well and measuring the water level response within that well. Water level change may be induced by suddenly injecting or emplacing a known quantity or "slug" into the well. The slug can water or solid (stainless steel, polyvinyl chloride). A detailed description of the procedure is provided, as follows:

- i) The static water level was determined prior to any testing of the well.
- ii) A datalogger, programmed to measure water pressure at an appropriate interval (eg. 5 seconds), was installed in the well at a known depth.
- iii) A slug of known dimensions was set in place just above the static water level.
- iv) The slug was then released instantaneously until it was completely submerged in the water column.
- v) After the initial positive displacement of the water column, water levels were monitored manually.
- vi) When the water level reached approximately 90 percent of the original observed (static) water level, the slug was then rapidly removed from the water column to initiate a "rising-head" test.

1.2 Rising Head Test (Recovery Test)

The recovery test also involves causing a sudden change in water level in a well and measuring the water level response within that well. Water level change may be induced by suddenly removing a known quantity or "slug" out of the well. The slug is usually a stainless steel or polyvinyl chloride rod.

Recovery tests were carried out after the slug tests described above. Water level monitoring continued until the water level was within 10 percent of the original static level.

Appendix C

Stratigraphic and Instrumentation Logs



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW1-19
 DATE COMPLETED: 20 September 2019
 DRILLING METHOD: HSA and Mud Rotary
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE					
				NUMBER	INTERVAL	REC (%)	'N Value	PID (ppm)	
0.15	TOPSOIL(FILL), sandy, brown, moist, rootlets	0.15	CONCRETE		X				
0.5	SILT (FILL), trace sand, trace clay, trace gravel, light brown, moist	0.76		SS1	X	46	32	0	
1.0	SILTY SAND (FILL), gravelly, very dense, grey, limestone fragments, moist			SS2	X	21	55	0	
1.5	- trace clay, trace peat, loose, fine to medium grained, brown, wet, organics at 1.52m BGS			SS3	X	25	9	0	
2.0				SS4	X	29	9	0	
2.5				SS4	X	29	9	0	
3.0	PEAT, organic, with gravel, with sand, trace silt, dark brown, wet, rootlets	2.82			X				
3.5	- trace gravel, trace sand, with petroleum hydrocarbon odour at 3.05m BGS			SS7	X	46	2	29	
4.0	- wood fibers, no odour at 3.81m BGS			SS6	X	17	3	1	
4.5				SS7	X	0	4		
5.0				SS7	X	0	4		
5.5	- wet at 5.33m BGS			SS8	X	33	4	2	
6.0	- dark brown, wet at 6.10m BGS		BENTONITE		X				
6.5	SAND and SILT, medium dense, fine grained, grey, wet	6.30		SS9	X	75	16	1	
7.0	SILT, trace sand, grey, wet	6.86		SS10	X	71	17	1	
7.5				SS11	X	71	17	1	
8.0				SS11	X	71	17	1	
8.5				SS12	X	75	18	1	
9.0	- trace clay at 9.14m BGS			SS13	X	67	19	1	
9.5					X				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG 11201680-30.GPJ GHD_Corp 12/11/19



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW1-19
 DATE COMPLETED: 20 September 2019
 DRILLING METHOD: HSA and Mud Rotary
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' Value	PID (ppm)
10.5				SS14	X	67	20	1
11.0				SS15	X	67	19	1
11.5				SS16	X	67	17	1
12.0				SS17	X	54	13	1
12.5				SS18	X	63	11	1
13.0	- with clay, medium dense at 12.95m BGS		← 20/40 SAND	SS19	X	75	5	1
13.5		13.72		SS20	X	100	4	1
14.0	SILTY CLAY, medium stiff, grey, wet			SS21	X	100	3	1
14.5	- soft at 14.48m BGS		← BENTONITE	SS22	X	100	15	1
15.0								
15.5								
16.0	- stiff at 16.00m BGS							
16.5	END OF BOREHOLE @ 16.61m BGS	16.61						
17.0								
17.5								
18.0								
18.5								
19.0								
19.5								

WELL DETAILS
 Screened interval:
 12.22 to 13.74m BGS
 Length: 1.52m
 Diameter: 51mm
 Slot Size: 10
 Material: PVC
 Seal:
 0.30 to 11.89m BGS
 Material: BENTONITE
 Sand Pack:
 11.89 to 14.02m BGS
 Material: SILICA SAND #2

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○

OVERBURDEN LOG 11201680-30.GPJ GHD_Corp 12/11/19



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW2-19
 DATE COMPLETED: 17 September 2019
 DRILLING METHOD: HSA
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' Value	PID (ppm)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5	SAND (FILL), silty, trace gravel, medium dense, light brown, moist - with gravel, brown, moist to wet, asphalt at 0.76m BGS TIMBER (FILL), dark brown, wet PEAT, organic, trace sand, trace gravel, trace silt, dark brown, wet SILTY SAND, medium dense, brown, fine grained, wet - trace gravel, trace organics, loose, grey at 4.57m BGS END OF BOREHOLE @ 5.18m BGS	1.52 2.29 3.15 5.18	<p style="text-align: center;">WELL DETAILS Screened interval: 3.05 to 4.57m BGS Length: 1.52m Diameter: 51mm Slot Size: 10 Material: PVC Seal: 0.30 to 2.74m BGS Material: BENTONITE Sand Pack: 2.74 to 4.57m BGS Material: SILICA SAND #2</p>	SS1 SS2 SS3 SS4 SS5 SS6	X X X X X X	50 63 4 17 58 71	17 12 3 4 11 6	0 0 0 0 0 0

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG 11201680-30.GPJ GHD_Corp 12/11/19



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW3-19
 DATE COMPLETED: 18 September 2019
 DRILLING METHOD: HSA
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' Value	PID (ppm)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5	SAND (FILL), silty, with gravel, medium dense, light brown, moist - moist to wet, with asphalt fragments at 0.76m BGS SAND AND GRAVEL (FILL), with silt, trace peat, loose, dark brown, wet - very loose at 2.29m BGS SILTY SAND, trace gravel, trace organic peat, fine grained, very loose, brown, wet SANDY SILT, trace organics, light brown, wet - trace sand at 7.62m BGS - grey at 9.14m BGS	1.52 3.05 4.57	<p style="text-align: center;">CONCRETE</p>	SS1 SS2 SS3 SS4 SS5 SS6 SS7 SS8 SS9		50 79 29 8 67 100 100 75 67	21 13 9 2 4 6 8 11 13	4 0 3 2 0 0 0 1 0

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ○

OVERBURDEN LOG 11201680-30.GPJ GHD_Corp 12/11/19

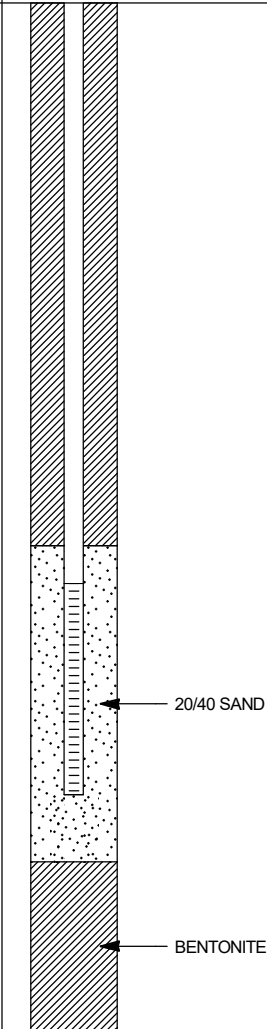


STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW3-19
 DATE COMPLETED: 18 September 2019
 DRILLING METHOD: HSA
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' Value	PID (ppm)
20.5				SS16	X	63	40	1
21.0								
21.5	SILTY SAND, trace clay, very dense, fine grained, grey, wet	21.34		SS17	X	71	52	1
22.0								
22.5								
23.0	- with bands of ~0.5cm thick clay, dense at 22.86m BGS			SS18	X	58	46	1
23.5								
24.0								
24.5	- trace clay, trace gravel, very dense at 24.38m BGS			SS19	X	71	77	1
25.0								
25.5								
26.0	SILT, trace clay, grey, wet	25.91		SS20	X	54	35	0
26.5								
27.0								
27.5								
28.0	END OF BOREHOLE @ 28.04m BGS	28.04		SS21	X	67	75	0
28.5								
29.0								
29.5								



WELL DETAILS
 Screened interval:
 24.20 to 25.73m BGS
 Length: 1.52m
 Diameter: 51mm
 Slot Size: 10
 Material: PVC
 Seal:
 0.30 to 23.93m BGS
 Material: BENTONITE
 Sand Pack:
 23.93 to 26.21m BGS
 Material: SILICA SAND #2

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 11201680-30.GPJ GHD Corp 12/11/19



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW4-19
 DATE COMPLETED: 30 September 2019
 DRILLING METHOD: HSA and Mud Rotary
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N Value	PID (ppm)
0.05	TOPSOIL (FILL), sandy, brown, moist, rootlets	0.05		SS1	X	50	12	0
0.5	SAND (FILL), with gravel, with silt, trace clay, compact, fine grained, dark brown, moist, faint sweet odour (asphalt)			SS2	X	79	8	0
1.0	- silty, loose, with wood fragments, brick, purple discolouration, faint sweet odour at 0.76m BGS			SS3	X	50	2	1
1.5	SAND, silty, trace clay, trace organics, very loose, fine grained, brown, moist to wet, no odour	1.52		SS4	X	63	7	0
2.0	- loose, wet at 2.29m BGS			SS5	X	58	3	0
2.5				SS6	X	71	9	0
3.0	- very loose, grey and brown at 3.05m BGS			SS7	X	67	17	1
3.5				SS8	X	67	17	1
4.0	- trace silt, loose, brown at 3.81m BGS			SS9	X	58	18	1
4.5	- silty, medium dense, brown with minor grey, deformed bands at 4.57m BGS			SS10	X	50	7	0
5.0	- brown at 5.33m BGS			SS11	X	71	7	0
5.5				SS12	X	75	9	0
6.0	SANDY SILT, brown, wet	6.10		SS13	X	92	3	0
6.5	- grey at 6.61m BGS							
7.0	- trace sand at 6.86m BGS							
7.5								
8.0								
8.5	- clayey at 8.38m BGS							
9.0								
9.5								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG 11201680-30.GPJ GHD_Corp 12/11/19



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW5-19
 DATE COMPLETED: 26 September 2019
 DRILLING METHOD: HSA and Mud Rotary
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE					
				NUMBER	INTERVAL	REC (%)	'N' Value	PID (ppm)	
0.5	TOPSOIL (FILL), sandy, brown, moist, rootlets SAND AND GRAVEL (FILL), trace silt, medium dense, grey, moist	0.02	CONCRETE	SS1	X	50	22	0	
1.0	SAND (FILL), with gravel, trace silt, loose, brown and grey, moist, with asphalt fragments	0.76		SS2	X	38	9	3	
1.5	- with silt, compact, fine grained at 1.52m BGS			SS3	X	46	13	0	
2.0				SS4	X	33	16	0	
3.0	SILTY SAND, very loose, fine grained, black-brown, wet	3.05		SS5	X	75	3	1	
3.5	- trace gravel, dark grey at 3.81m BGS			SS6	X	58	3	0	
4.0				SS7	X	21	9	0	
4.5				SS8	X	79	14	0	
5.0	- medium dense at 5.33m BGS		BENTONITE	SS9	X	63	19	0	
5.5				SS10	X	75	22	0	
6.0	- trace gravel at 6.10m BGS			SS11	X	58	26	0	
6.5				SS12	X	58	16	0	
7.0	- trace silt at 6.86m BGS			SS13	X	54	10	0	
7.5	- medium dense, fine grained, grey, wet at 7.62m BGS								
8.0									
8.5									
9.0	SANDY SILT, trace clay, stiff, fine grained, grey, wet	9.14							
9.5	- trace sand, trace gravel at 9.91m BGS								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 11201680-30.GPJ GHD_Corp 12/11/19



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW5-19
 DATE COMPLETED: 26 September 2019
 DRILLING METHOD: HSA and Mud Rotary
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N Value	PID (ppm)
10.5				SS14	X	71	11	0
11.0				SS15	X	63	3	0
11.5			20/40 SAND	SS16	X	92	4	0
12.0	- with clay, soft at 12.19m BGS			SS17	X	108	4	0
12.5		12.95		SS18	X	108	15	0
13.0	SILTY CLAY, silty, trace sand, stiff, grey, wet			SS19	X	92	11	0
13.5			BENTONITE	SS20	X	79	15	0
14.0	- stringer of silty sand from 14.02 to 14.17m BGS			SS21	X	104	8	0
14.5								
15.0								
15.5		15.85						
16.0	END OF BOREHOLE @ 15.85m BGS							
16.5			WELL DETAILS Screened interval: 10.67 to 12.19m BGS Length: 1.52m Diameter: 51mm Slot Size: 10 Material: PVC Seal: 0.30 to 10.36m BGS Material: BENTONITE Sand Pack: 10.36 to 12.50m BGS Material: SILICA SAND #2					
17.0								
17.5								
18.0								
18.5								
19.0								
19.5								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW6-19
 DATE COMPLETED: 25 September 2019
 DRILLING METHOD: HSA and Mud Rotary
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N Value	PID (ppm)
0.18	SAND (TOPSOIL), silty, trace gravel, brown, moist	0.18	CONCRETE	SS1	X	67	18	0
0.5	SILT (FILL), sandy, trace gravel, compact, light brown, moist - trace clay at 0.76m BGS			SS2	X	71	16	1
1.0				SS3	X	63	13	1
1.5	- trace asphalt at 1.52m BGS			SS4	X	46	15	1
2.0				SS5	X	29	12	1
2.5	- brick at 2.29m BGS			SS6	X	29	4	1
3.0				SS7	X	29	3	1
3.5	- brick, wood fragments at 3.05m BGS			SS8	X	46	4	1
4.0				SS9	X	71	2	1
4.5	- very loose, moist to wet at 3.81m BGS			SS10	X	83	5	1
5.0				SS11	X	58	11	0
5.5	- dark brown, wet at 4.57m BGS			SS12	X	58	6	1
6.0				SS13	X	88	4	0
5.94	SAND, very loose, fine grained, brown, wet, with brick fragments - grey, without brick fragments at 6.50m BGS	5.94	BENTONITE					
7.0								
7.5	- sand, with silt, compact, grey at 7.62m BGS							
8.0								
8.5	- loose at 8.38m BGS							
8.92	CLAYEY SILT, with clay, trace sand, medium stiff, grey, wet - soft at 9.14m BGS	8.92						
9.0								
9.5	- very soft at 9.91m BGS							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS

OVERBURDEN LOG 11201680-30.GPJ GHD_Corp 12/11/19



STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: 57-75 Bradford Street Property
 PROJECT NUMBER: 11201680
 CLIENT: Barrie Lakeshore Developments
 LOCATION: 51-75 Bradford Street, Barrie, Ontario

HOLE DESIGNATION: MW6-19
 DATE COMPLETED: 25 September 2019
 DRILLING METHOD: HSA and Mud Rotary
 FIELD PERSONNEL: S. Howell

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH m BGS	Monitoring Well	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' Value	PID (ppm)
10.5				SS14	X	96	1	0
11.0				SS15	X	113	0	0
11.5				ST16	X	100	-	0
12.0					X			
12.5				SS17	X	88	2	0
13.0	- firm at 12.95m BGS				X			
13.5	SILTY CLAY, medium stiff, grey, wet	13.26		SS18	X	100	6	0
14.0	- trace sand at 13.72m BGS				X			
14.5	- minor silt partings, soft at 14.48m BGS			SS19	X	100	7	0
15.0	- trace silt at 15.24m BGS				X			
15.5				SS20	X	104	4	0
16.0	- medium stiff at 16.00m BGS				X			
16.5				SS21	X	113	3	0
17.0					X			
17.5	END OF BOREHOLE @ 17.37m BGS	17.37		SS22	X	108	8	0
18.0					X			
18.5				SS23	X	108	6	0
19.0					X			
19.5					X			

WELL DETAILS
 Screened interval:
 15.85 to 17.37m BGS
 Length: 1.52m
 Diameter: 51mm
 Slot Size: 10
 Material: PVC
 Seal:
 0.30 to 15.54m BGS
 Material: BENTONITE
 Sand Pack:
 15.54 to 17.37m BGS
 Material: SILICA SAND #2

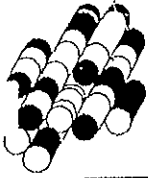
20/40 SAND

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS



OVERBURDEN LOG 11201680-30.GPJ GHD_Corp 12/11/19



Terraprobe

LOG OF BOREHOLE 100

PROJECT: Blue Sails Site Development

DATE: June 6, 2008

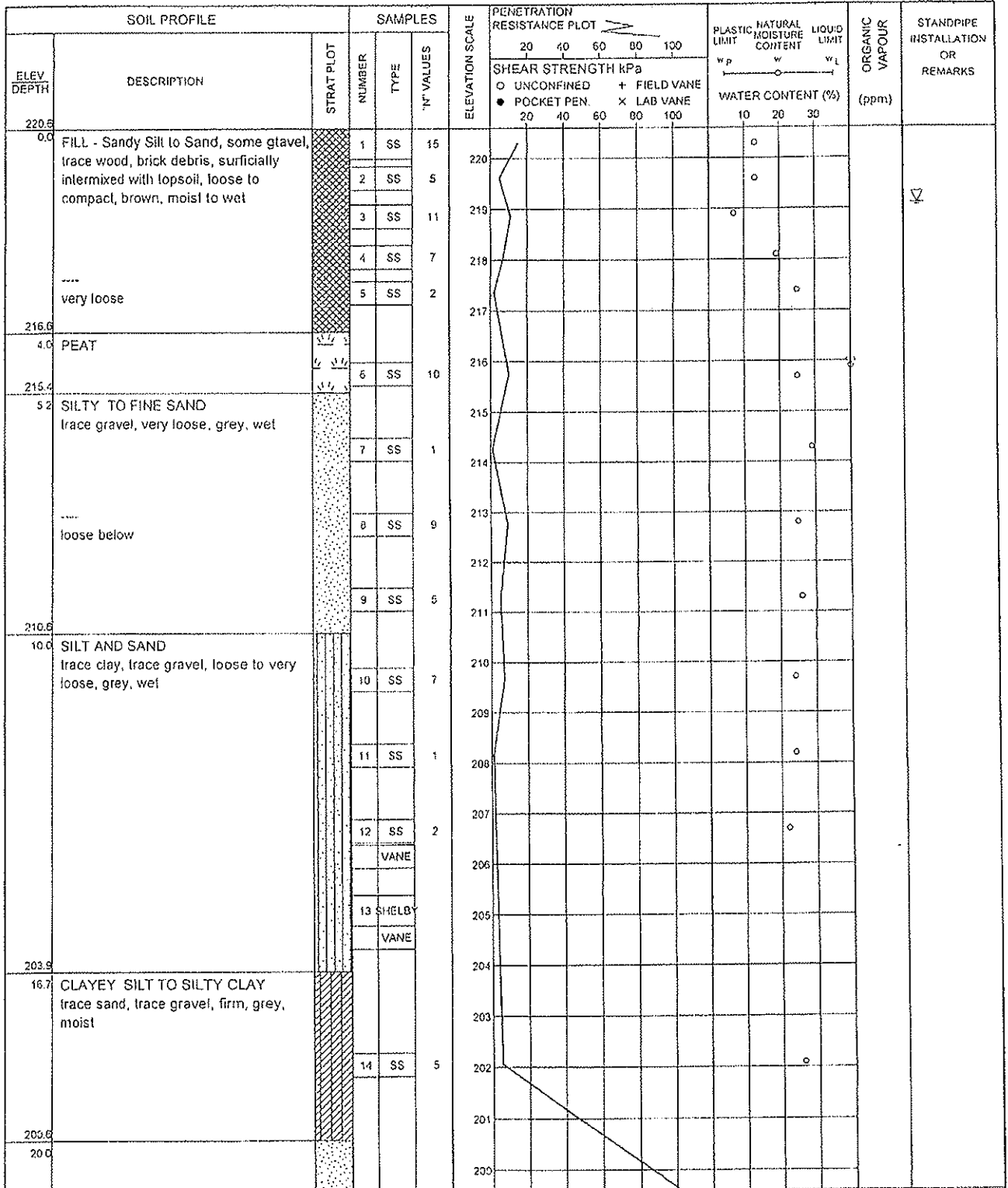
LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

CLIENT:

ELEVATION DATUM: Geodetic

FILE: 3-08-4039



NOTES:
Borehole was caving at 1.5m and unstabilized water level at 1.5m (Elev. 119.1m) upon completion of drilling.



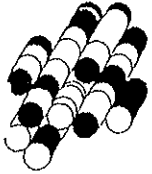
Terraprobe

LOG OF BOREHOLE 100

PROJECT: Blue Salis Site Development DATE: June 6, 2008
 LOCATION: Bradford Street to Lakeshore Drive EQUIPMENT: Bombardier/Hollow Stem Augers
 CLIENT: _____ ELEVATION DATUM: Geodetic FILE: 3-08-4039

SOIL PROFILE			SAMPLES			PENETRATION RESISTANCE PLOT		FLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	20	40	60	80	100			W _p	W	W _L
188.5	SILTY TO FINE SAND trace gravel, dense to very dense, grey, wet		15	SS	50/15cm	199									
			16	SS	53	195									
			17	SS	46	193									
			18	SS	69	190									
188.5			SANDY SILT trace clay, trace gravel dense to very dense, grey, moist		19	SS	46	187							
182.5	20	SS			30/28cm	184									
180.5	21	SS			77	181									
180.5	COARSE SAND some gravel, trace silt, very dense, grey, moist to wet					182									
180.5	End of Borehole					151									

NOTES:
 Borehole was caving at 1.5m and unstabilized water level at 1.5m (Elev. 119.1m) upon completion of drilling.



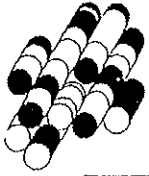
Terraprobe

LOG OF BOREHOLE 101

PROJECT: Blue Sails Site Development DATE: 5-6 June, 2008
 LOCATION: Bradford Street to Lakeshore Drive EQUIPMENT: Bombardier/Hollow Stem Augers
 CLIENT: _____ ELEVATION DATUM: Geodetic FILE: 3-08-4039

SOIL PROFILE		SAMPLES			PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE						
195.6	SILTY TO FINE SAND trace gravel, very dense, grey, wet		15	SS	79	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● POCKET PEN x LAB VANE 20 40 60 80 100 WATER CONTENT (%) 10 20 30				
196.0			16	SS	86					
197.0			17	SS	53					
198.0			18	SS	50/15cm					
186.0	FINE TO COARSE SAND trace to some silt, trace gravel, very dense, grey, wet		19	SS	50/13cm					
185.0			20	SS	50/13cm					
181.5	End of Borehole		21	SS	50/14cm					

NOTES:
 Borehole was caving at 3.7m and unstabilized water level at 2.1m (Elev. 219.7m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 102

PROJECT: Blue Sails Site Development

DATE: May 30, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Dynamic Cone Penetration Test

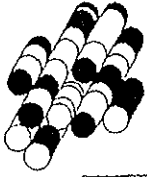
CLIENT: _____

ELEVATION DATUM: Geodetic

FILE: 3-08-4039

SOIL PROFILE		SAMPLES			PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE						
222.0 0.0										
222										
221										
220										
219										
218										
217										
216										
215										
214										
213										
212										
211										
210										
209										
208										
207										
206										
205										
204										
203										

NOTES:



Terraprobe

LOG OF BOREHOLE 103

PROJECT: Blue Sails Site Development

DATE: 3-4 June, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

CLIENT: _____

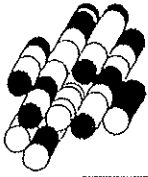
ELEVATION DATUM: Geodetic

FILE: 3-08-4039

SOIL PROFILE			SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT	FLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES												
221.5 0.0	very loose FILL - Sandy Silt to Sand, some gravel, concrete rubble, brick debris, topsoil presence, embedded rootlets, loose to compact, brown/dark grey, moist	[Hatched Pattern]	1	SS	12		20 40 60 80 100 20 40 60 80 100 10 20 30	w _p w w _L ○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE	WATER CONTENT (%) ○ ○ ○								
			2	SS	4												
			3	SS	3												
			4	SS	17												
			5	SS	4												
216.5 4.6	PEAT	[Wavy Pattern]	6	SS	4												
216.1	SILTY TO FINE SAND trace gravel, loose, brown, wet compact below grey	[Dotted Pattern]	7	SS	6												
			8	SS	13												
			9	SS	12												
211.5 10.0			SILT AND SAND trace clay, trace gravel, compact, grey, wet very loose	[Vertical Lines]	10							SS	12				
	11	SS			2												
	12	SS			2												
	13	SS			14												
				VANE													
			14	SS	22												
201.5 20.0		[Hatched Pattern]															

NOTES:

Borehole was caving at 3.6m and unstabilized water level at 2.7m (Elev. 218.8m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 103

PROJECT: Blue Sails Site Development

DATE: 3-4 June, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

CLIENT: _____

ELEVATION DATUM: Geodetic

FILE: 3-08-4039

SOIL PROFILE			SAMPLES			PENETRATION RESISTANCE PLOT	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	T _N VALUES						
186.5	CLAYEY SILT TO SILTY CLAY trace to some sand, trace gravel, embedded sand layers. very stiff to hard, grey, moist		15	SS	34	200		18	28		
			16	SS	62	197		18	28		
			17	SS	46	194		18	28		
			18	SS	21	191		18	28		
			19	SS	35	187		18	28		
181.4	SANDY SILT TO SILTY SAND trace clay, trace gravel, very dense, grey, moist to wet		20	SS	95/27cm	185		18	28		
40.1			21	SS	62	182		18	28		
	End of Borehole										

NOTES:

Borehole was caving at 3.6m and unstabilized water level at 2.7m (Elev. 218.8m) upon completion of drilling.



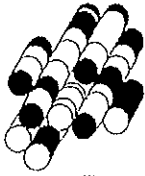
Terraprobe

LOG OF BOREHOLE 104

PROJECT: Blue Sails Site Development DATE: June 11, 2008
 LOCATION: Bradford Street to Lakeshore Drive EQUIPMENT: Dynamic Cone Penetration Test
 CLIENT: _____ ELEVATION DATUM: Geodetic FILE: 3-08-4039

ELEV. DEPTH	SOIL PROFILE		SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES					
220.5 00							SHEAR STRENGTH KPa ○ UNCONFINED + FIELD VANE ● POCKET PEN. × LAB VANE 20 40 60 80 100	W _P — W — W _L WATER CONTENT (%) 10 20 30		
220										
219										
218										
217										
216										
215										
214										
213										
212										
211										
210										
209										
208										
207										
206										
205										
204										
203										
202										
201										

NOTES:



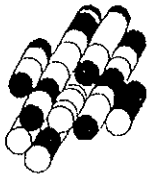
Terraprobe

LOG OF BOREHOLE 105

PROJECT: Blue Sails Site Development DATE: 26-27 May, 2008
 LOCATION: Bradford Street to Lakeshore Drive EQUIPMENT: Bombardier/Hollow Stem Augers
 CLIENT: _____ ELEVATION DATUM: Geodetic FILE: 3-08-4039

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
			NUMBER	TYPE	"N" VALUES						
222.3	FIL. - Silty Fine Sand, trace gravel, trace wood, trace brick, dense, brown, damp to moist ----- loose, grey	[Pattern]	1	SS	44	[Plot]	[Plot]	[Plot]	[Plot]	[Plot]	
0.0			2	SS	7						
220.2			3	SS	37						
2.1	coarse sand and cinders	[Pattern]	4	SS	6	[Plot]	[Plot]	[Plot]	[Plot]	[Plot]	
219.6			5	SS	4						
2.8	ORGANIC MATTER decayed vegetation, trace cinders, trace wood, loose, firm, brownish black, moist SILTY TO FINE SAND trace gravel, loose to compact, brown, wet ----- grey	[Pattern]	6	SS	10	[Plot]	[Plot]	[Plot]	[Plot]	[Plot]	
212.4			7	SS	21						
9.0			8	SS	12						
9.0			9	SS	4						
9.0			10	SS	4						
9.0			11	SS	1						
9.0			12	SS	6						
9.0			13	SS	17						
9.0			14	SS	12						
204.8	CLAYEY SILT TO SILTY CLAY trace sand, trace gravel, stiff, grey, moist	[Pattern]	15	SS	8	[Plot]	[Plot]	[Plot]	[Plot]	[Plot]	
17.5			16	SS	12						
201.7			16	SS	12						
20.6											

NOTES:
Borehole was caving at 3.7m and unstabilized water level at 3.0m (Elev. 219.3m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 105

PROJECT: Blue Sails Site Development

DATE: 26-27 May, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

CLIENT:

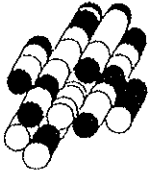
ELEVATION DATUM: Geodetic

FILE: 3-08-4039

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
			NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa	WATER CONTENT (%)					
	SANDY SILT trace gravel, trace clay, very dense, grey, very moist		17	SS	50/13cm	201							
			18	SS	50/10cm	200							
			19	SS	54	198							
			20	SS	63	196							
			21	SS	92	195							
	----- dense		22	SS	48	193							
192.5						192							
29.7	FINE TO COARSE SAND some silt, trace gravel, very dense, grey, very moist to wet		23	SS	67	192							
	----- dense		24	SS	36	190							
	----- sandy silt, some clay		25	SS	50/15cm	187							
183.6			26	SS	54/25cm	184							
38.5	End of Borehole												

NOTES:

Borehole was caving at 3.7m and unstabilized water level at 3.0m (Elev. 219.3m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 108

PROJECT: Blue Sails Site Development

DATE: 26-27 May, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

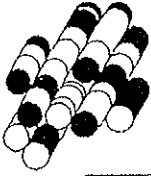
CLIENT: _____

ELEVATION DATUM: Geodetic

FILE: 3-08-4039

ELEV. DEPTH	SOIL PROFILE		SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES							
199.6	hard		15	SS	52	201						
22.8	SANDY SILT trace clay, trace gravel, dense, grey, very moist		16	SS	40	198						
	very dense below		17	SS	78	195						
			18	SS	97	192						
	silty sand		19	SS	50/13cm	189						
			20	SS	50/10cm	186						
184.1	End of Borehole		21	SS	50/13cm	185						
38.2												

NOTES:
Borehole was caving at 3.0m and unstabilized water level at 2.1m (Elev. 220.3m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 109

PROJECT: Blue Sails Site Development

DATE: 2-3 June, 2008

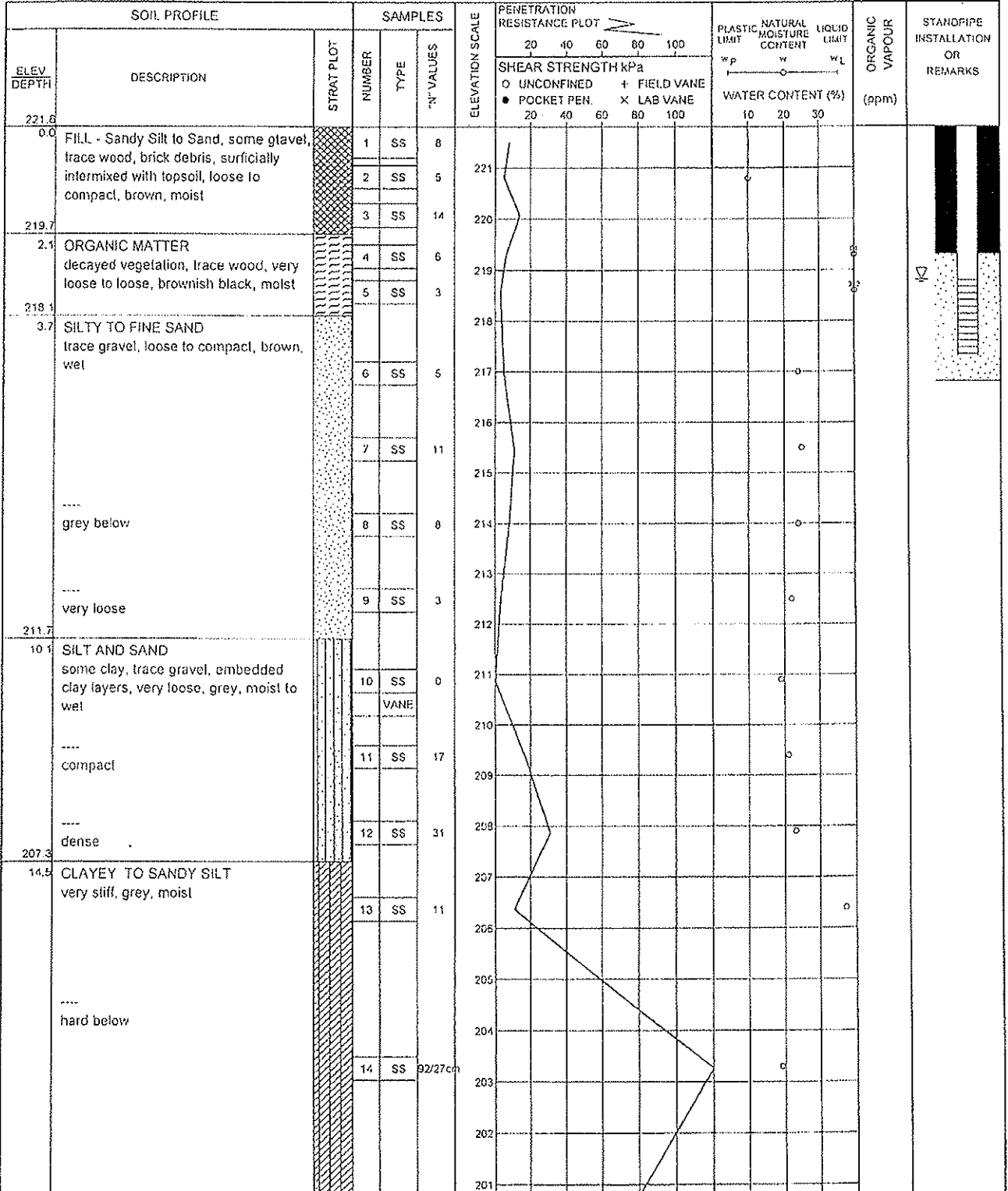
LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

CLIENT: _____

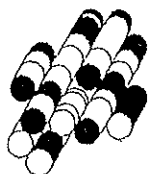
ELEVATION DATUM: Geodetic

FILE: 3-08-4039



NOTES:

Borehole was caving at 3.3m and unstabilized water level at 3.0m (Elev. 218.8m) upon completion of drilling.



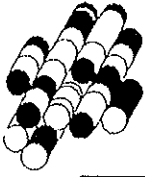
Terraprobe

LOG OF BOREHOLE 109

PROJECT: Blue Sails Site Development DATE: 2-3 June, 2008
 LOCATION: Bradford Street to Lakeshore Drive EQUIPMENT: Bombardier/Hollow Stem Augers
 CLIENT: _____ ELEVATION DATUM: Geodetic FILE: 3-08-4039

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT 20 40 60 80 100	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● POCKET PEN. x LAB VANE	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
			NUMBER	TYPE	"N" VALUES								
			15	SS	72								
			16	SS	33								
	----- silly sand, dense, wet -----		17	SS	44								
			18	SS	65								
			19	SS	50/13cm								
185.6 35.0	MEDIUM SAND trace gravel, trace silt, very dense, grey, wet												
184.6 37.0	End of Borehole		20	SS	63								

NOTES:
 Borehole was caving at 3.3m and unstabilized water level at 3.0m (Elev. 218.8m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 111

PROJECT: Blue Sails Site Development

DATE: 29-30 May, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

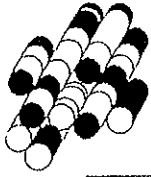
CLIENT: _____

ELEVATION DATUM: Geodetic

FILE: 3-08-4039

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
			NUMBER	TYPE	"N" VALUES		20	40					
222.6 0.0	FILL - Sand, some gravel intermixed with cinders, slags, brick debris, compact, brown/black, moist	[Pattern]	1	SS	18								[Standpipe Diagram]
221.6 0.8			2	SS	2								
221.2 1.4	FILL - Sand, trace silt, very loose, brown SILTY TO FINE SAND trace gravel, very loose to loose, brown, very moist wet	[Pattern]	3	SS	6								
			4	SS	7								
			5	SS	2								
			6	SS	6								
			7	SS	16								
	compact grey	[Pattern]	8	SS	15								
			9	SS	13								
			10	SS	3								
211.2 11.4	SILT AND SAND trace gravel, very loose, grey, moist to wet compact below	[Pattern]	11	SS	3								
			12	SS	29								
			13	SS	25								
205.9 16.7	CLAYEY SILT TO SILTY CLAY trace sand, trace gravel, firm, grey, moist	[Pattern]	14	SS	8								
201.5 20.7													

NOTES:
Borehole was caving at 3.0m and unstabilized water level at 1.22m (Elev. 221.3m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 111

PROJECT: Blue Sails Site Development

DATE: 29-30 May, 2008

LOCATION: Bradford Street to Lakeshore Drive

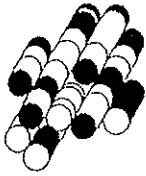
EQUIPMENT: Bombardier/Hollow Stem Augers

CLIENT: _____

ELEVATION DATUM: Geodetic

FILE: 3-08-4039

SOIL PROFILE		STRAT PLOT	SAMPLES		ELEVATION SCALE	PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE							
	SANDY SILT TO SILTY SAND trace gravel, trace clay, very dense, grey, very moist to wet		15	SS	69						
			16	SS	50						
			17	SS	60						
			18	SS	70						
			19	SS	62						
185.4		fine to coarse sand		20	SS	52					
37.2	End of Borehole										
NOTES: Borehole was caving at 3.0m and unstabilized water level at 1.22m (Elev. 221.3m) upon completion of drilling.											



Terraprobe

LOG OF BOREHOLE 112

PROJECT: Blue Sails Site Development

DATE: May 23, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Solid Stem Augers

CLIENT: _____

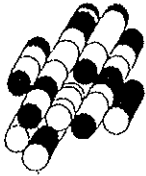
ELEVATION DATUM: Geodetic

FILE: 3-08-4039

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● POCKET PEN X LAB VANE	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
			NUMBER	TYPE	"N" VALUES							
220.9	50mm ASPHALT	[Pattern]										
220.0	700mm GRANULAR BASE	[Pattern]										
220.1	FILL - Sand, trace silt, trace gravel, brick debris, concrete debris, cinders, brown, compact, moist	[Pattern]	1	SS	18	220						
219.5		[Pattern]	2	SS	4	219						
218.8	ORGANIC MATTER	[Pattern]	3	SS	2	218						
218.1	decayed vegetation, trace wood, trace cinders, very soft, black, wet	[Pattern]	4	SS	2	218						
216.1	PEAT, trace marl fragments	[Pattern]				217						
214.4	SILTY TO FINE SAND trace gravel, very loose to loose, brown, wet	[Pattern]	5	SS	0	216						
214.4	End of Borehole		6	SS	9	215						

NOTES:

Borehole was caving at 4.2m and unstabilized water level at 2.1m (Elev. 218.8m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 113

PROJECT: Blue Salis Site Development

DATE: May 22, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Solid Stem Augers

CLIENT: _____

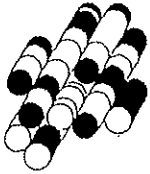
ELEVATION DATUM: Geodetic

FILE: 3-08-4039

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
			NUMBER	TYPE	"N" VALUES					
220.8 0.0	FILL - Sand, some gravel, trace silt, topsoil inclusions, concrete debris, trace cinders, loose to compact, dark brown, moist		1	SS	24					
219.2 1.4			2	SS	8					
218.5 1.4	ORGANIC MATTER decayed vegetation, trace wood, soft, brownish black, wet		3	SS	3					
218.5 2.1			4	SS	7					
214.1 6.6	SILTY TO FINE SAND trace gravel, loose to compact, greyish brown, wet		5	SS	6					
			6	SS	11					
			7	SS	8					
214.1 6.6	End of Borehole									

NOTES:

Borehole was caving at 5.0m and unstabilized water level at 1.8m (Elev. 218.8m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 114

PROJECT: Blue Sails Site Development

DATE: May 23, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Solid Stem Augers

CLIENT: _____

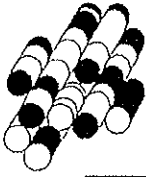
ELEVATION DATUM: Geodetic

FILE: 3-08-4039

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS					
			NUMBER	TYPE	"N" VALUES												
220.1 0.0	FILL - Sand, trace silt, trace gravel, topsoil inclusions, embedded rootlets, loose to compact, dark brown, moist --- cinders with some coarse sand		1	SS	4												
219.6			2	SS	16												
1.5 217.9	ORGANIC MATTER decayed vegetation, some gravel, compact, black, moist		3	SS	11												
2.2 217.3	PEAT SILTY TO FINE SAND trace gravel, trace decayed vegetation, loose to compact, dark brown, moist --- grey, wet below		4	SS	2												
2.8			5	SS	12												
313.6 6.6	End of Borehole		6	SS	9												
			7	SS	9												

NOTES:

Borehole was caving at 1.5m and unstabilized water level at 1.5m (Elev. 218.6m) upon completion of drilling



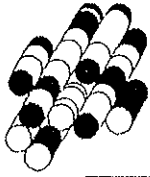
Terraprobe

LOG OF BOREHOLE 115

PROJECT: Blue Sails Site Development DATE: May 22, 2008
 LOCATION: Bradford Street to Lakeshore Drive EQUIPMENT: Bombardier/Solid Stem Augers
 CLIENT: _____ ELEVATION DATUM: Geodetic FILE: 3-08-4039

SOIL PROFILE			SAMPLES			ELEVATION SCALE	PENETRATION RESISTANCE PLOT	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES					
219.5 0.0	FILL - Silty Sand, trace gravel, topsoil inclusions with rootlets, brick debris, trace cinders, loose, brown, moist	[Hatched Pattern]	1	SS	7					
219.2 0.7			2	SS	8					
216.9 3.0	FILL - Gravelly Sandy Silt, brick debris, concrete rubble, loose to compact, grey, moist ----- very loose, wet	[Hatched Pattern]	3	SS	14					
			4	SS	3					
215.9 3.0	ORGANIC MATTER decayed vegetation, peat inclusions, trace rootlets, very soft, brownish black, moist	[Wavy Pattern]	5	SS	1					
215.1 4.8	COARSE SAND	[Dotted Pattern]	6	SS	26					
214.8 5.1	trace gravel, compact, brown, moist	[Dotted Pattern]								
	End of Borehole									

NOTES:
 Borehole was caving at 2.6m and unstabilized water level at 2.3m (Elev. 217.6m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 116

PROJECT: Blue Sails Site Development

DATE: May 22, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Solid Stem Augers

CLIENT:

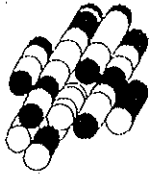
ELEVATION DATUM: Geodetic

FILE: 3-08-4039

SOIL PROFILE		STRAT PLOT	SAMPLES		ELEVATION SCALE	PENETRATION RESISTANCE PLOT	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS	
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE						"N" VALUES
220.1	FILL - Silty Sand, some gravel, concrete rubble, compact, grey/brown, moist	[Cross-hatched pattern]	1	SS	23	[Penetration resistance plot line]	○ UNCONFINED ● POCKET PEN.	○		
218.7			2	SS	30					○
1.4	dense, grey ---- very loose, brown ----	[Dotted pattern]	3	SS	31	[Penetration resistance plot line]	○ UNCONFINED ● POCKET PEN.	○		
			4	SS	3					○
			5	SS	14					○
215.0	FINE TO MEDIUM SAND some silt, trace gravel, loose to compact, greyish brown, very moist	[Dotted pattern]				[Penetration resistance plot line]	○ UNCONFINED ● POCKET PEN.	○		
5.1			6	SS	7					○
	End of Borehole									

NOTES:

Borehole was caving at 1.5m and unstabilized water level at 1.5m (Elev. 218.6m) upon completion of drilling.



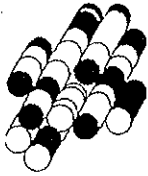
Terraprobe

LOG OF BOREHOLE 117

PROJECT: Blue Sails Site Development DATE: May 23, 2008
 LOCATION: Bradford Street to Lakeshore Drive EQUIPMENT: Bombardier/Solid Stem Augers
 CLIENT: _____ ELEVATION DATUM: Geodetic FILE: 3-08-4039

SOIL PROFILE			SAMPLES			PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES						
220.6	FILL - Sand, some silt to silty, some gravel, loose to compact, brown, damp to moist brick debris, concrete rubble, very moist ---- trace wood, organic matter, black		1	SS	24		○ UNCONFINED ● POCKET PEN	+ FIELD VANE x LAB VANE	W _p — W — W _L	WATER CONTENT (%)	
0.0			2	SS	10						
			3	SS	6						
			4	SS	26						
			5	SS	15						
216.8	FINE TO MEDIUM SAND trace gravel, compact, grey, wet		6	SS	27						
3.8											
215.5	End of Borehole										

NOTES:
 Borehole was caving at 2.0m and unstabilized water level at 1.8m (Elev. 218.8m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 119

PROJECT: Blue Sails Site Development

DATE: June 10, 2008

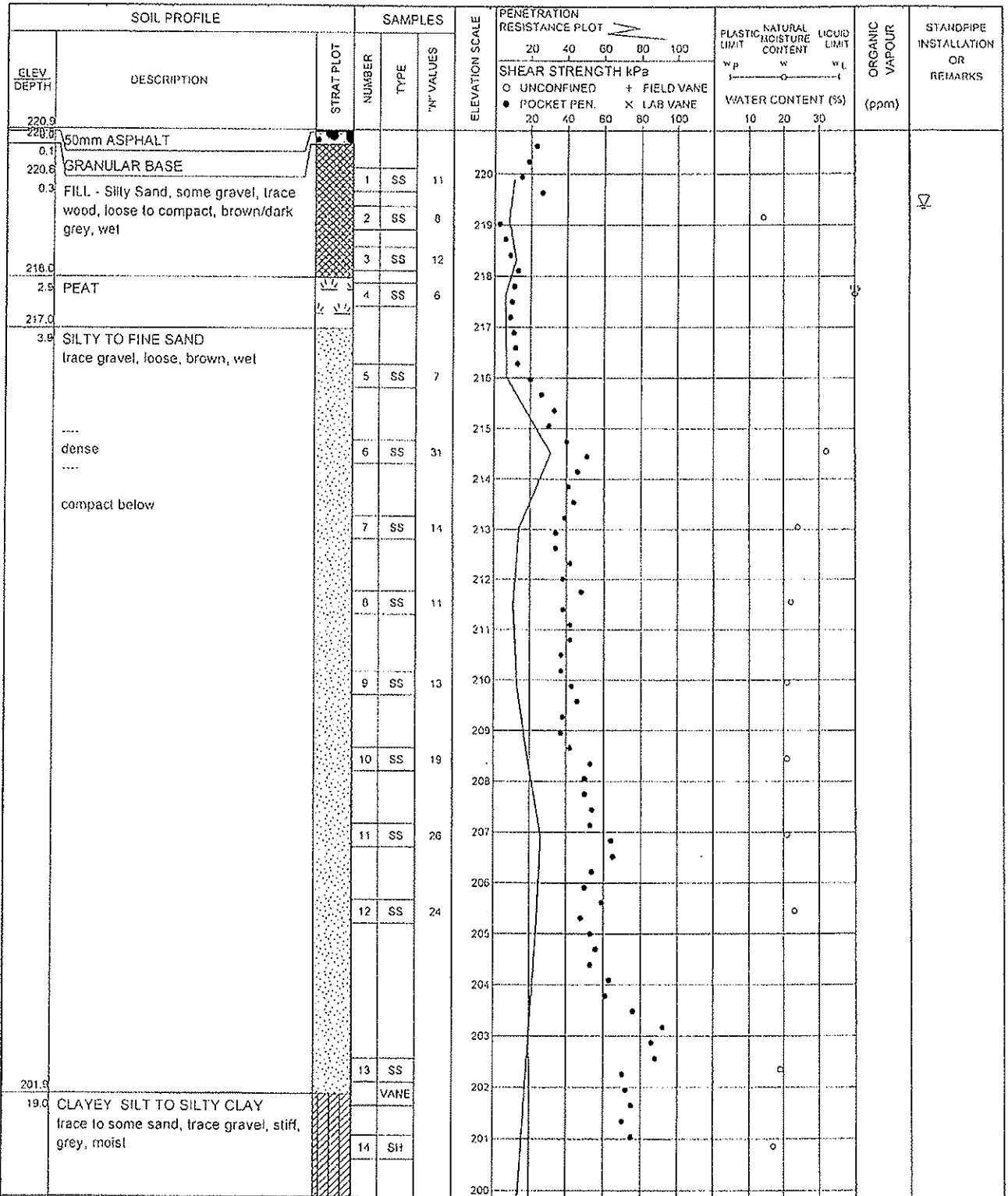
LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

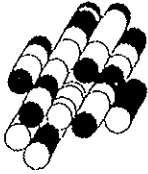
CLIENT: _____

ELEVATION DATUM: Geodetic

FILE: 3-08-4039



NOTES:
Borehole was caving at 1.5m and unstabilized water level at 1.5m (Elev. 218.3m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 119

PROJECT: Blue Sails Site Development

DATE: June 10, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Hollow Stem Augers

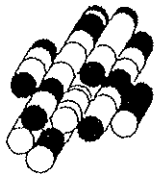
CLIENT: _____

ELEVATION DATUM: Geodetic

FILE: 3-08-4039

SOIL PROFILE			SAMPLES			PENETRATION RESISTANCE PLOT	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES				
195.4	CLAYEY SILT TO SILTY CLAY trace to some sand, trace gravel, stiff, grey, moist	[Hatched pattern]	15	SS	11	[Penetration curve]	[Moisture content]		
25.5	SANDY SILT trace gravel, trace clay, very dense, grey, moist	[Dotted pattern]	16	SS	53	[Penetration curve]	[Moisture content]		
190.0	SILTY SAND trace clay, trace gravel, very dense, grey, moist to wet	[Dotted pattern]	17	SS	50	[Penetration curve]	[Moisture content]		
30.0			18	SS	71	[Penetration curve]	[Moisture content]		
186.2	End of Borehole		19	SS	50/13cm	[Penetration curve]	[Moisture content]		
34.7									

NOTES:
Borehole was caving at 1.5m and unstabilized water level at 1.5m (Elev. 218.3m) upon completion of drilling.



Terraprobe

LOG OF BOREHOLE 120

PROJECT: Blue Sails Site Development

DATE: May 22, 2008

LOCATION: Bradford Street to Lakeshore Drive

EQUIPMENT: Bombardier/Solid Stem Augers

CLIENT: _____

ELEVATION DATUM: Geodetic

FILE: 3-08-4039

SOIL PROFILE			SAMPLES			PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	ORGANIC VAPOUR (ppm)	STANDPIPE INSTALLATION OR REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
220.3	FILL - Silty Sand, some gravel, brick debris, trace cinders, topsoil inclusions, embedded rootlets, trace wood, compact, dark brown, moist --- concrete rubble, petroleum odour, grey --- decayed vegetation, grey to black, wet		1	SS	12		○ UNCONFINED ● POCKET PEN	+ FIELD VANE x LAB VANE	w _p w w _L		
216.9			2	SS	27						
3.9			3	SS	15						
216.7			4	SS	14						
4.0			5	SS	10						
215.2			6	SS	8						
5.1	End of Borehole										

NOTES:
Borehole was caving at 3.3m and unstabilized water level at 1.2m (Elev. 219.1m) upon completion of drilling.

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 10, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

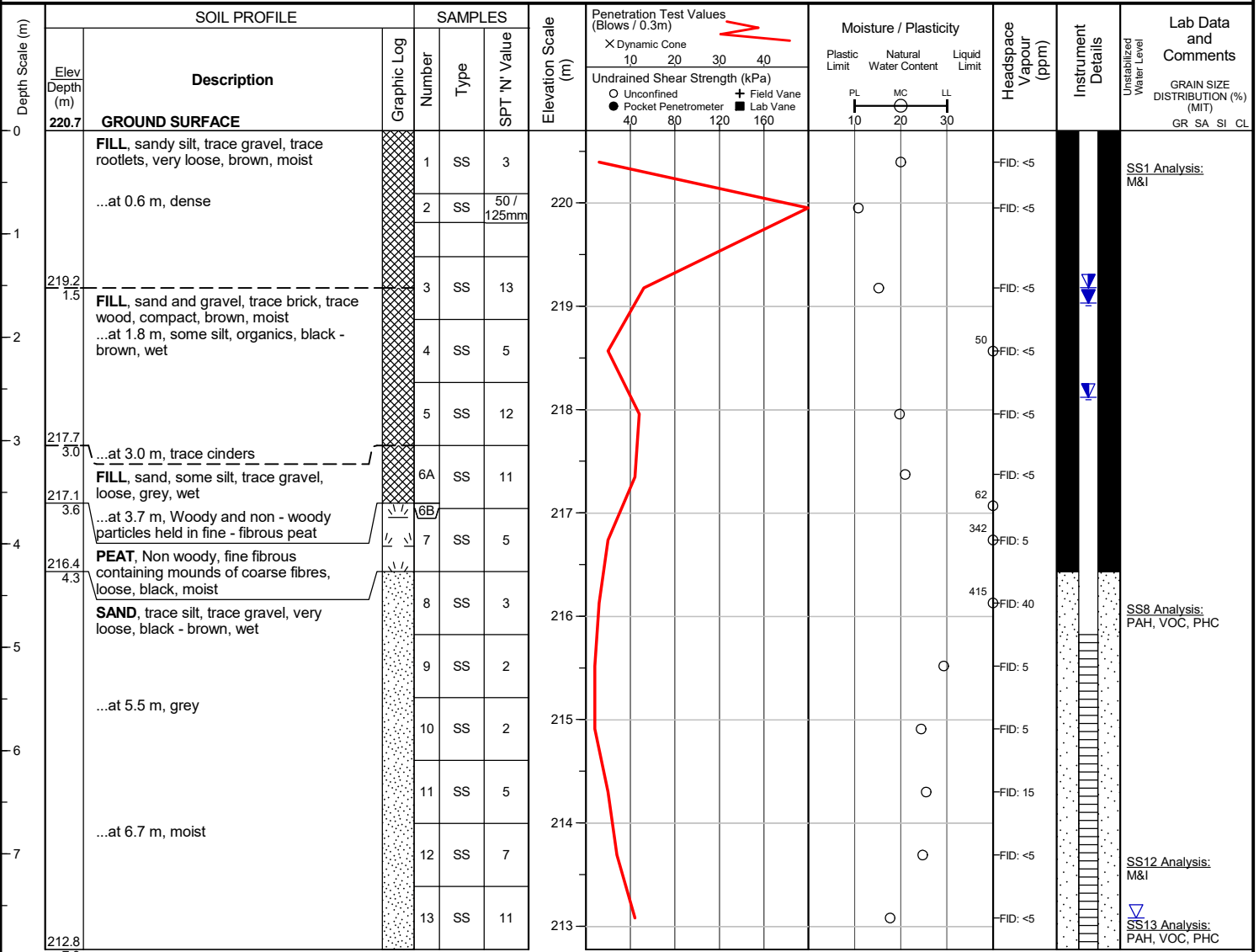
Checked by :

Position : E: 604246, N: 4915391 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers


END OF BOREHOLE

Unstabilized water level measured at 7.6 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	2.6	218.1
Apr 20, 2017	1.5	219.2
Jun 19, 2017	1.7	219.0

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 10, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

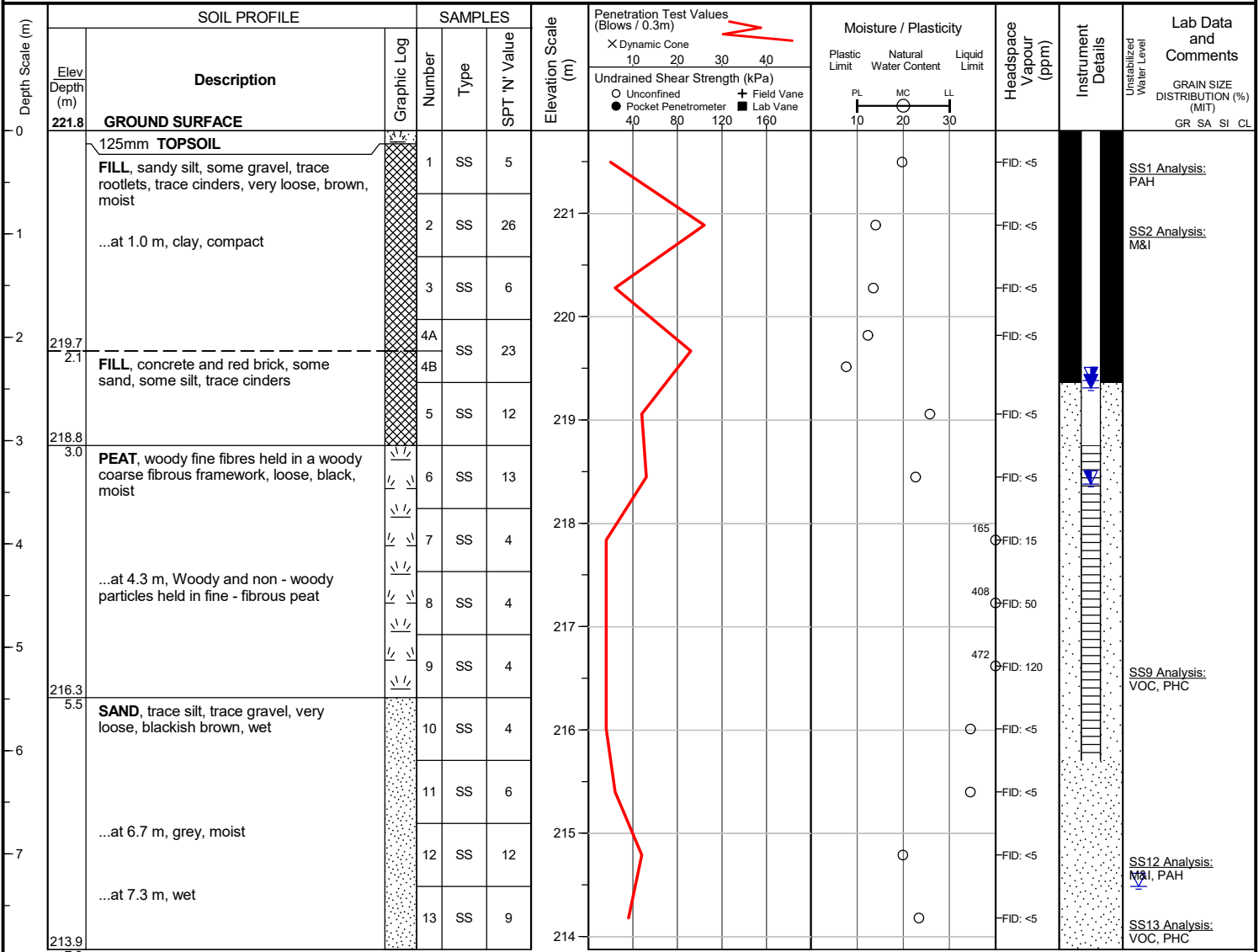
Checked by :

Position : E: 604192, N: 4915414 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers


END OF BOREHOLE

Unstabilized water level measured at 7.3 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	3.4	218.4
Apr 21, 2017	2.4	219.4
Jun 19, 2017	2.5	219.3

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 11, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

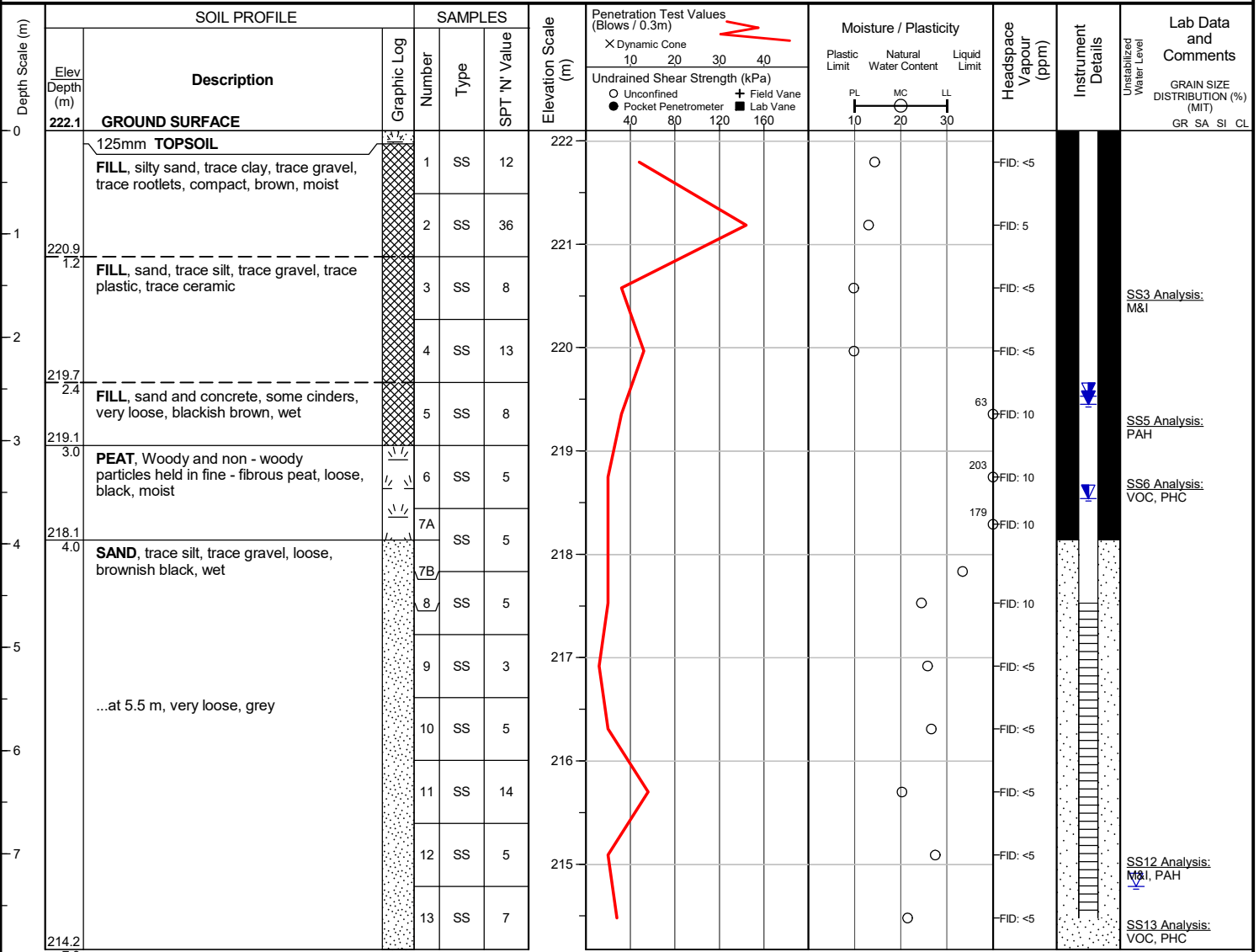
Checked by :

Position : E: 604165, N: 4915416 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers


END OF BOREHOLE

Unstabilized water level measured at 7.3 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	3.6	218.5
Apr 20, 2017	2.6	219.5
Jun 19, 2017	2.7	219.5

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 11, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

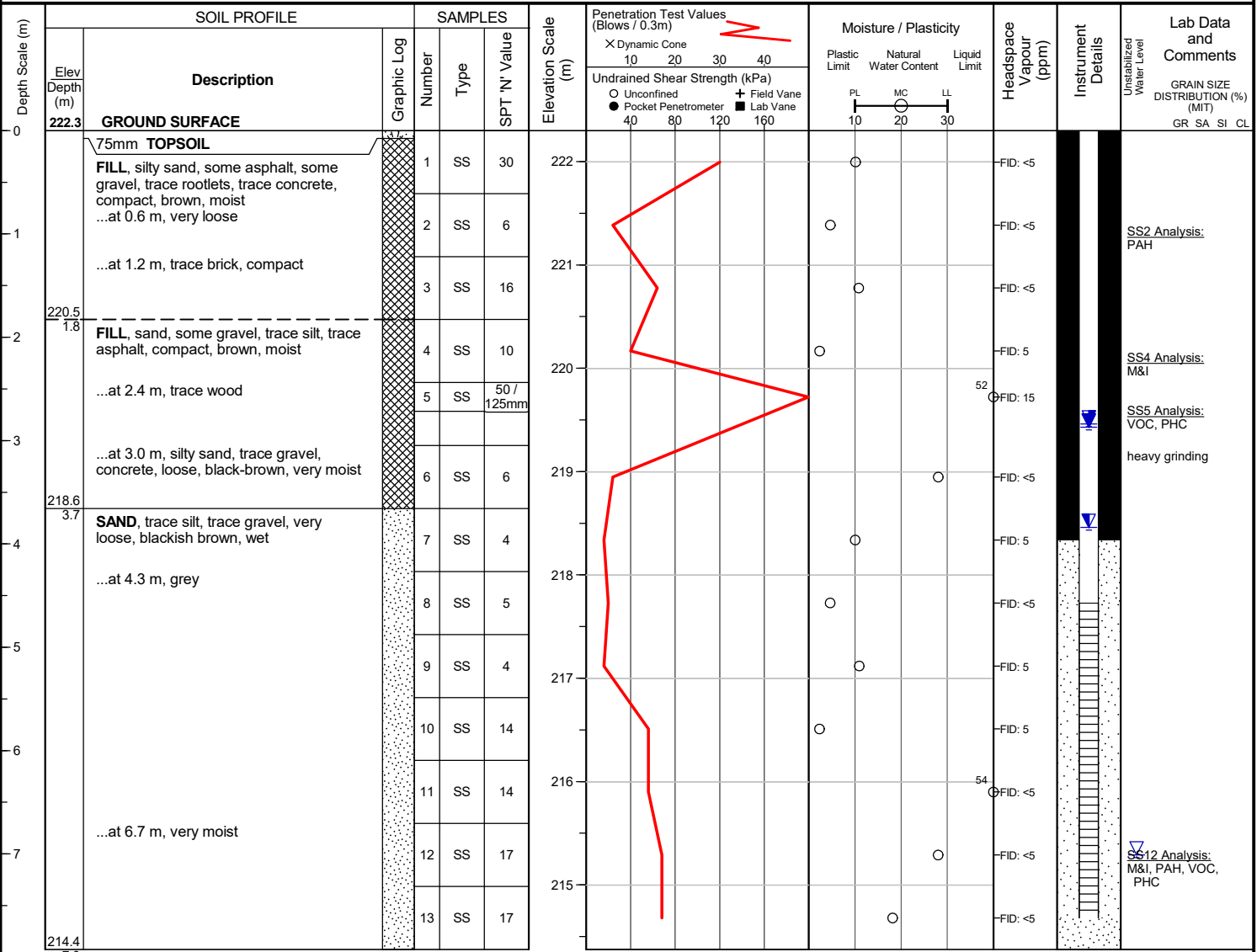
Checked by :

Position : E: 604150, N: 4915475 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers


END OF BOREHOLE

Unstabilized water level measured at 7.0 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	3.8	218.5
Apr 21, 2017	2.8	219.5
Jun 19, 2017	2.9	219.4

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 11, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

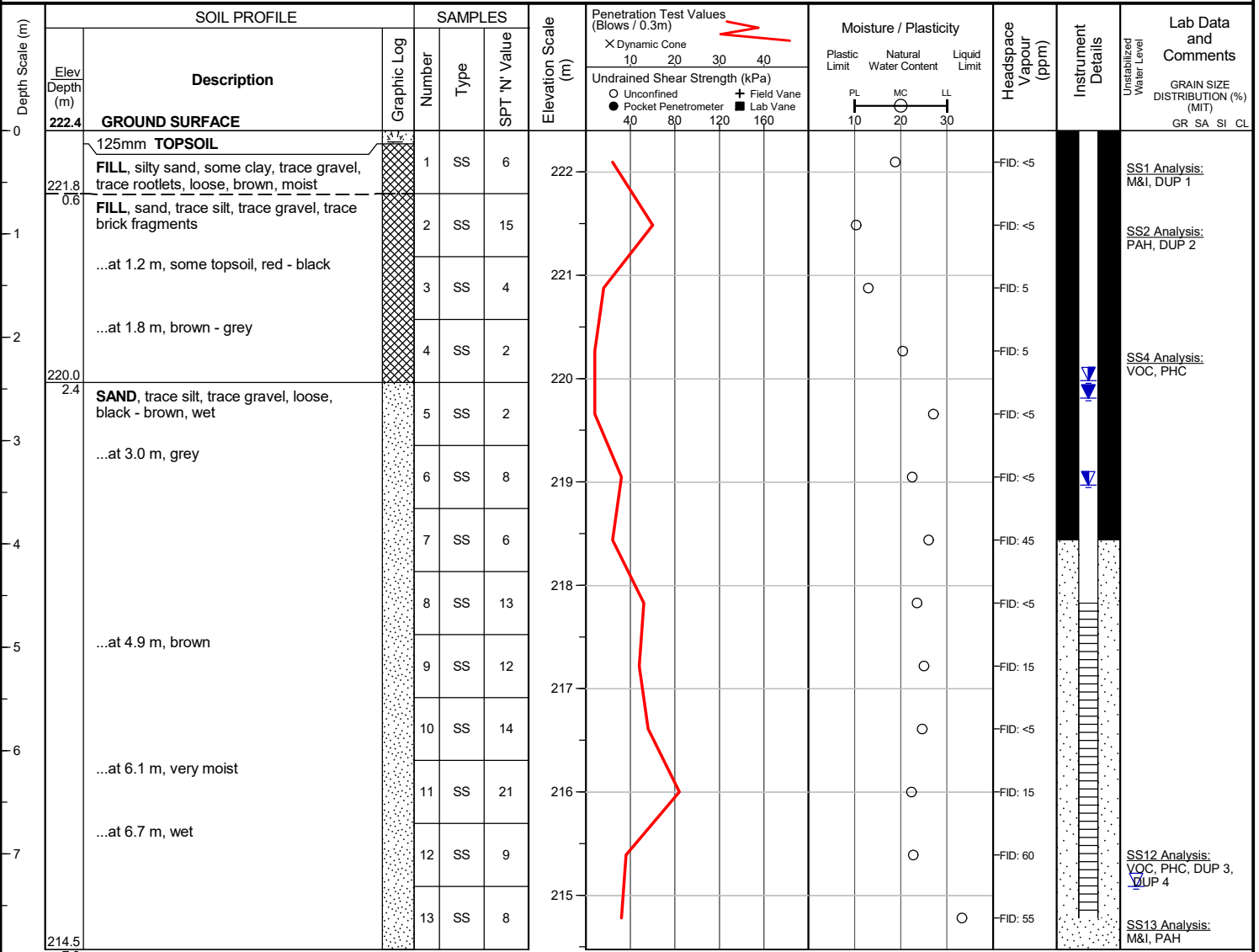
Checked by :

Position : E: 604108, N: 4915454 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers



Unstabilized water level measured at 7.3 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	3.4	219.0
Apr 21, 2017	2.4	220.0
Jun 19, 2017	2.6	219.8

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 12, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

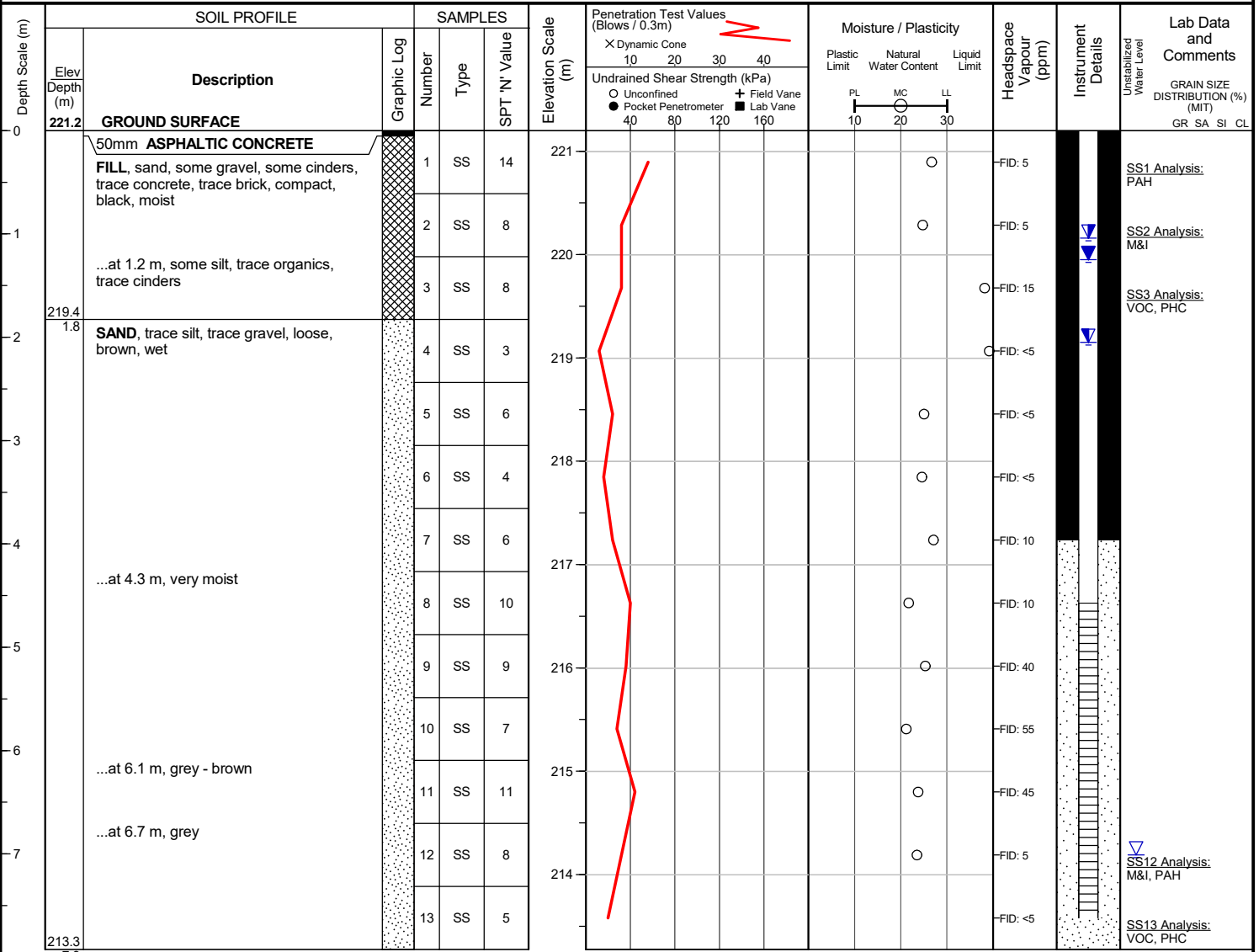
Checked by :

Position : E: 604093, N: 4915410 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers



Unstabilized water level measured at 7.0 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	2.1	219.2
Apr 21, 2017	1.0	220.2
Jun 19, 2017	1.3	220.0

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 12, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

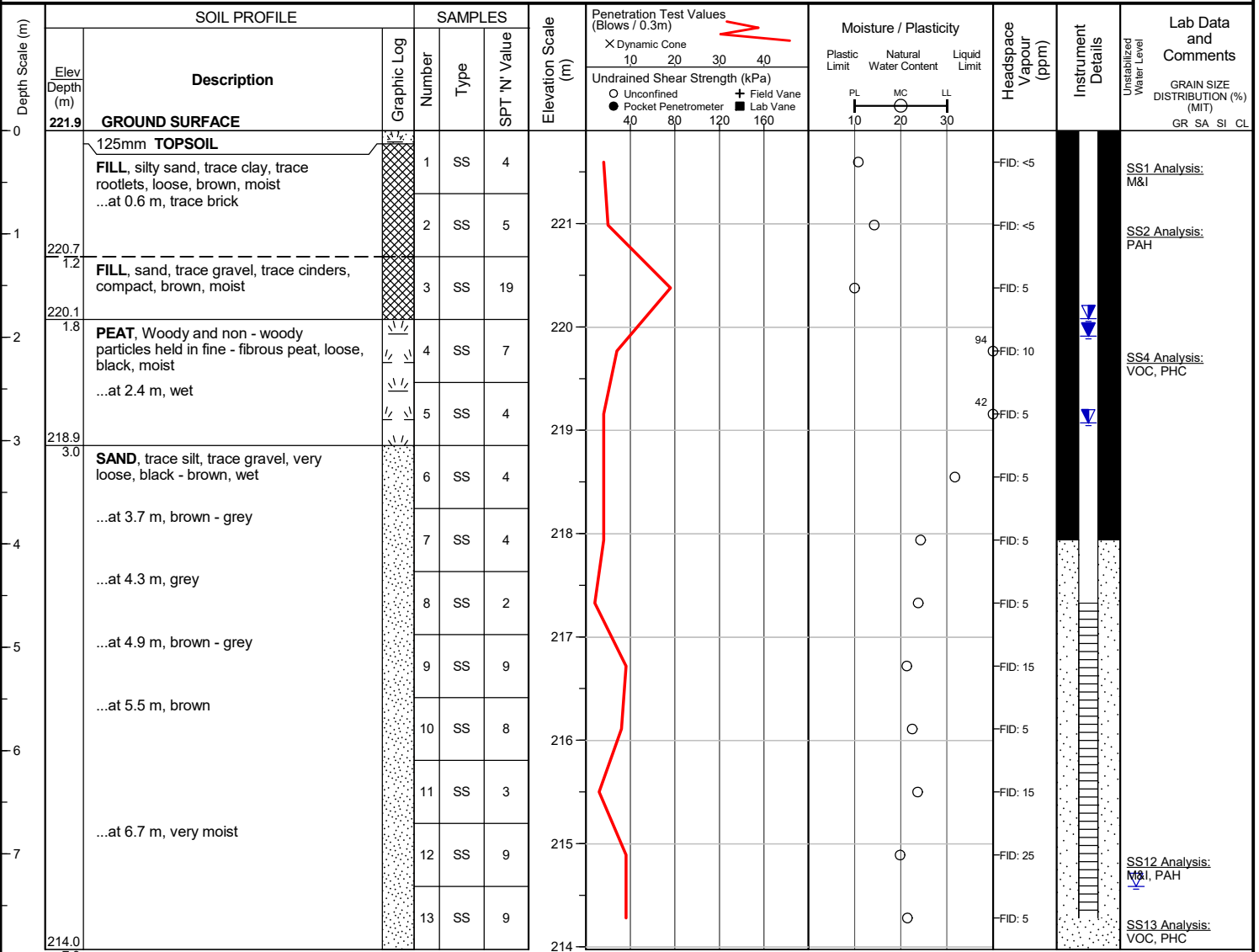
Checked by :

Position : E: 604117, N: 4915400 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers



Unstabilized water level measured at 7.3 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	2.8	219.1
Apr 21, 2017	1.8	220.1
Jun 19, 2017	2.0	219.9

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 12, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

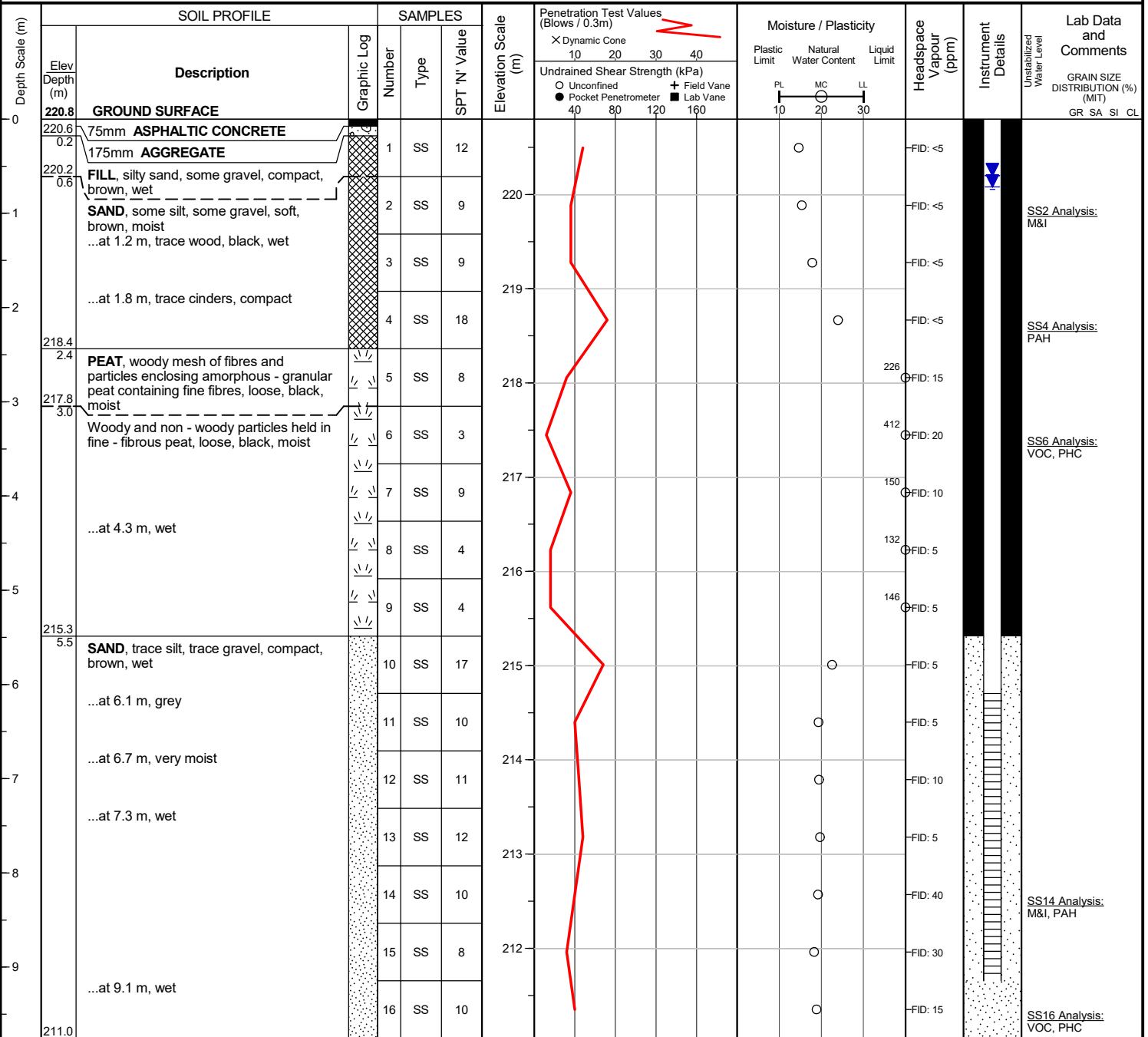
Checked by :

Position : E: 604089, N: 4915306 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers


END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	0.6	220.2
Apr 21, 2017	0.6	220.2
Jun 19, 2017	0.7	220.1

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 13, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

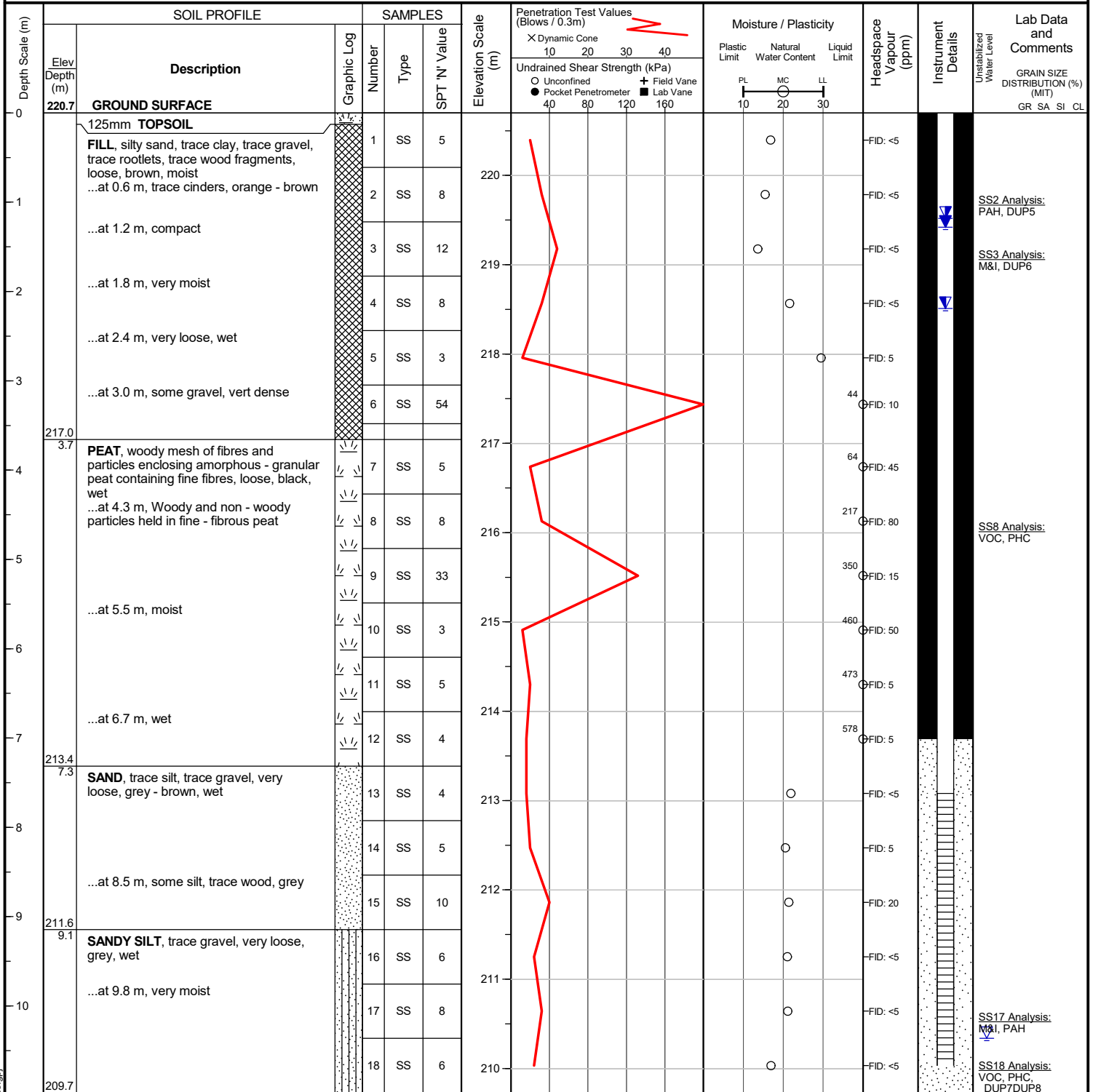
Checked by :

Position : E: 604192, N: 4915354 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers



file: 1-17-0147-42 -all boreholes.gpj

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	2.2	218.5
Apr 20, 2017	1.2	219.5
Jun 19, 2017	1.3	219.4

Unstabilized water level measured at 10.4 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

SS2 Analysis: PAH, DUP5

SS3 Analysis: M&I, DUP6

SS8 Analysis: VOC, PHC

SS17 Analysis: M&I, PAH

SS18 Analysis: VOC, PHC, DUP7DUP8

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc

Originated by : MC

Date started : April 13, 2017

Project : 75 Bradford Street

Compiled by :

Sheet No. : 1 of 1

Location : Barrie, Ontario

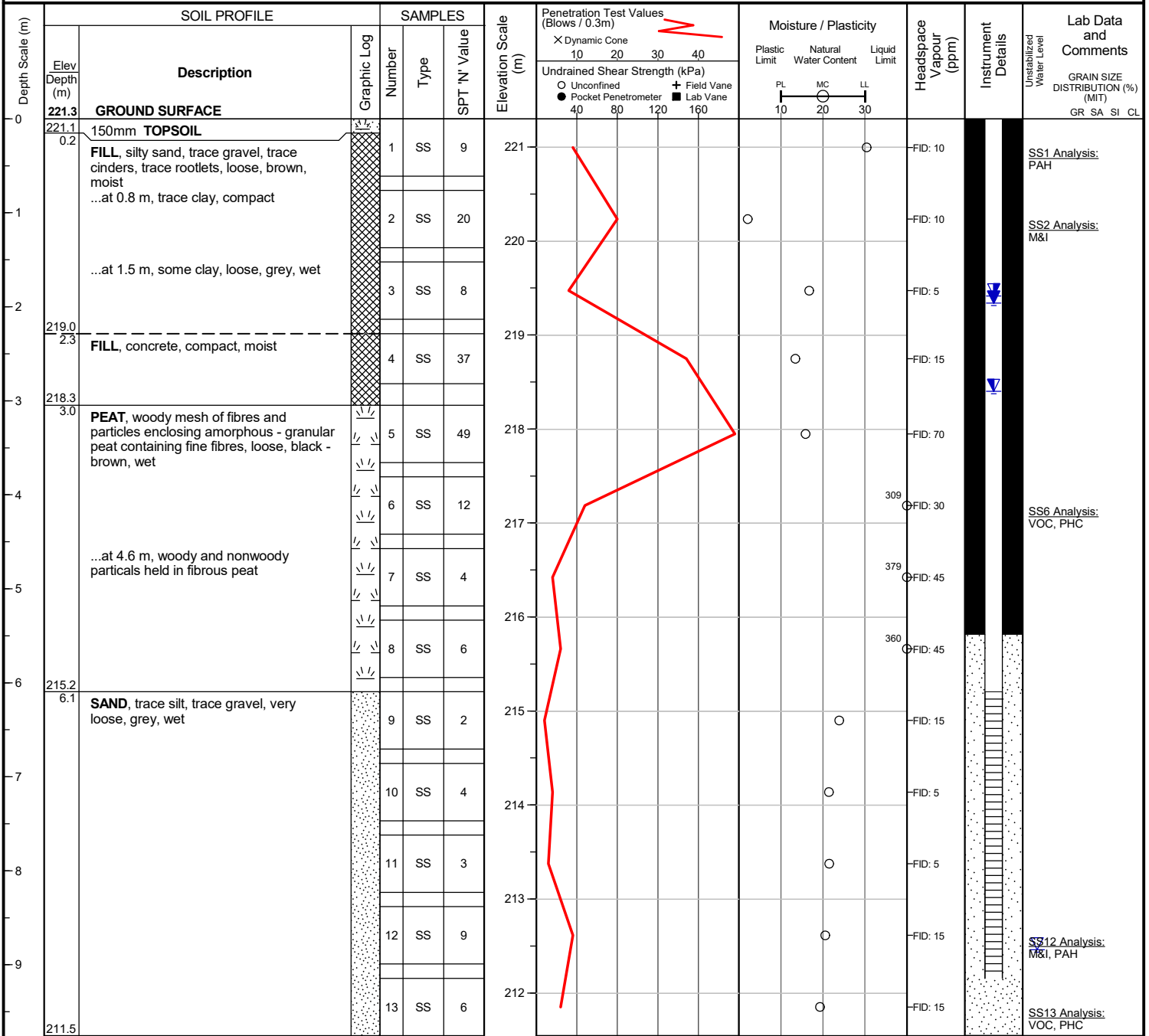
Checked by :

Position : E: 604217, N: 4915367 (UTM 17T)

Elevation Datum : Geodetic

Rig type : CME 75, track-mounted

Drilling Method : Hollow stem augers



END OF BOREHOLE

Unstabilized water level measured at 8.8 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Apr 18, 2017	2.9	218.4
Apr 20, 2017	1.9	219.4
Jun 19, 2017	2.0	219.3

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc.

Originated by : NG

Date started : June 28, 2017

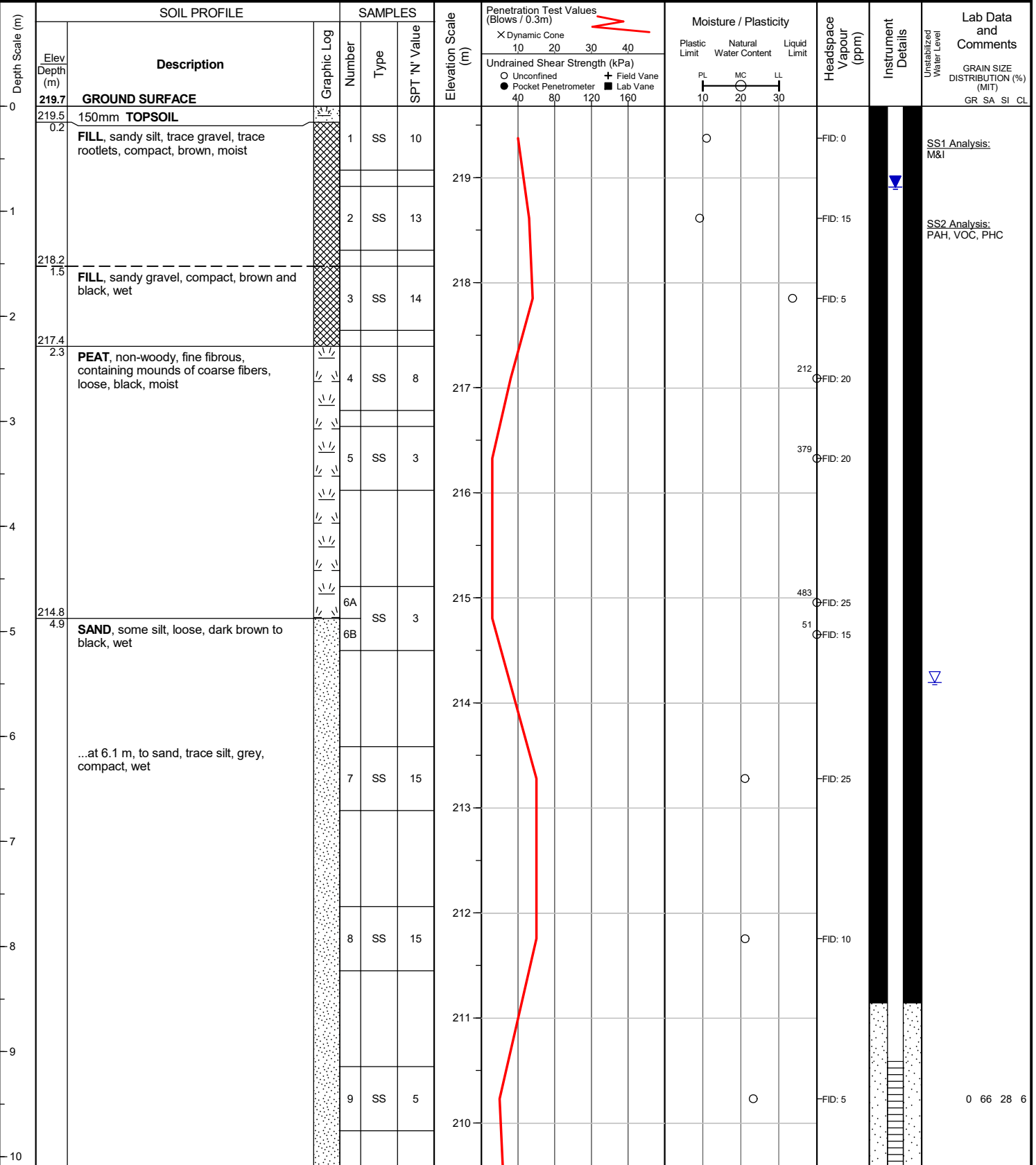
Project : 75 Bradford Street

Compiled by : SM

Sheet No. : 1 of 2

Location : Barrie, Ontario

Checked by : MB

 Position : _____ Elevation Datum : Geodetic
 Rig type : Track-mounted Drilling Method : Hollow stem augers


file: 1-17-0147-42 bh logs_300 series.gpj

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc.

Originated by : NG

Date started : June 28, 2017

Project : 75 Bradford Street

Compiled by : SM

Sheet No. : 2 of 2

Location : Barrie, Ontario

Checked by : MB

 Position : _____ Elevation Datum : Geodetic
 Rig type : Track-mounted Drilling Method : Hollow stem augers

Depth Scale (m)	SOIL PROFILE		SAMPLES			Elevation Scale (m)	Penetration Test Values (Blows / 0.3m)	Moisture / Plasticity			Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
	Elev Depth (m)	Description	Graphic Log	Number	Type			SPT 'N' Value	Dynamic Cone	Plastic Limit			
	(continued)						X Dynamic Cone Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane	PL MC LL 10 20 30					
11		SAND, some silt, loose, dark brown to black, wet (continued)	[Graphic Log]	10	SS	7							
12													
206.9 12.8				11	SS	4							SS11 Analysis: M&I, PAH, VOC, PHC

END OF BOREHOLE

Unstabilized water level measured at 5.5 m below ground surface; borehole caved to 11.9 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
10' screen installed.

WATER LEVEL READINGS		
Date	Water Depth (m)	Elevation (m)
Jul 4, 2017	0.8	218.9

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc.

Originated by : NG

Date started : June 28, 2017

Project : 75 Bradford Street










Compiled by : SM

Sheet No. : 1 of 2

Location : Barrie, Ontario

Checked by : MB

 Position : _____ Elevation Datum : Geodetic
 Rig type : Track-mounted Drilling Method : Hollow stem augers

Depth Scale (m)	SOIL PROFILE		SAMPLES			Elevation Scale (m)	Penetration Test Values (Blows / 0.3m)	Moisture / Plasticity			Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
	Elev Depth (m)	Description	Graphic Log	Number	Type			SPT 'N' Value	Plastic Limit	Natural Water Content			
0	221.8	GROUND SURFACE											
0.2	221.6	150mm TOPSOIL		1	SS	13							SS1 Analysis: M&I
		FILL , silty sand, trace gravel, trace rootlets, trace wood fragments, compact, brown, moist		2	SS	15							SS2 Analysis: PAH, VOC, PHC
		...at 1.5 m, trace asphalt		3	SS	14							
		...at 2.3 m, some brick fragments, red		4	SS	41							
3	218.8	FILL , sand and gravel, compact, brown to black, wet		5	SS	22							
	3.0												
5	217.2	PEAT , non-woody, fine fibrous, containing mounds of coarse fibers, loose, black, wet		6	SS	6							
	4.6												
6	215.7	SAND , trace silt, loose, brown, wet		7	SS	9							
	6.1												
		...at 7.6 m, grey		8	SS	18							
				9	SS	8							
10													

file: 1-17-0147-42 bh logs_300 series.gpj

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Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc.

Originated by : NG

Date started : June 28, 2017

Project : 75 Bradford Street

Compiled by : SM

Sheet No. : 2 of 2

Location : Barrie, Ontario

Checked by : MB

 Position : _____ Elevation Datum : Geodetic
 Rig type : Track-mounted Drilling Method : Hollow stem augers

Depth Scale (m)	SOIL PROFILE		SAMPLES			Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) X Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	Moisture / Plasticity			Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL SS11 Analysis: M&I, PAH, VOC, PHC
	Elev Depth (m)	Description	Graphic Log	Number	Type			SPT 'N' Value	Plastic Limit	Natural Water Content			
209.0 12.8	(continued)												
11	SAND, trace silt, loose, brown, wet (continued)		10	SS		211					FID: 5		
12			11	SS	2	210					FID: 15		

END OF BOREHOLE

Unstabilized water level measured at 6.1 m below ground surface; borehole caved to 11.6 m below ground surface upon completion of drilling.

50 mm dia. monitoring well installed.
10' screen installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jul 4, 2017	3.4	218.5

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc.

Originated by : NG

Date started : June 29, 2017

Project : 75 Bradford Street













Compiled by : SM

Sheet No. : 1 of 2

Location : Barrie, Ontario

Checked by : MB

 Position : _____ Elevation Datum : Geodetic
 Rig type : Track-mounted Drilling Method : Hollow stem augers

Depth Scale (m)	SOIL PROFILE		SAMPLES			Elevation Scale (m)	Penetration Test Values (Blows / 0.3m)	Moisture / Plasticity			Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments	
	Elev Depth (m)	Description	Graphic Log	Number	Type			SPT 'N' Value	Dynamic Cone	Plastic Limit				Natural Water Content
0	220.2	GROUND SURFACE												
0.2	220.0	150mm TOPSOIL		1	SS	8	220							
		FILL , silty sand, trace gravel, trace rootlets, trace wood fragments, loose, brown, moist												
		...at 0.8 m, compact												
1				2	SS	19	219							
	218.7	FILL , sand and gravel, compact, brown to grey, moist		3	SS	18	218							
		...at 2.3 m, to sand, trace silt, trace gravel, loose, grey, wet												
2				4	SS	2	218							
3	217.2	PEAT , non-woody, fine fibrous, containing mounds of coarse fibers, loose, black, moist		5	SS	2	217							
4							216							
5	215.6	SAND , trace silt, loose, brown, wet		6	SS	7	215							
		...at 6.1 m, compact, grey												
6				7	SS	10	214							
7				8	SS	10	213							
8				9A	SS	12	212							
9				9B			211							
10														

file: 1-17-0147-42 bh logs_300 series.gpj

(continued next page)

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc.

Originated by : NG

Date started : June 29, 2017

Project : 75 Bradford Street


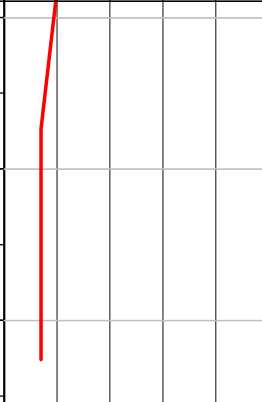
Compiled by : SM

Sheet No. : 2 of 2

Location : Barrie, Ontario

Checked by : MB

 Position : _____ Elevation Datum : Geodetic
 Rig type : Track-mounted Drilling Method : Hollow stem augers

Depth Scale (m)	SOIL PROFILE		SAMPLES			Elevation Scale (m)	Penetration Test Values (Blows / 0.3m)	Moisture / Plasticity			Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
	Elev Depth (m)	Description	Graphic Log	Number	Type			SPT 'N' Value	Plastic Limit	Natural Water Content			
207.4 12.8	(continued)						X Dynamic Cone Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane	PL	MC	LL			GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
11	SAND, trace silt, loose, brown, wet (continued)		10	SS	7	210					FID: 0		
12						209							
			11	SS	7	208							SS11 Analysis: M&I, PAH, VOC, PHC

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

 50 mm dia. monitoring well installed.
 10' screen installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jul 4, 2017	1.6	218.6

Project No. : 1-17-0147-42

Client : Fortress Kempenfelt Bay Developments Inc.

Originated by : NG

Date started : June 29, 2017

Project : 75 Bradford Street

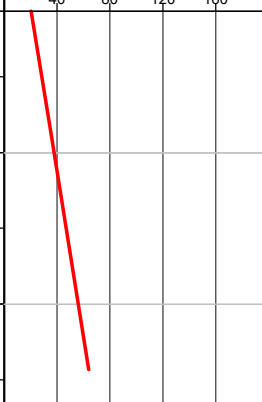
Compiled by : SM

Sheet No. : 2 of 2

Location : Barrie, Ontario

Checked by : MB

 Position : _____ Elevation Datum : Geodetic
 Rig type : Track-mounted Drilling Method : Hollow stem augers

Depth Scale (m)	SOIL PROFILE		SAMPLES			Elevation Scale (m)	Penetration Test Values (Blows / 0.3m)	Moisture / Plasticity			Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
	Elev Depth (m)	Description	Graphic Log	Number	Type			SPT 'N' Value	Plastic Limit	Natural Water Content			
207.3		(continued)					X Dynamic Cone 10 20 30 40 Undrained Shear Strength (kPa) ○ Unconfined + Field Vane ● Pocket Penetrometer ■ Lab Vane 40 80 120 160	PL MC LL 10 20 30					
11		SAND AND SILT, trace sea shells, loose, grey, wet (continued)											
12		...at 12.2 m, compact											
207.3	12.8												

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

 50 mm dia. monitoring well installed.
 10' screen installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jul 4, 2017	0.6	219.5

LOG OF BOREHOLE NO. 1/MW3

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

LOCATION Lakeshore Drive, Barrie, Ontario

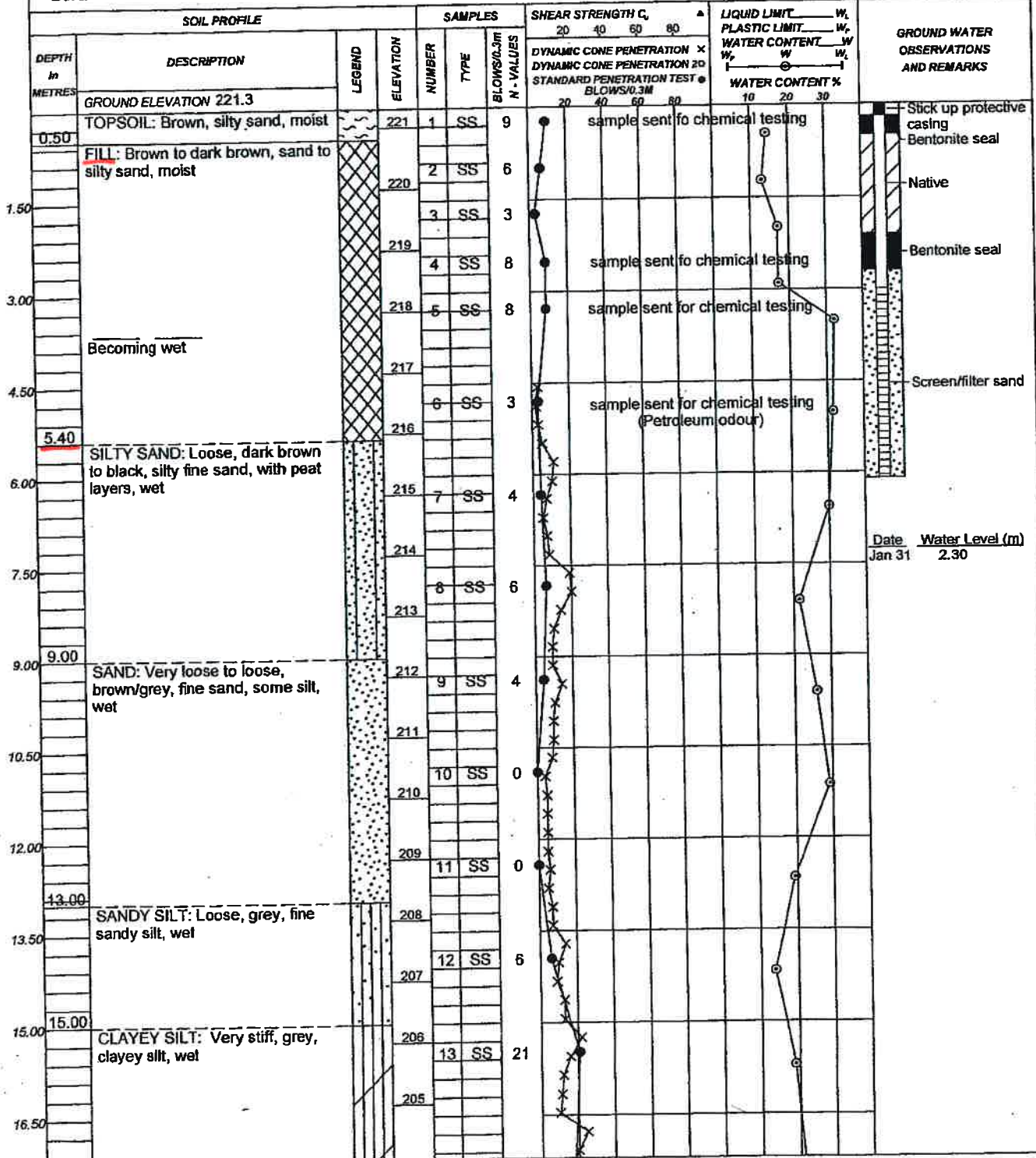
BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

BORING DATE January 25, 2008

OUR PROJECT NO. 07BF057

ENGINEER GW

TECHNICIAN JH, AD



Date Jan 31 Water Level (m) 2.30

NOTES
x-x Dynamic Cone Penetration Test from 4.6 to 20.4 m

CHECKED BY

LOG OF BOREHOLE NO. 1/MW3

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 25, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH, AD

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C_u				LIQUID LIMIT w_L			GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	20 40 60 80				PLASTIC LIMIT w_p			
							DYNAMIC CONE PENETRATION \times				WATER CONTENT w			
CONTINUED FROM PREVIOUS PAGE							DYNAMIC CONE PENETRATION \times				WATER CONTENT w			
							STANDARD PENETRATION TEST \bullet				WATER CONTENT %			
							BLOWS/0.3M							
18.00	CLAYEY SILT: Very stiff, grey, clayey silt, wet		203	14	SS	16								
19.50			202											
20.00														
21.00	SILT: Dense, grey, silt, trace fine sand, with occasional silty sand seams, wet		201											
22.50			200	15	SS	39								
23.00			199											
24.00	SILTY SAND: Dense to very dense, grey, silty sand, occasional sandy silt seams, wet		198											
25.50			197	16	SS	34								
27.00			196											
28.50			195											
30.00			194	17	SS	45								
31.50			193											
			192											
			191	18	SS	64								
			190											
			189											
			188	19	SS	64								
			187											

NOTES

x-x Dynamic Cone Penetration Test from 4.6 to 20.4 m

CHECKED BY 

LOG OF BOREHOLE NO. 1/MW3

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 25, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH, AD

SOIL PROFILE		SAMPLES			SHEAR STRENGTH C, ▲				LIQUID LIMIT — W _L			GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	20 40 60 80				PLASTIC LIMIT — W _p			
							DYNAMIC CONE PENETRATION × DYNAMIC CONE PENETRATION 20 STANDARD PENETRATION TEST ● BLOWS/0.3M				WATER CONTENT — W _w			
							20 40 60 80				10 20 30			
CONTINUED FROM PREVIOUS PAGE														
34.50	SILTY SAND: Dense to very dense, grey, silty sand, occasional sandy silt seams, wet		186											
36.00			185											
37.50			184	20	SS	9*								*Suspect sample hydraulically disturbed
38.00			183											
39.00	SAND: Dense to very dense, grey and brown, fine to medium sand, trace gravel, wet		182											
40.50			181	21	SS	41								
42.00			180											
43.50			179	22	SS	100/25 mm								
45.00	Becoming gravelly		178											
45.80	END		176	23	SS	74/100 mm							Upon completion of augering Wet cave at 2.4 m	

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 2

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

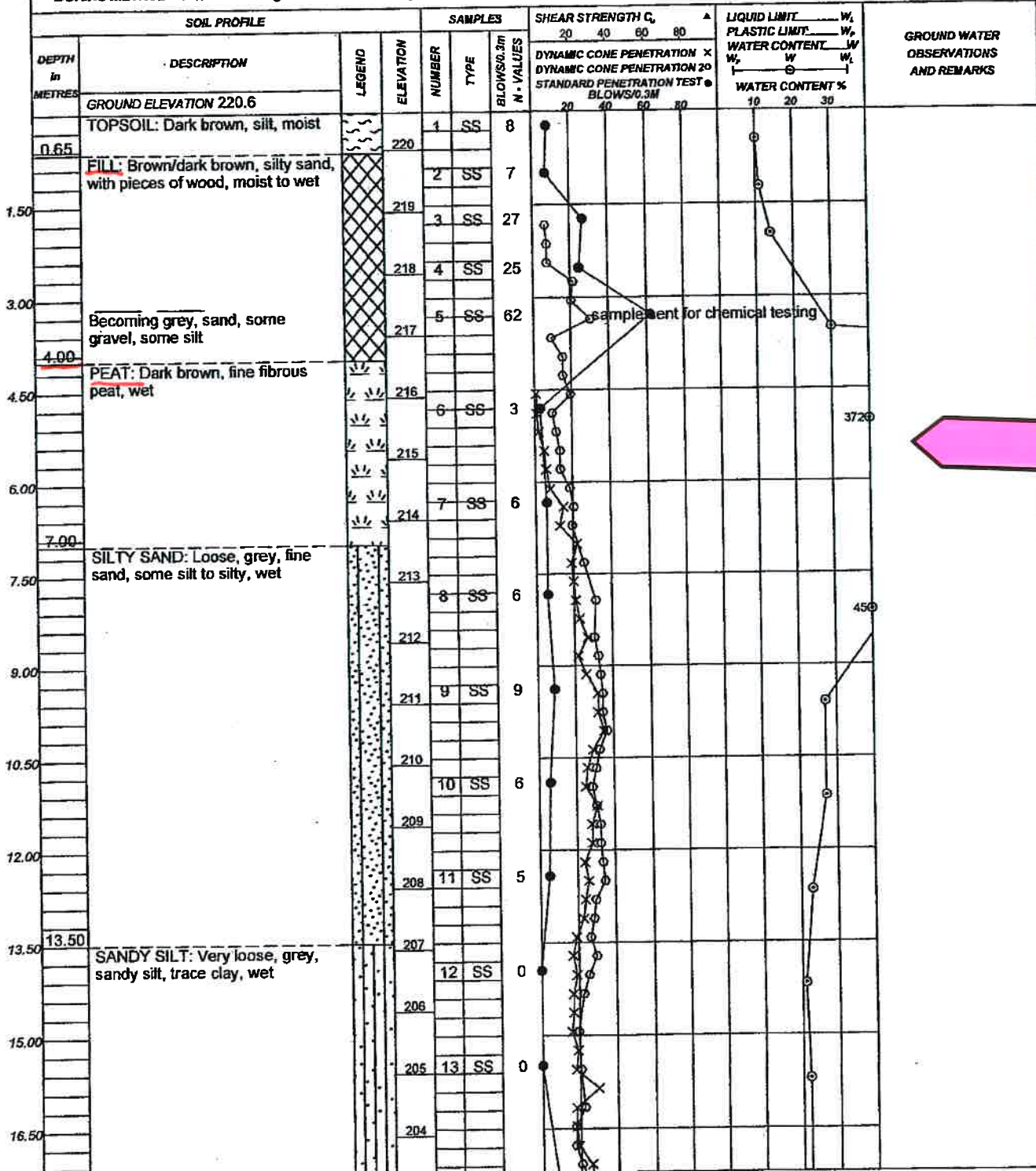
LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 16, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN JH



NOTES

x-x Dynamic Cone Penetration Test from 4.6 to 23.8 m
o-o Dynamic Cone Penetration Test from 1.8 to 32.6 m

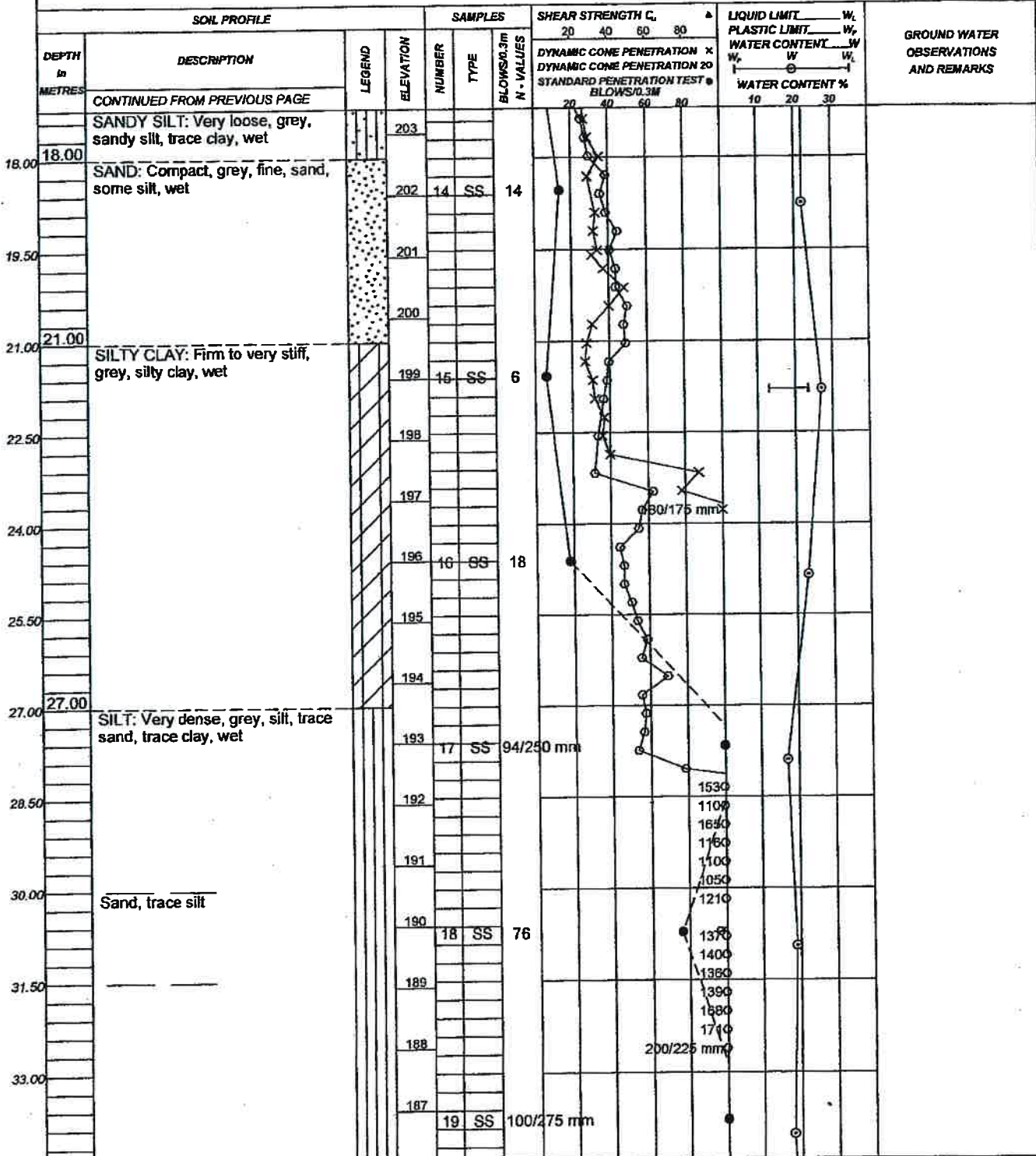
CHECKED BY 

LOG OF BOREHOLE NO. 2

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 16, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN JH



NOTES
x-x Dynamic Cone Penetration Test from 4.6 to 23.8 m
o-o Dynamic Cone Penetration Test from 1.8 to 32.6 m

CHECKED BY

LOG OF BOREHOLE NO. 2

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 16, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN JH

SDIL PROFILE		SAMPLES			SHEAR STRENGTH C_u				LIQUID LIMIT W_L			GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	20	40	60	80	PLASTIC LIMIT W_p		WATER CONTENT W
							DYNAMIC CONE PENETRATION \times				DYNAMIC CONE PENETRATION 20		
STANDARD PENETRATION TEST \bullet							BLOWS/0.3M				WATER CONTENT %		
							20	40	60	80	10	20	30
34.50	CONTINUED FROM PREVIOUS PAGE		185										
	SILT: Very dense, grey, silt, trace sand, trace clay, wet		185										
36.00			184	20	SS	81							
			183										
37.50			182										
			181										
39.00				181	21	SS	94/225 mm						
40.00	END												

Upon completion of augering
Wet cave at 3.6 m

NOTES

CHECKED BY 

LOG OF BOREHOLE NO. 3

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

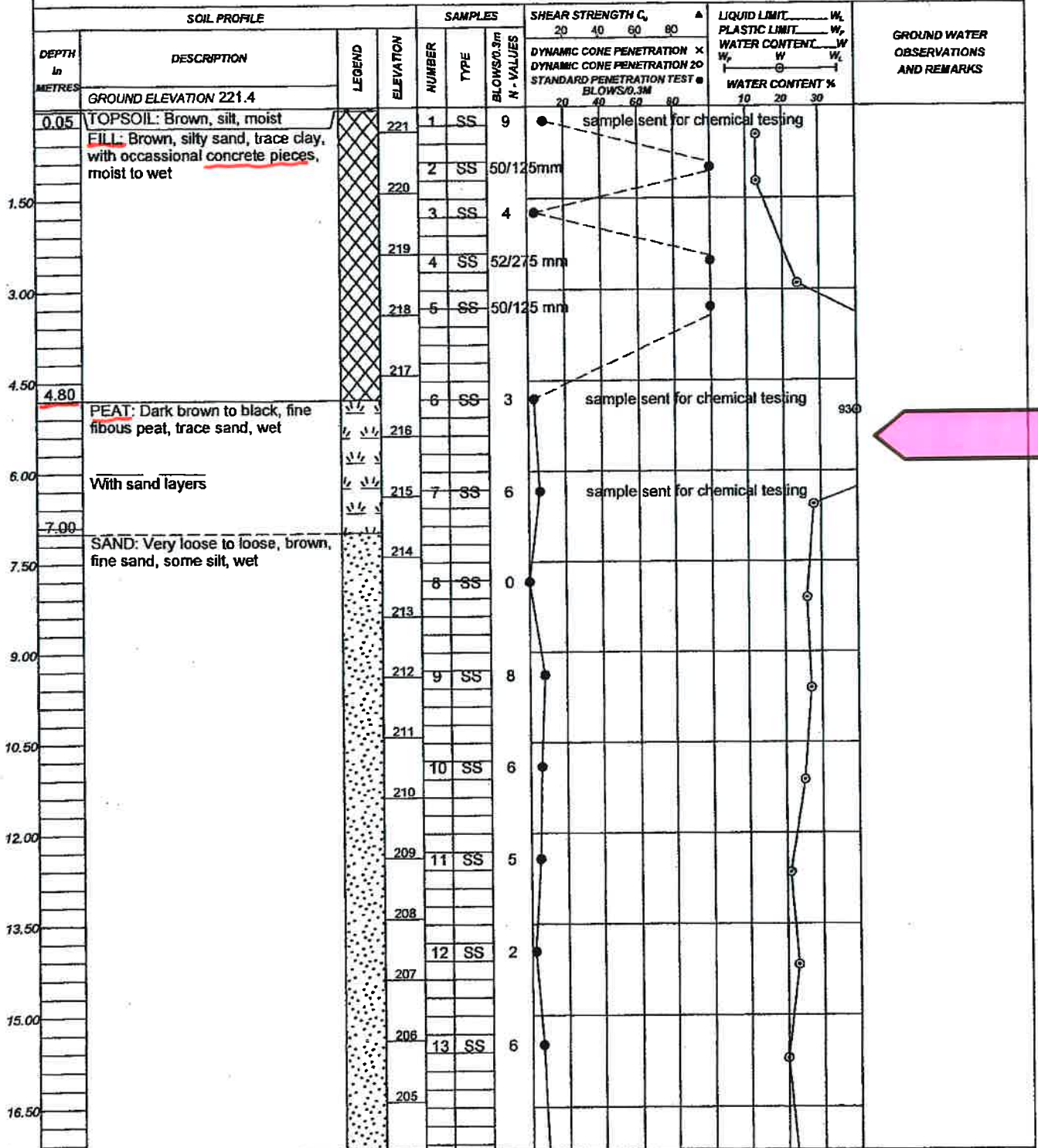
LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 14, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH



NOTES

CHECKED BY 

LOG OF BOREHOLE NO. 3

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 14, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH

SOIL PROFILE		LEGEND	ELEVATION	SAMPLES		SHEAR STRENGTH C_u 20 40 60 80	DYNAMIC CONE PENETRATION \times DYNAMIC CONE PENETRATION 20 STANDARD PENETRATION TEST ϕ BLOWS/0.3M 20 40 60 80	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_L W_P W WATER CONTENT % 10 20 30	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION			NUMBER	TYPE				
	CONTINUED FROM PREVIOUS PAGE		204						
18.00	SAND: Very loose to loose, brown, fine sand, some silt, wet	[Pattern]	203	14	SS	11			
19.50	Becoming compact, grey, silty sand,		202						
20.00			201						
21.00	SILT: Very dense to dense, grey silt, trace sand, trace clay, wet	[Pattern]	200	15	SS	52			
22.50			199						
24.00			198						
25.50			197						
27.00			196						
28.50			195						
30.00			194						
31.50		193							
32.00	SAND: Compact, grey, fine sand, trace silt, wet	[Pattern]	192						
			191						
33.00			190						
		189							
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NOTES

CHECKED BY *JH*

LOG OF BOREHOLE NO. 3

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 14, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C_u			LIQUID LIMIT w_L			GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH m METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	20 40 60 80			PLASTIC LIMIT w_p			
							DYNAMIC CONE PENETRATION X DYNAMIC CONE PENETRATION 20 STANDARD PENETRATION TEST 20			WATER CONTENT w			WATER CONTENT %
							BLOWS/0.3M			10 20 30			
34.50	CONTINUED FROM PREVIOUS PAGE												
35.00	SAND: (continued)												
	SILT: Dense to very dense, grey, silt, trace sand, trace clay, wet		186										
36.00			185										
				20	SS	44							
37.50			184										
			183										
39.00			182										
				21	SS	93							
40.50			181										
			180										
42.00	SAND: Very dense, brown, medium sand, trace gravel, trace silt, wet		179										
				22	SS	108/275 mm							
43.50			178										
			177										
45.00			176										
				23	SS	50/100 mm							
46.50			175										
			174										
48.00			173										
				24	SS	92							
49.50			172										
49.70	DYNAMIC CONE PENETRATION TEST												
50.20	END												

Upon completion of augering
Wet cave at 5.1 m

NOTES

x-x Dynamic Cone Penetration Test from 49.7 to 50.3 m

CHECKED BY *JM*

LOG OF BOREHOLE NO. 4

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
 LOCATION Lakeshore Drive, Barrie, Ontario
 BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

OUR PROJECT NO. 07BF057
 ENGINEER GW
 TECHNICIAN JH

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C, Δ			LIQUID LIMIT W_L			GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N-VALUES	20 40 60 80			PLASTIC LIMIT W_P			
							DYNAMIC CONE PENETRATION \times			WATER CONTENT W			
							DYNAMIC CONE PENETRATION 20			WATER CONTENT W			
STANDARD PENETRATION TEST \bullet			WATER CONTENT W										
						BLOWS/0.3M			10 20 30				
	GROUND ELEVATION 222.0												
	FILL: Brown to dark brown, silty sand to sandy silt, trace gravel, pieces of brick, moist to wet		221	1	SS	16							
1.50			220	2	SS	13							
			219	3	SS	9							
3.00			218	4	SS	6							
3.20	PEAT: Dark brown/black, fine fibrous peat, wet		218	5	SS	3						sample sent for chemical testing	
4.50			217	6	SS	2						sample sent for chemical testing	
	SILTY FINE SAND: Very loose to loose, brown, some silt to silty, trace silt, occasional peat layers, wet		216										
6.00			215	7	SS	2							sample sent for chemical testing
7.50			214	8	SS	12							
			213										
9.00			212	9	SS	8							
10.50			211	10	SS	0							
	SILT: Very loose, grey, silt, trace sand, trace clay, wet		210										
12.00			209	11	SS	0							
	CLAYEY SILT: Very soft to firm, grey, clayey silt, wet		208	12	SS	2							
13.50			207										
15.00			206	13	SS	7							
16.50			205										

NOTES

CHECKED BY

LOG OF BOREHOLE NO. 4

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 11, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH

SOIL PROFILE		SAMPLES			SHEAR STRENGTH C_u			LIQUID LIMIT W_L			GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/30.3m N - VALUES	20 40 60 80			W _L PLASTIC LIMIT W _P WATER CONTENT % W ₁ W ₂ W _L			
							DYNAMIC CONE PENETRATION X DYNAMIC CONE PENETRATION 20 STANDARD PENETRATION TEST ● BLOWS/0.3M			10 20 30			
	CONTINUED FROM PREVIOUS PAGE												
18.00	CLAYEY SILT: Very soft to firm, grey, clayey silt, wet		204										
				14	SS	40							
	SILT: Dense to compact, grey, silt, trace sand, trace clay, wet		203										
19.50			202										
			201										
21.00				15	SS	34							
			200										
22.50			199										
			198										
24.00				16	SS	26							
			197										
25.50			196										
			195										
27.00	SILTY CLAY: Firm to stiff, grey, silty clay, wet, low plastic			17	SS	7							
			194										
28.50			193										
			192										
30.00				18	SS	14							
			191										
31.50			190										
			189										
33.00	SILT: Very dense, grey, silt, trace sand, trace clay, wet			19	SS	99/250 mm							
			188										

NOTES

CHECKED BY 

LOG OF BOREHOLE NO. 4

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 11, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C, ▲			LIQUID LIMIT — W _L			GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	20 40 60 80			PLASTIC LIMIT — W _p			
							DYNAMIC CONE PENETRATION ×			WATER CONTENT — W _w			
							DYNAMIC CONE PENETRATION ×			WATER CONTENT — W _w			
							STANDARD PENETRATION TEST ●			WATER CONTENT %			
							BLOWS/0.3M			10 20 30			
34.50	CONTINUED FROM PREVIOUS PAGE												
	SILT: Very dense, grey, silt, trace sand, trace clay, wet		187										
36.00	Becoming compact, sandy silt		186										
			185	20	SS	15							
37.50			184										
39.00			183										
	SAND: Dense to very dense, grey, sand, some gravel to gravelly, trace silt, wet		182	21	SS	43							
40.50			181										
42.00			180										
			179	22	SS	83							
43.50			178										
			177	23	SS	81							
45.00			176	24	SS	88/275 mm							
46.30			175										
46.50	DYNAMIC CONE PENETRATION TEST								151X			Upon completion of augering Wet cave at 3.0 m	
47.20	END								201X				
									205X				

NOTES

x-x Dynamic Cone Penetration Test from 46.3 to 47.2 m

CHECKED BY *JH*

LOG OF BOREHOLE NO. 5

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 18, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN JH

DEPTH In METRES	SOIL PROFILE DESCRIPTION	LEGEND	ELEVATION	SAMPLES			SHEAR STRENGTH C, ⁴				LIQUID LIMIT <u>W_L</u>			GROUND WATER OBSERVATIONS AND REMARKS
				NUMBER	TYPE	BLOWS/0.3M N - VALUES	20	40	60	80	PLASTIC LIMIT <u>W_P</u>	WATER CONTENT <u>W</u>	WATER CONTENT <u>W</u>	
	GROUND ELEVATION 220.5													
	FILL: Brown, sand, some silt, trace gravel, trace organics, moist to wet	[Cross-hatched pattern]	220	1	SS	5								
				2	SS	4								
1.50				219	3	SS	8							
				218	4	SS	3							
3.00				217	5	SS	3							
4.00	SAND: Loose to very loose, brown, sand, with occasional layers of peat, wet	[Dotted pattern]	216	6	SS	4								
4.50				215									1490	
6.00				214	7	SS	3							
	SILTY SAND: Loose, grey, silty fine sand, wet	[Dotted pattern]	213											
7.50				212	8	SS	6							
9.00				211	9	SS	6							
10.50				210	10	SS	7							
12.00	Becoming silty fine sand to fine sandy silt	[Dotted pattern]	209											
				208	11	SS	4							
13.50				207										
15.00			205	12	SS	4								
16.50			205	13	SS	2								
			204											

NOTES

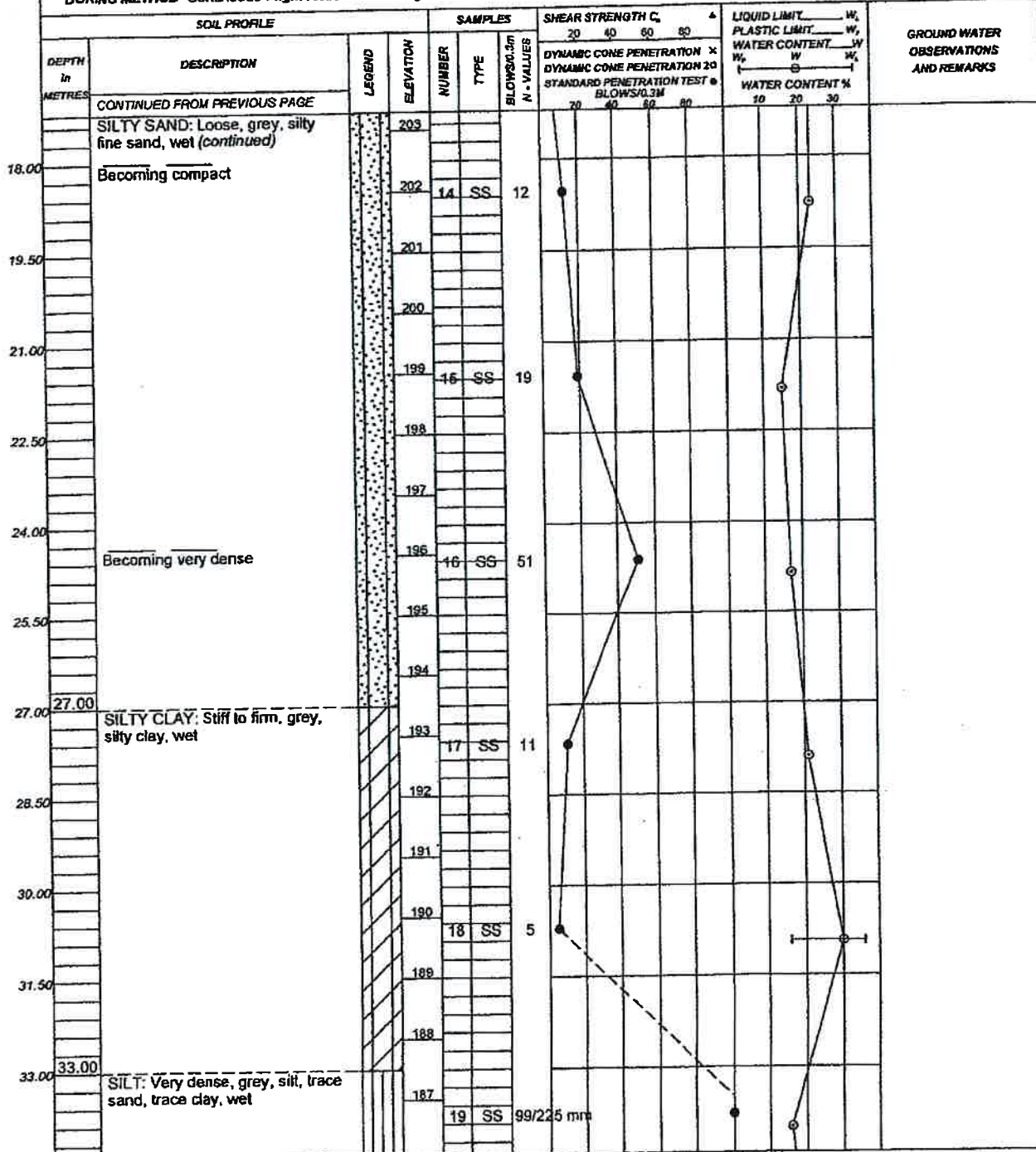
CHECKED BY *[Signature]*

LOG OF BOREHOLE NO. 5

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 18, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN JH



NOTES

CHECKED BY *MM*

LOG OF BOREHOLE NO. 5

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 18, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN JH

DEPTH in METRES	SOIL PROFILE DESCRIPTION	LEGEND	ELEVATION	SAMPLES		SHEAR STRENGTH C				LIQUID LIMIT			GROUND WATER OBSERVATIONS AND REMARKS
				NUMBER	TYPE	20	40	60	80	W _L	W _P	W _N	
	CONTINUED FROM PREVIOUS PAGE												
34.50	SILT Very dense, grey, silty, trace sand, trace clay, wet (continued)												
			185										
36.00			184										
			183	20	SS	50/100 mm							
37.50			182										
			181										
39.00													
40.00	END			21	SS	97/275 mm							Upon completion of augering Wet cave at 1.4 m

NOTES

CHECKED BY *M*

LOG OF BOREHOLE NO. 6

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

LOCATION Lakeshore Drive, Barrie, Ontario

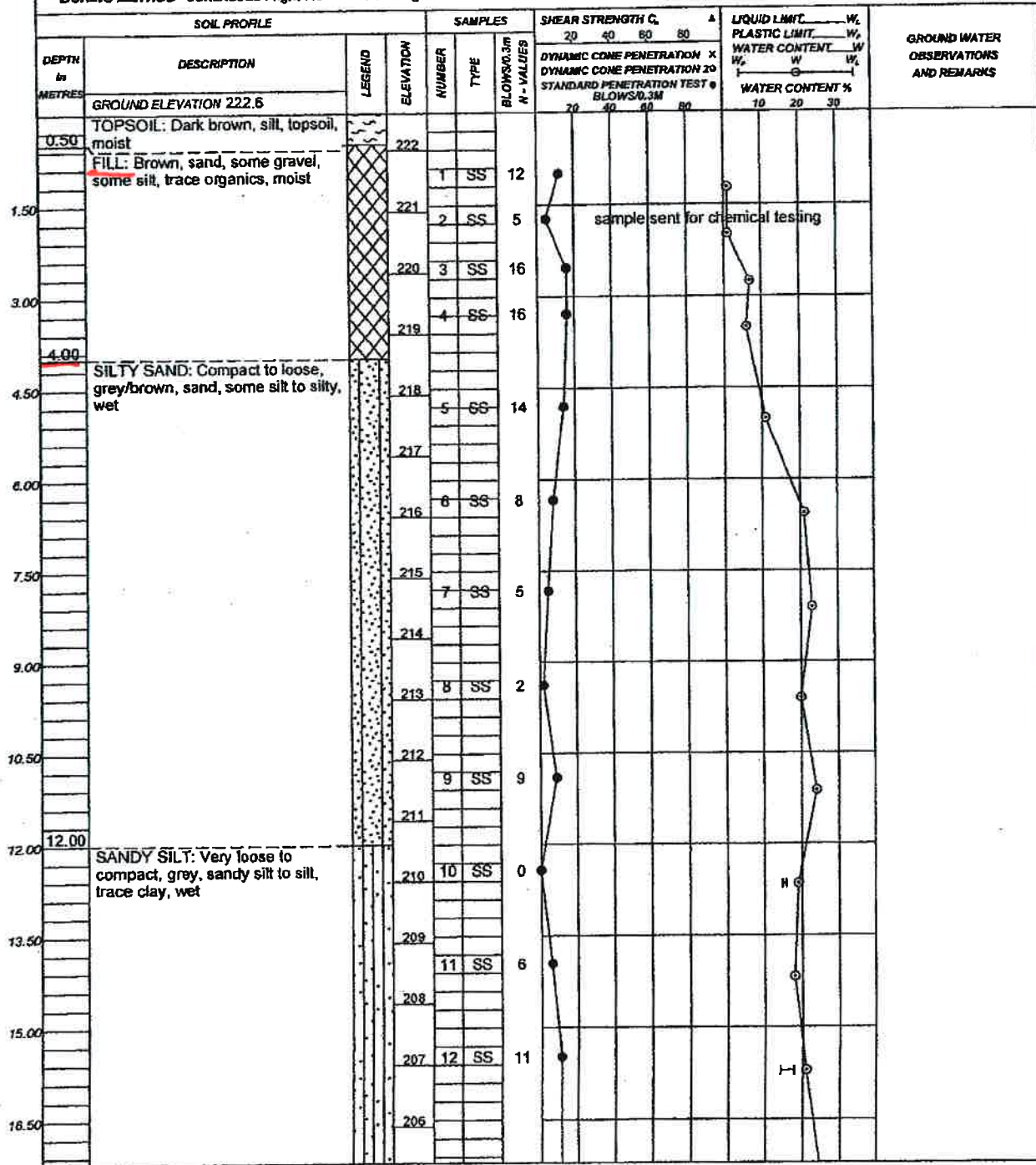
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE December 20, 2007

OUR PROJECT NO. 07BF057

ENGINEER GW

TECHNICIAN NLB



NOTES

CHECKED BY *MJ*

LOG OF BOREHOLE NO. 6

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE December 20, 2007

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN NLB

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C, ▲				LIQUID LIMIT — W, PLASTIC LIMIT — W, WATER CONTENT — W, %			GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	DYNAMIC CONE PENETRATION ×				WATER CONTENT %				
							STANDARD PENETRATION TEST @ BLOWS/0.3M				WATER CONTENT %				
							20	40	60	80	10	20	30		
	CONTINUED FROM PREVIOUS PAGE														
18.00	CLAYEY SILT: Stiff, grey, clayey silt, wet		205												
			204	13	SS	11									
19.50			203												
			202												
21.00	SILT: Compact, grey, silt, trace clay, wet		201	14	SS	12									
			200												
22.50			199												
			198	15	SS	13									
24.00			197												
25.50			196												
27.00			195	16	SS	11									
28.50			194												
30.00	SAND: Compact, grey, sand, trace silt, wet		193												
			192	17	SS	14									
31.50			191												
32.00	SILT: Very dense, grey, silt, trace sand, trace clay, wet		190												
			189	18	SS	106/225 mm									
33.00															

NOTES

CHECKED BY *JM*

LOG OF BOREHOLE NO. 6

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE December 20, 2007

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN NLB

SOIL PROFILE			SAMPLES				SHEAR STRENGTH C, Δ				LIQUID LIMIT W_L			GROUND WATER OBSERVATIONS AND REMARKS
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/30cm N - VALUES	20 40 60 80				PLASTIC LIMIT W_P			
							DYNAMIC CONE PENETRATION X DYNAMIC CONE PENETRATION 20 STANDARD PENETRATION TEST Φ BLOWS/30cm				WATER CONTENT W			
							20 40 60 80				10 20 30			
34.50	CONTINUED FROM PREVIOUS PAGE		188											
	SILT: Very dense, grey, silt, trace sand, trace clay, wet (continued)		187											
36.00			185											
37.00	END			19	SS	99								Upon completion of augering Wet cave at 3.4 m

NOTES

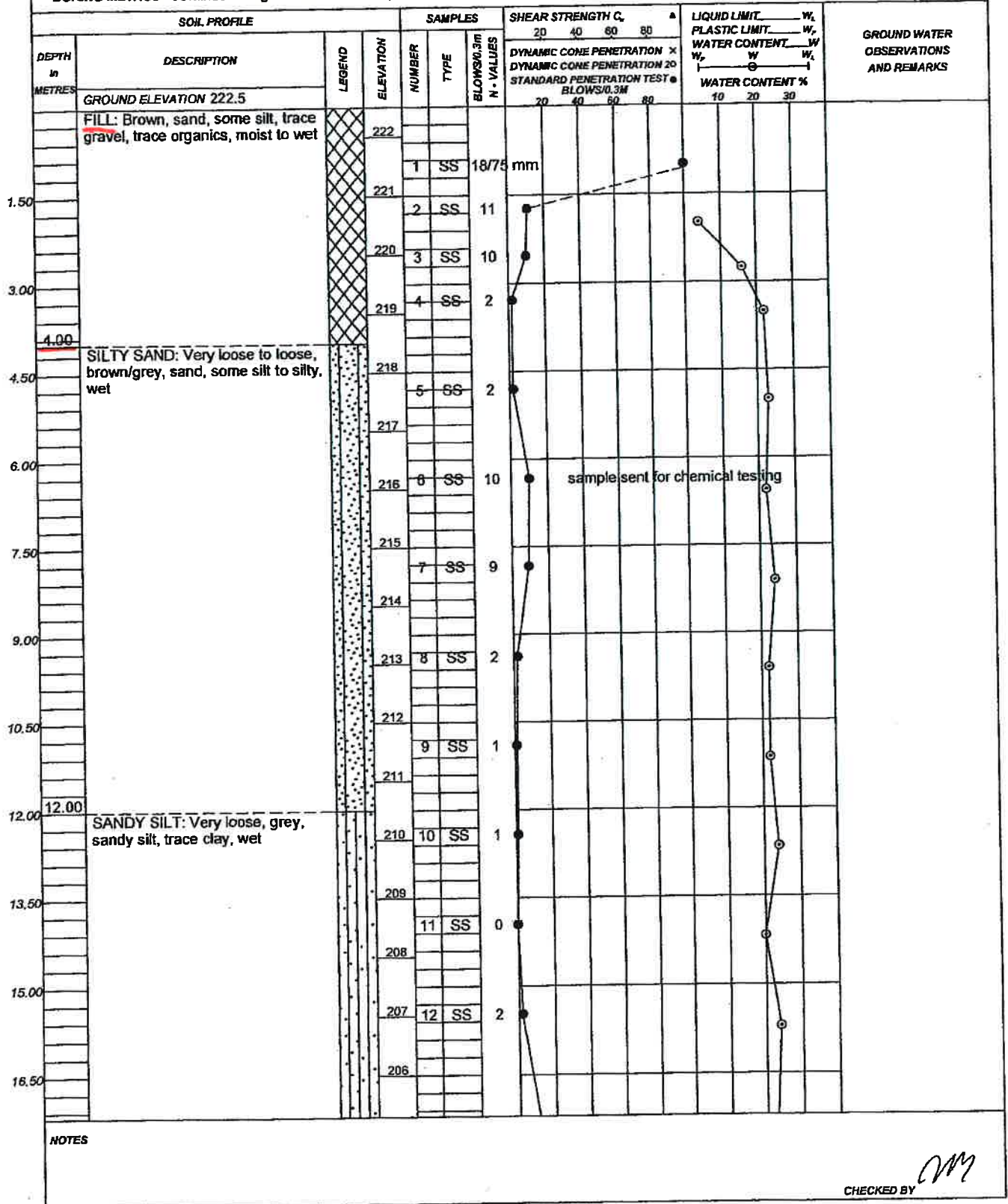
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LOG OF BOREHOLE NO. 7

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE December 19, 2007

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN NLB



NOTES

CHECKED BY *GW*

LOG OF BOREHOLE NO. 7

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE December 19, 2007

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN NLB

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C_u ▲				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	DYNAMIC CONE PENETRATION X DYNAMIC CONE PENETRATION 20 STANDARD PENETRATION TEST ● BLOWS/0.3M				WATER CONTENT %			
							20	40	60	80	10	20	30	
	CONTINUED FROM PREVIOUS PAGE													
18.00	SANDY SILT: Very loose, grey, sandy silt, trace clay, wet		205											
18.50	SAND: Compact to dense, sand, trace silt, wet	[Pattern]	204	14	SS	18								
19.50			203											
21.00			202											
22.50			201	15	SS	32								
24.00			200											
24.00	SILT: Very dense to compact, grey, silt, some sand, trace gravel, trace clay, wet	[Pattern]	198	16	SS	63								
25.50			197											
27.00			196											
28.50			195	17	SS	26								
30.00			194											
31.50			193											
33.00	SAND: Brown/grey, sand, trace silt, wet	[Pattern]	192	18	SS	35								
			191											
			190											
			189	19	SS	*0*								*Suspect sample disturbance

NOTES

CHECKED BY *MM*

LOG OF BOREHOLE NO. 7

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

LOCATION Lakeshore Drive, Barrie, Ontario


BORING METHOD Continuous Flight Hollow Stem Augers

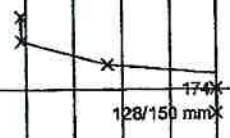
BORING DATE December 19, 2007

OUR PROJECT NO. 07BF057

ENGINEER GW

TECHNICIAN NLB

SOIL PROFILE				SAMPLES			SHEAR STRENGTH C, Δ				LIQUID LIMIT W_L			GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	20 40 60 80				PLASTIC LIMIT W_p	WATER CONTENT W_w		
							DYNAMIC CONE PENETRATION \times				W _p	W ₁	W ₂	
							DYNAMIC CONE PENETRATION 20				WATER CONTENT %			
							STANDARD PENETRATION TEST \bullet				10	20	30	
							BLOWS/0.3M							
34.50	CONTINUED FROM PREVIOUS PAGE													
	SAND: Brown/grey, sand, trace silt, wet		187											
35.60														
36.00	DYNAMIC CONE PENETRATION TEST		185											
37.50				185										
38.00	END													



Upon completion of augering
Wet cave at 3.2 m

NOTES
x-x Dynamic Cone Penetration Test from 36.6 to 38.0 m

CHECKED BY 

LOG OF BOREHOLE NO. 8/MW2

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

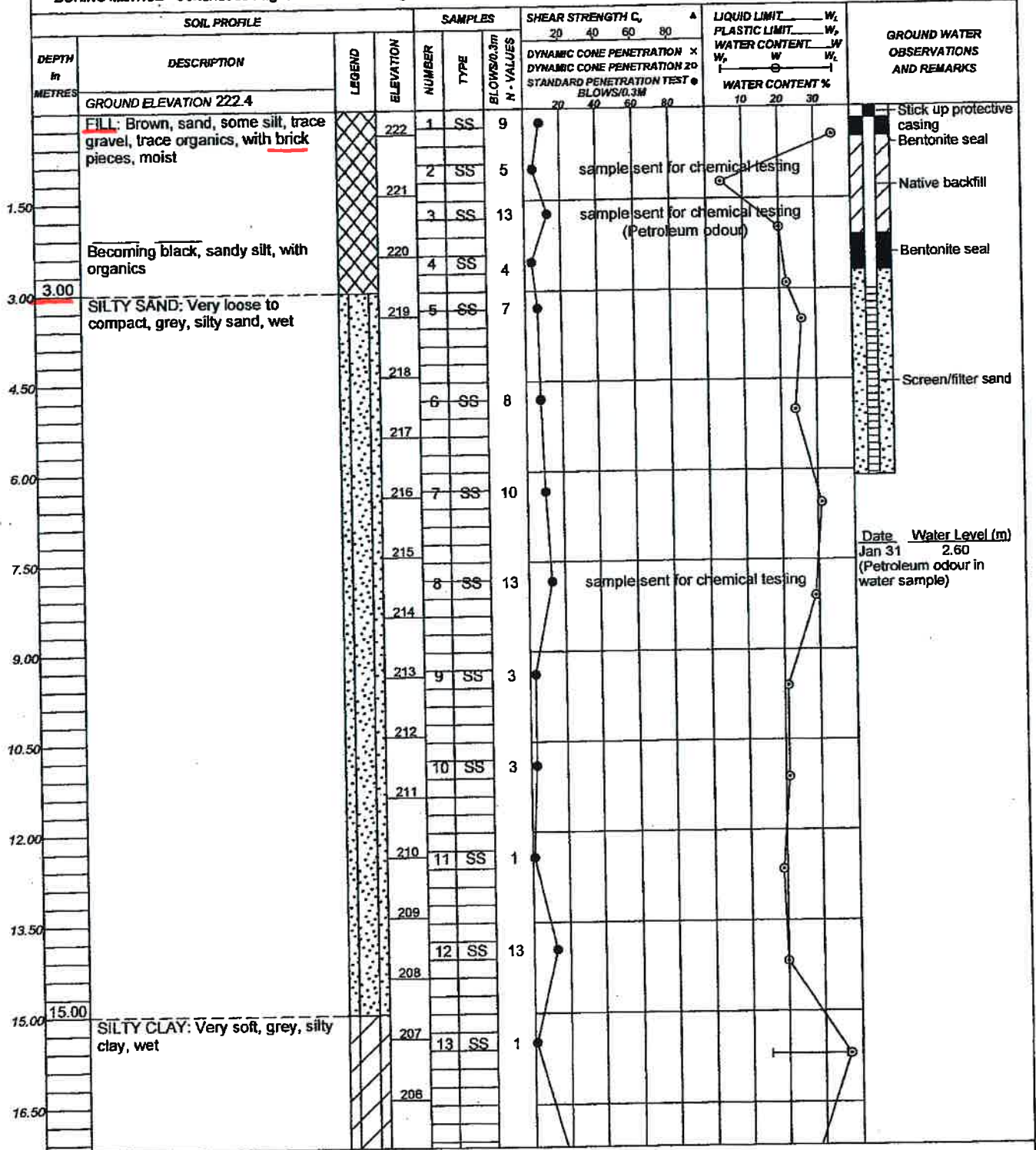
LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 22, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH



NOTES

M

CHECKED BY

LOG OF BOREHOLE NO. 8/MW2

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

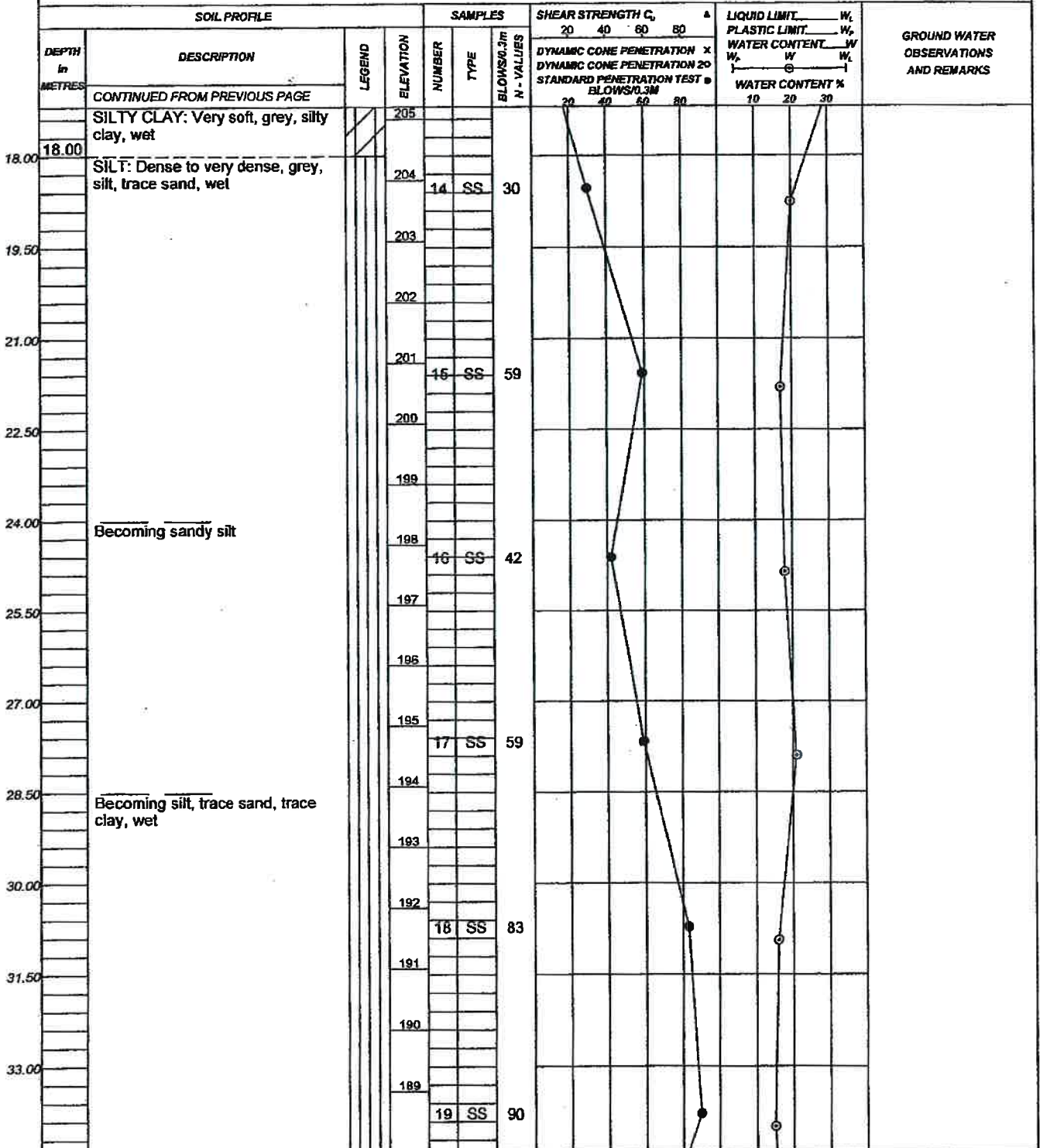
LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 22, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH



NOTES

[Handwritten Signature]

CHECKED BY

LOG OF BOREHOLE NO. 8/MW2

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057

LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 22, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH

SOIL PROFILE			SAMPLES				SHEAR STRENGTH C_u		LIQUID LIMIT W_L		GROUND WATER OBSERVATIONS AND REMARKS		
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/30cm N - VALUES	20	40	60	80		PLASTIC LIMIT W_p	WATER CONTENT W
							DYNAMIC CONE PENETRATION \times					DYNAMIC CONE PENETRATION 20	
							20	40	60	80		10	20
34.50	CONTINUED FROM PREVIOUS PAGE												
	SILT: Dense to very dense, grey, silt, trace sand, wet		187										
36.00	SAND: Compact to dense, grey, sand, trace to some silt, wet		186	20	SS	6*							
			185										
37.50			184										
			183	21	SS	21							
39.00			182										
			181										
42.00			180	22	SS	35							
			179										
43.50			178										
	Becoming gravelly sand, trace silt		177	23	SS	28							
45.00			176										
			175										
46.50			174										
	Becoming very dense		173	24	SS	139							
48.00			172										
			171										

*Suspect sample disturbance

NOTES

CHECKED BY *M*

LOG OF BOREHOLE NO. 8/MW2

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT

OUR PROJECT NO. 07BF057


LOCATION Lakeshore Drive, Barrie, Ontario

BORING DATE January 22, 2008

ENGINEER GW

BORING METHOD Continuous Flight Hollow Stem Augers/Casing and Wash Boring

TECHNICIAN JH

SOIL PROFILE			SAMPLES				SHEAR STRENGTH C, ▲				LIQUID LIMIT — W _L			GROUND WATER OBSERVATIONS AND REMARKS
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	20 40 60 80				PLASTIC LIMIT — W _p			
							DYNAMIC CONE PENETRATION ×				WATER CONTENT — W _c			
							DYNAMIC CONE PENETRATION 20				W _c — W _c			
							STANDARD PENETRATION TEST ●				WATER CONTENT %			
							20 40 60 80				10 20 30			
	CONTINUED FROM PREVIOUS PAGE													
52.30	SAND: Compact to dense, grey, sand, trace to some silt, wet		170	25	SS	100/25 mm								Upon completion of augering Wet cave at 3.2 m
	END													

NOTES

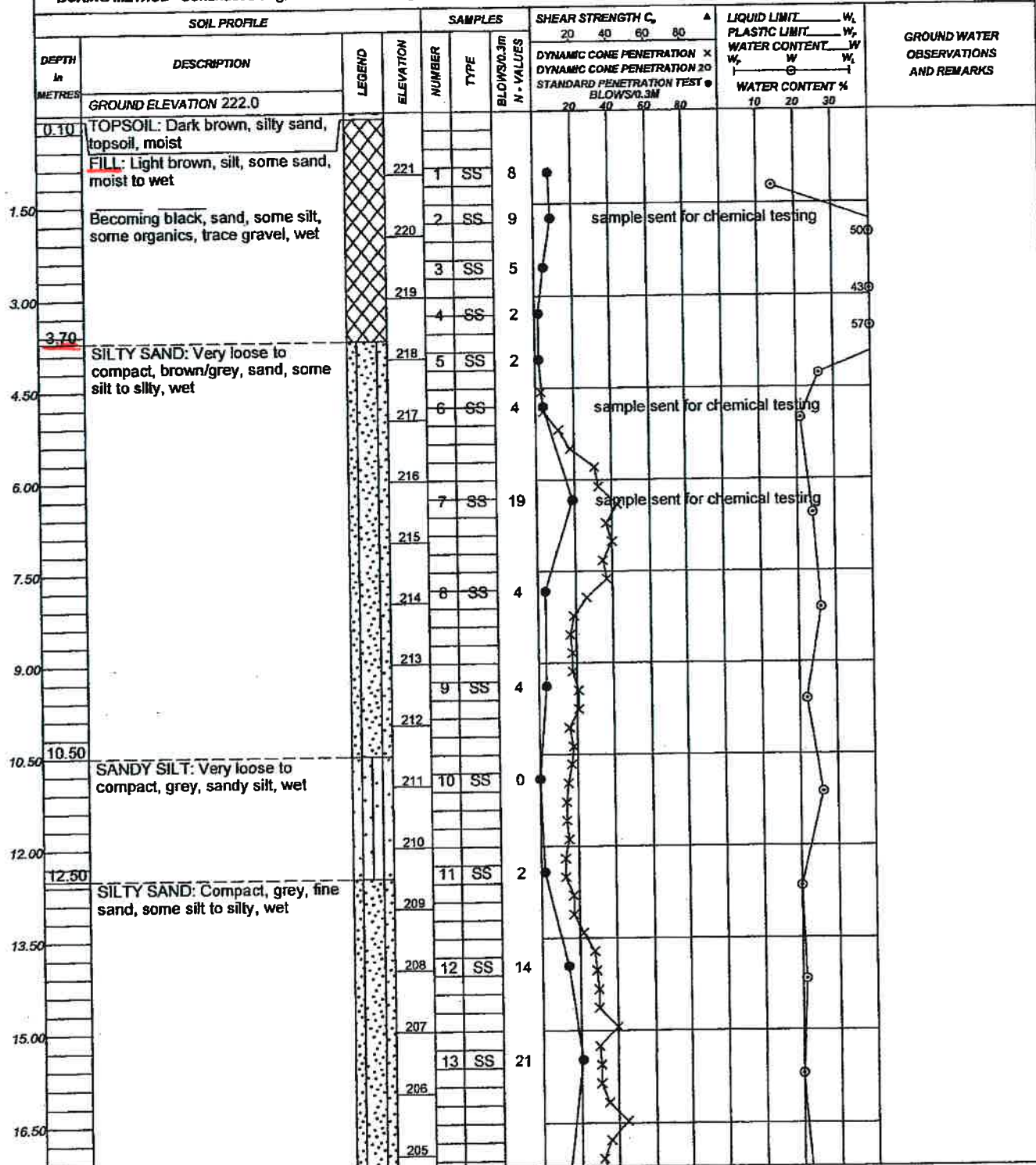
CHECKED BY: 

LOG OF BOREHOLE NO. 9

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 8, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN MN



NOTES
 x-x Dynamic Cone Penetration Test from 4.6 to 26.8 m

CHECKED BY 

LOG OF BOREHOLE NO. 9

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 8, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN MN

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C, ▲		LIQUID LIMIT — W _L		GROUND WATER OBSERVATIONS AND REMARKS				
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	DYNAMIC CONE PENETRATION ×			WATER CONTENT W			
							STANDARD PENETRATION TEST ●			WATER CONTENT %			
							20	40	60	80	10	20	30
	CONTINUED FROM PREVIOUS PAGE												
18.00	SILTY SAND: Compact, grey, fine sand, some silt to silty, wet	[Pattern]	204										
18.00	CLAYEY SILT: Stiff to very stiff, grey, clayey silt, wet	[Pattern]	203	14	SS	9							
19.50			202										
21.00			201										
21.50	SILT: Dense to compact, grey, silt, trace sand, trace clay, wet	[Pattern]	200	15	SS	47							
22.50			199										
24.00			198										
25.50			197	16	SS	41							
25.50			196				160	110	104	135	185		
27.00			195										
28.50			194	17	SS	23							
30.00			193										
31.50			192										
31.50			191	18	SS	31							
33.00	SAND: Dense to compact, grey, fine/fine to medium sand, some silt, wet	[Pattern]	189										
33.00			188	19	SS	40							

NOTES

x-x Dynamic Cone Penetration Test from 4.6 to 26.8 m

AM

CHECKED BY

LOG OF BOREHOLE NO. 9

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 8, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN MN

SOIL PROFILE			SAMPLES		SHEAR STRENGTH C_u Δ				LIQUID LIMIT W_L			GROUND WATER OBSERVATIONS AND REMARKS			
DEPTH In METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	DYNAMIC CONE PENETRATION \times				WATER CONTENT W				
							DYNAMIC CONE PENETRATION \times				WATER CONTENT W				
CONTINUED FROM PREVIOUS PAGE							DYNAMIC CONE PENETRATION \times				WATER CONTENT W				
							STANDARD PENETRATION TEST \bullet				WATER CONTENT W				
							BLOWS/0.3M				%				
							20 40 60 80				10 20 30				
34.50	SAND: Dense to compact, grey, fine/fine to medium sand, some silt, wet Becoming gravelly sand		187												
36.00			186												
37.50			185	20	SS	24									
39.00			184												
40.50			183												
42.00			182	21	SS	40									
43.30			181												
43.50			DYNAMIC CONE PENETRATION TEST		180										
45.00					179	22	SS	21							
46.50					178										
	177														
46.90	176														
	END														

Upon completion of augering
Wet cave at 2.5 m

NOTES
o-o Dynamic Cone Penetration Test from 43.6 to 46.9 m

CHECKED BY

LOG OF BOREHOLE NO. 10

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 30, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN JH

SOIL PROFILE		LEGEND	SAMPLES			SHEAR STRENGTH C _v (kPa) ▲				LIQUID LIMIT W_L			GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH in METRES	DESCRIPTION		ELEVATION	NUMBER	TYPE	BLOWS/30cm N - VALUES	20	40	60	80	PLASTIC LIMIT W_p	WATER CONTENT W		WATER CONTENT %
	GROUND ELEVATION 222.3													
	FILL: Brown, silty sand to sandy silt, trace organics, with wood pieces, moist	[Cross-hatched pattern]	222	1	SS	10								
			221	2	SS	12								
1.50					3	SS	5							sample sent for chemical testing
					220	4	SS	4						sample sent for chemical testing
2.70	SAND: Loose to compact, brown, medium sand, trace silt, wet	[Dotted pattern]	219	5	SS	9								
3.00														
					218									
4.50					217	6	SS	13						
					216	7	SS	13						
6.00														
6.70	BOREHOLE TERMINATED AT 6.70 m												Upon completion of augering Wet cave at 2.4 m	

NOTES

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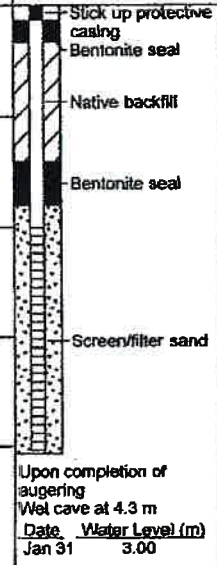
LOG OF BOREHOLE NO. MW1

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT
LOCATION Lakeshore Drive, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers

BORING DATE January 30, 2008

OUR PROJECT NO. 07BF057
ENGINEER GW
TECHNICIAN JH

SOIL PROFILE			SAMPLES			SHEAR STRENGTH C _v (kPa)				LIQUID LIMIT W _L			GROUND WATER OBSERVATIONS AND REMARKS	
DEPTH to METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3M N - VALUES	20	40	60	80	PLASTIC LIMIT W _P	W _L		W _P
							DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST				WATER CONTENT %			
							BLOWS/0.3M				20	40		60
	GROUND ELEVATION 222.9													
	Topsoil over Sand Fill	[Cross-hatched pattern]	222											
1.50			221											
3.00			220											
3.50			219											
4.50	SAND: Compact to loose, brown, sand, some silt, wet	[Dotted pattern]	218	1	SS	17								
			217	2	SS	7								
6.00	BOREHOLE TERMINATED AT 6.10 m													



NOTES

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TEST PIT LOG

Project: Blue Sails	Project Number: 3-08-4039	Test Pit No. 4
Location: Barrie, Ontario	Equipment: Rubber Tire	Sheet No. 1 of 1
Client:	Depth (m): 3.0	Date: 17 June 2008

Notes: Test Pit was open and slight ground water seepage at 2.8m upon completion of excavation.

Elev. (m)	Depth (m)	Strat.	Material Description	Well Detail	Comments	Water Contents (%)			
						0	10	20	30
	1		FILL - Silt and Sand, trace gravel, compact, brown, moist						
	2		FILL - Silty Sand, some large reinforced concrete rubble, asphalt, trace brick, loose, brown, moist						
	3		SAND trace silt, loose, greyish brown, wet						
	4		End of Test Pit						



Terraprobe

TEST PIT LOG

Project: Blue Sails	Project Number: 3-08-4039	Test Pit No. 6
Location: Barrie, Ontario	Equipment: Rubber Tire	Sheet No. 1 of 1
Client:	Depth (m): 3.2	Date: 17 June 2008

Notes: Test Pit was open and ground water seepage at 2.6m upon completion of excavation.

Elev. (m)	Depth (m)	Strat.	Material Description	Well Detail	Comments	Water Contents (%)			
						0	10	20	30
		[Cross-hatched pattern]	FILL - Concrete Rubble, some silty sand						
	1		FILL - Cinders and Sand, some wood timber, loose to compact, black						
	2		200mm ORGANIC STAINED SAND						
	3		SAND some silt, loose, brown / grey, wet						
	4		End of Test Pit						




TEST PIT LOG

<i>Project:</i> Blue Sails		<i>Project Number:</i> 3-08-4039		<i>Test Pit No.</i> 12					
<i>Location:</i> Barrie, Ontario		<i>Equipment:</i> Rubber Tire		<i>Sheet No.</i> 1 of 1					
<i>Client:</i>		<i>Depth (m):</i> 2.5		<i>Date:</i> 17 June 2008					
<i>Notes:</i> Test Pit was open and ground water seepage at 2.5m upon completion of excavation.									
<i>Elev. (m)</i>	<i>Depth (m)</i>	<i>Strat.</i>	<i>Material Description</i>	<i>Well Detail</i>	<i>Comments</i>	<i>Water Contents (%)</i>			
						0	10	20	30
	1		<i>FILL - Silty Sand, loose, brown, moist</i>						
			<i>FILL - Wood and Roots, one rubber tire</i>						
	2		<i>FILL - Sandy Gravel, hydrocarbon impacted, one rail road tie, loose to compact, black, wet</i>						
			<i>PEAT high content of preserved wood, loose, black, wet</i>						
			<i>End of Test Pit</i>						
	3								
	4								

LOG OF TEST PIT NO. 1

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT - Small Parcel
LOCATION Bradford Street, Barrie, Ontario
DATE February 21, 2008

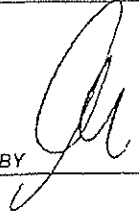
PML REF. 08BF006
ENGINEER GW
TECHNICIAN GW

DEPTH in METRES	DESCRIPTION	LEGEND	SAMPLE NUMBER	SHEAR STRENGTH kPa			WATER CONTENT %			GROUND WATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION			50	100	150	200	10	20	
	FILL: Brown, sand and gravel, some silt, pieces of glass and metal, moist to frozen									
0.90	Becoming brown, sand, some gravel, some silt, wet									
	TEST PIT TERMINATED AT 0.90 m									

NOTES

No footing present. Base of slab-on-grade founded on fill 250 mm below existing ground surface.


CHECKED BY



LOG OF TEST PIT NO. 2

PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT - Small Parcel
LOCATION Bradford Street, Barrie, Ontario
DATE February 21, 2008

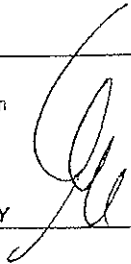
PML REF. 08BF006
ENGINEER GW
TECHNICIAN GW

DEPTH in METRES	DESCRIPTION	LEGEND	SAMPLE NUMBER	SHEAR STRENGTH kPa				WATER CONTENT %			GROUND WATER OBSERVATIONS AND REMARKS
	GROUND ELEVATION			50	100	150	200	10	20	30	
0.60	FILL: 300 mm dark brown to black, sand, some gravel, some silt, frozen, over black, silt, some gravel, some sand, trace organics, pieces of glass, moist to wet										
	TEST PIT TERMINATED AT 0.60 m										

NOTES

Footing founded on fill about 500 mm below existing grade. Footing projects only 50 to 100 mm and was only 50 to 100 mm thick.




CHECKED BY



LOG OF TEST PIT NO. 3

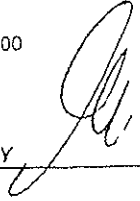
PROJECT PROPOSED BLUE SAILS CONDOMINIUM DEVELOPMENT - Small Parcel
LOCATION Bradford Street, Barrie, Ontario
DATE February 21, 2008

PML REF. 08BF006
ENGINEER GW
TECHNICIAN GW

DEPTH in METRES	DESCRIPTION	LEGEND	SAMPLE NUMBER	SHEAR STRENGTH kPa				WATER CONTENT %			GROUND WATER OBSERVATIONS AND REMARKS
				50	100	150	200	10	20	30	
	GROUND ELEVATION										
0.07	Asphaltic concrete										
	FILL: Brown, sand and gravel, some silt, pieces of glass, plastic bags, moist to wet										
1.10											
1.20	SAND: Loose, brown/grey, sand, some gravel, some silt, trace organics, moist										
	TEST PIT TERMINATED AT 1.20 m										

NOTES

Footings founded on possible native soil at 1.1 m below existing grade. Footing projects 50 to 100 mm and was only 50 to 100 mm thick. One section of footing was 200 mm thick and projected 200 mm

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Appendix D

Single Well Response Test Analyses

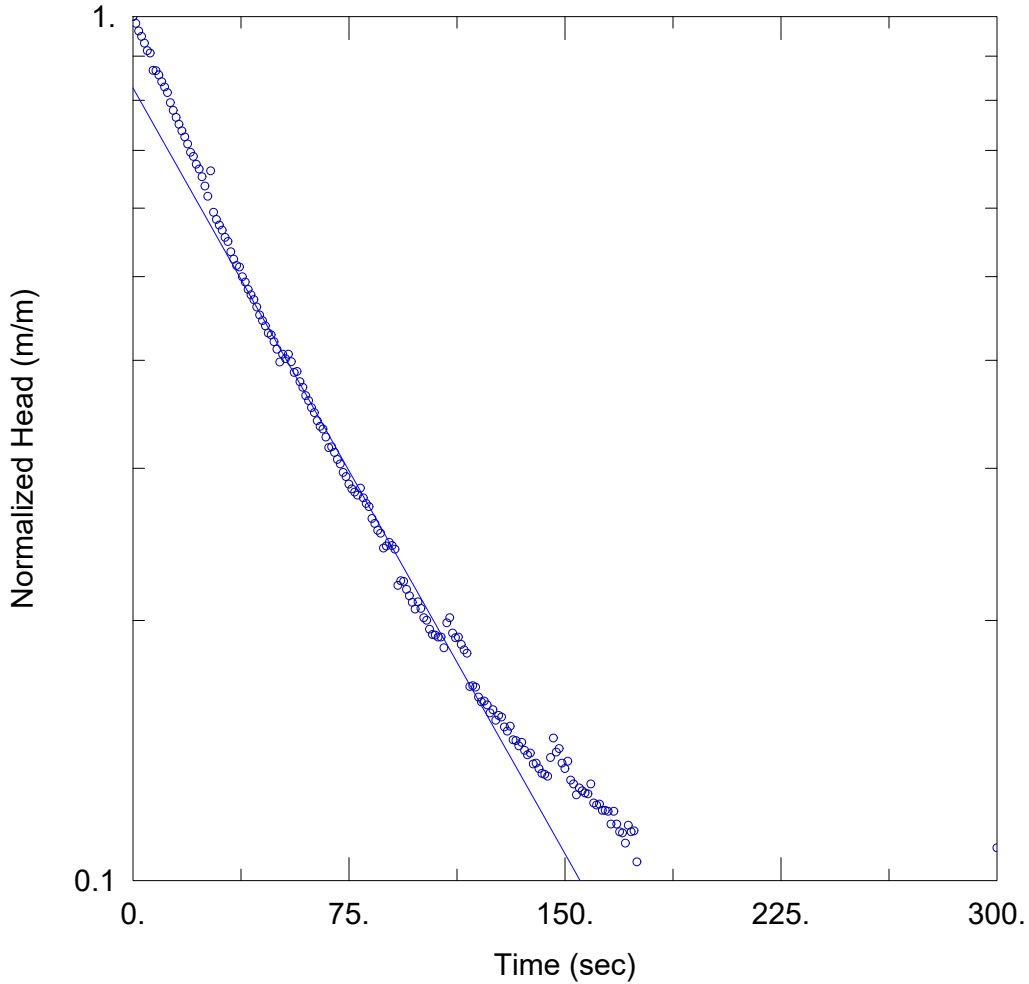
MW2-19 Falling Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW2-19 Falling Head Test Bouwer-Rice.aqt
Date: 11/14/19 Time: 10:48:59

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.004242 cm/sec y0 = 0.2455 m

AQUIFER DATA

Saturated Thickness: 4.302 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-19)

Initial Displacement: 0.2969 m
Static Water Column Height: 4.302 m
Total Well Penetration Depth: 4.302 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



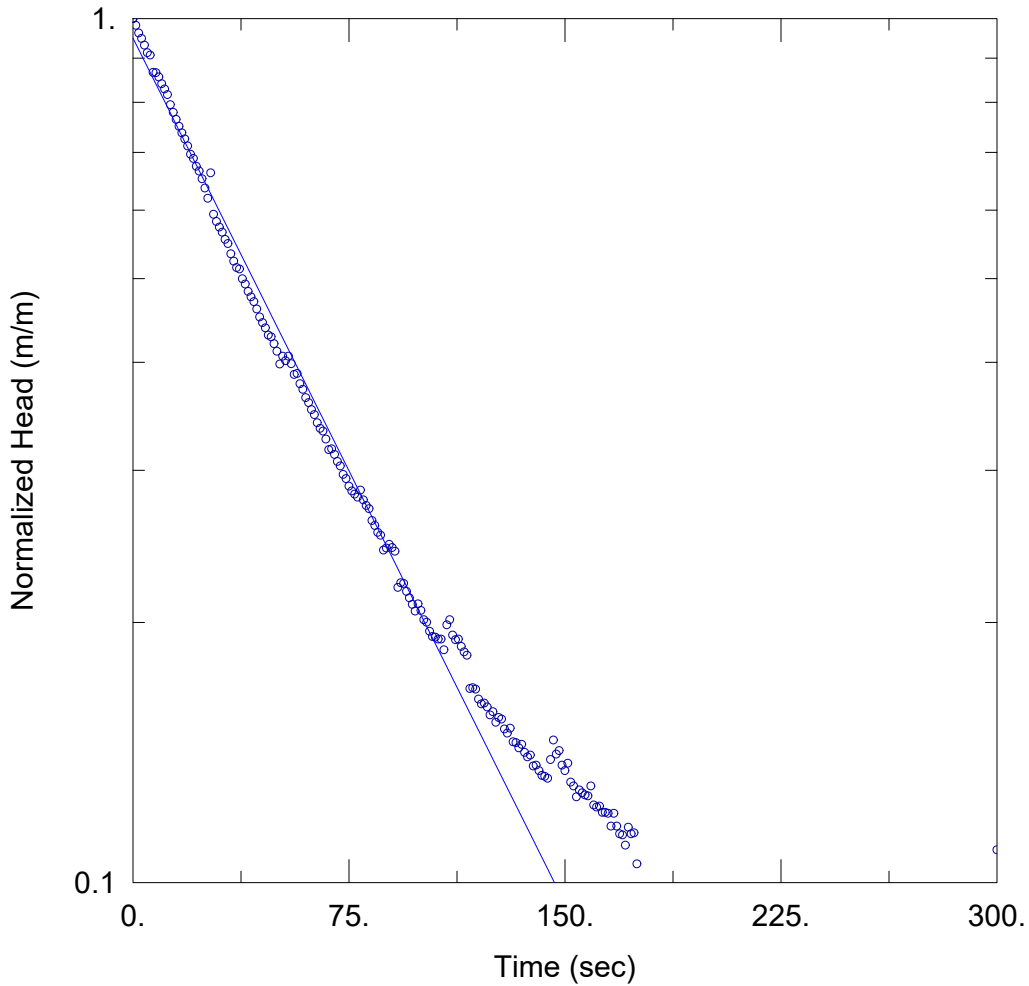
MW2-19 Falling Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW2-19 Falling Head Test Hvorslev.aqt
Date: 11/14/19 Time: 10:49:41

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

$K = \underline{0.00642}$ cm/sec $y_0 = \underline{0.2818}$ m

AQUIFER DATA

Saturated Thickness: 4.302 m Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW2-19)

Initial Displacement: 0.2969 m
Static Water Column Height: 4.302 m
Total Well Penetration Depth: 4.302 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



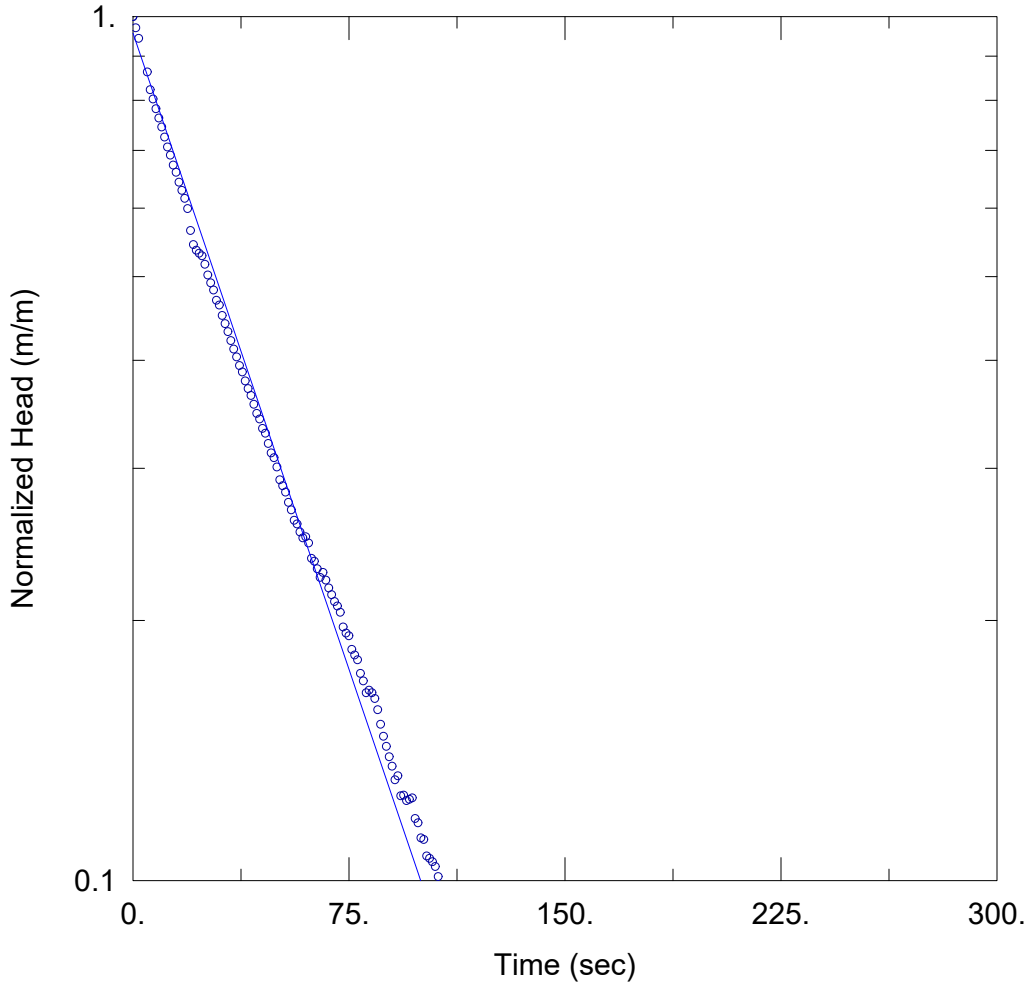
MW2-19 Rising Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW2-19 Rising Head Test Bouwer-Rice.aqt
Date: 11/14/19 Time: 10:50:11

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.007049 cm/sec y0 = 0.4177 m

AQUIFER DATA

Saturated Thickness: 4.302 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-19)

Initial Displacement: 0.4365 m
Static Water Column Height: 4.302 m
Total Well Penetration Depth: 4.302 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



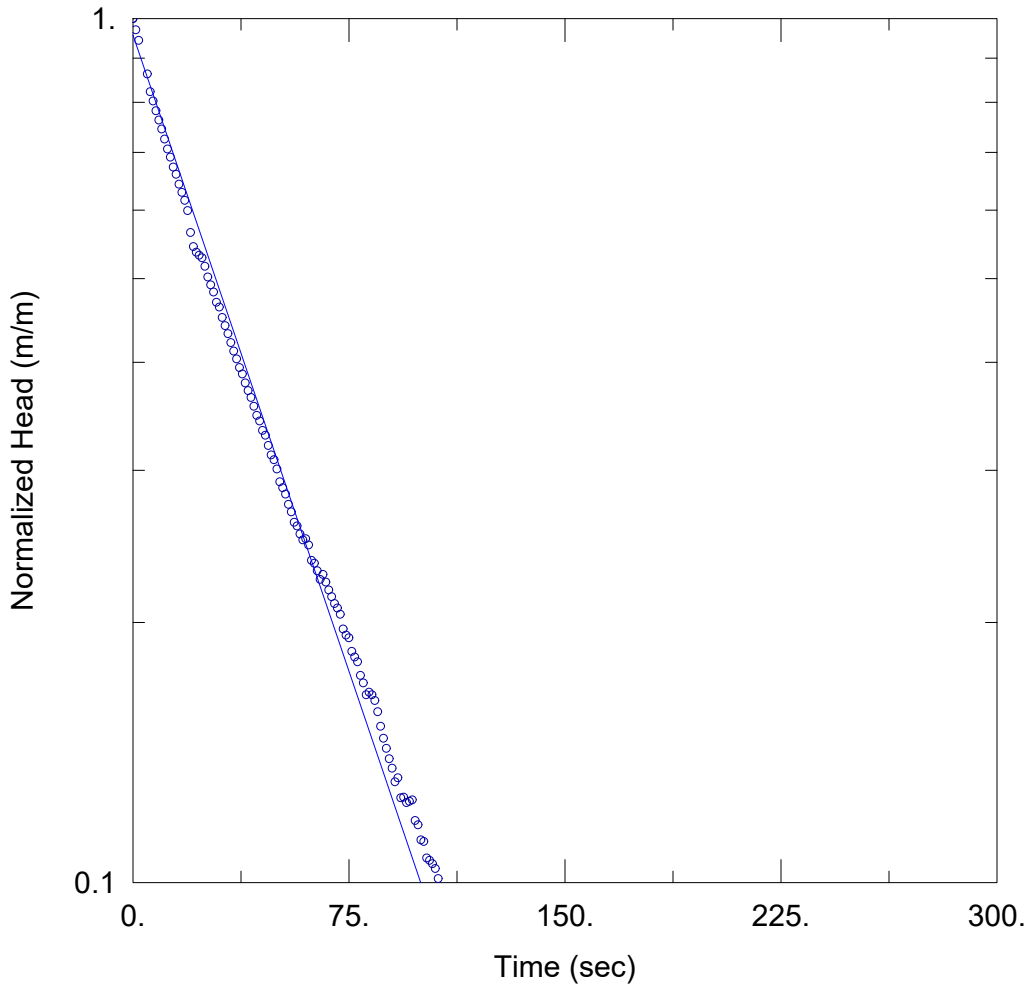
MW2-19 Rising Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW2-19 Rising Head Test Hvorslev.aqt
Date: 11/14/19 Time: 10:50:37

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.009439 cm/sec y0 = 0.4177 m

AQUIFER DATA

Saturated Thickness: 4.302 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-19)

Initial Displacement: 0.4365 m
Static Water Column Height: 4.302 m
Total Well Penetration Depth: 4.302 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



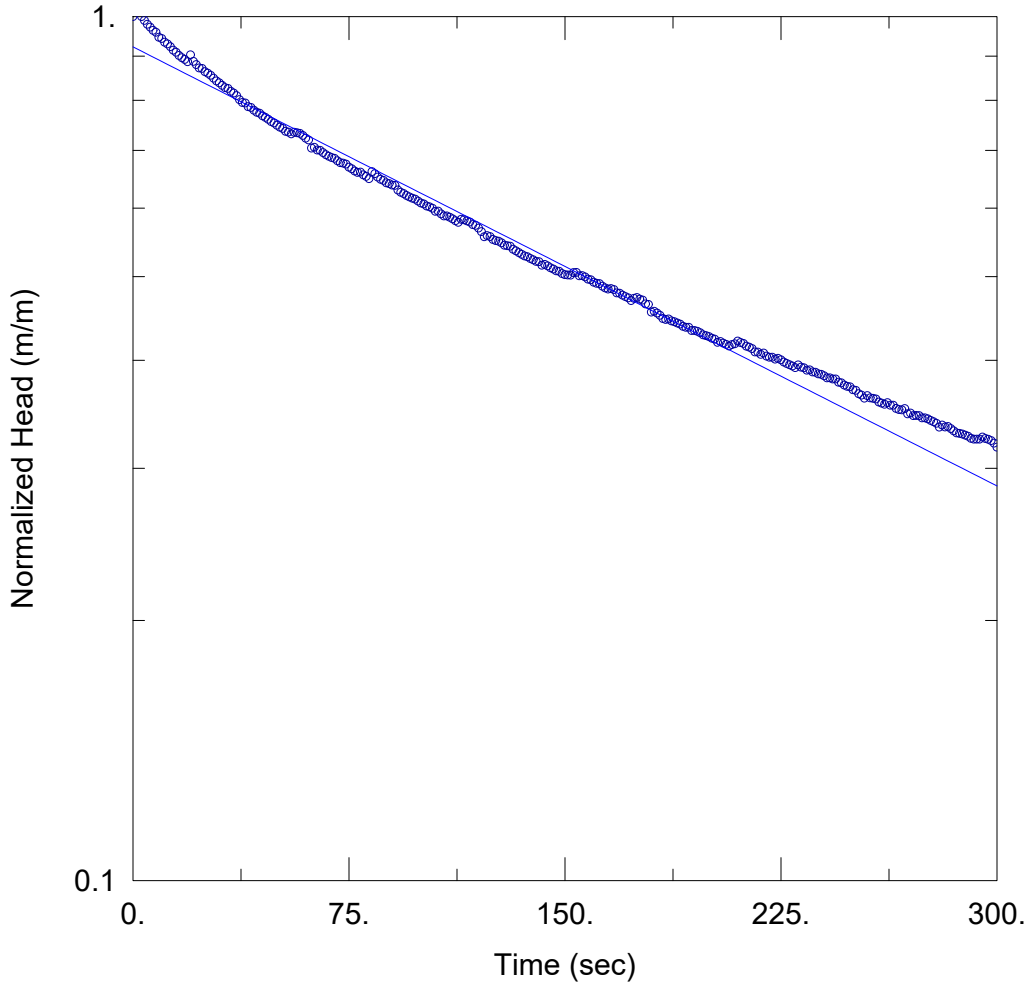
MW5-19 Falling Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW5-19 Falling Head Test Bouwer-Rice.aqt
Date: 11/14/19 Time: 10:51:49

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001394 cm/sec y0 = 0.4244 m

AQUIFER DATA

Saturated Thickness: 9.342 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5-19)

Initial Displacement: 0.4601 m
Static Water Column Height: 9.342 m
Total Well Penetration Depth: 9.342 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



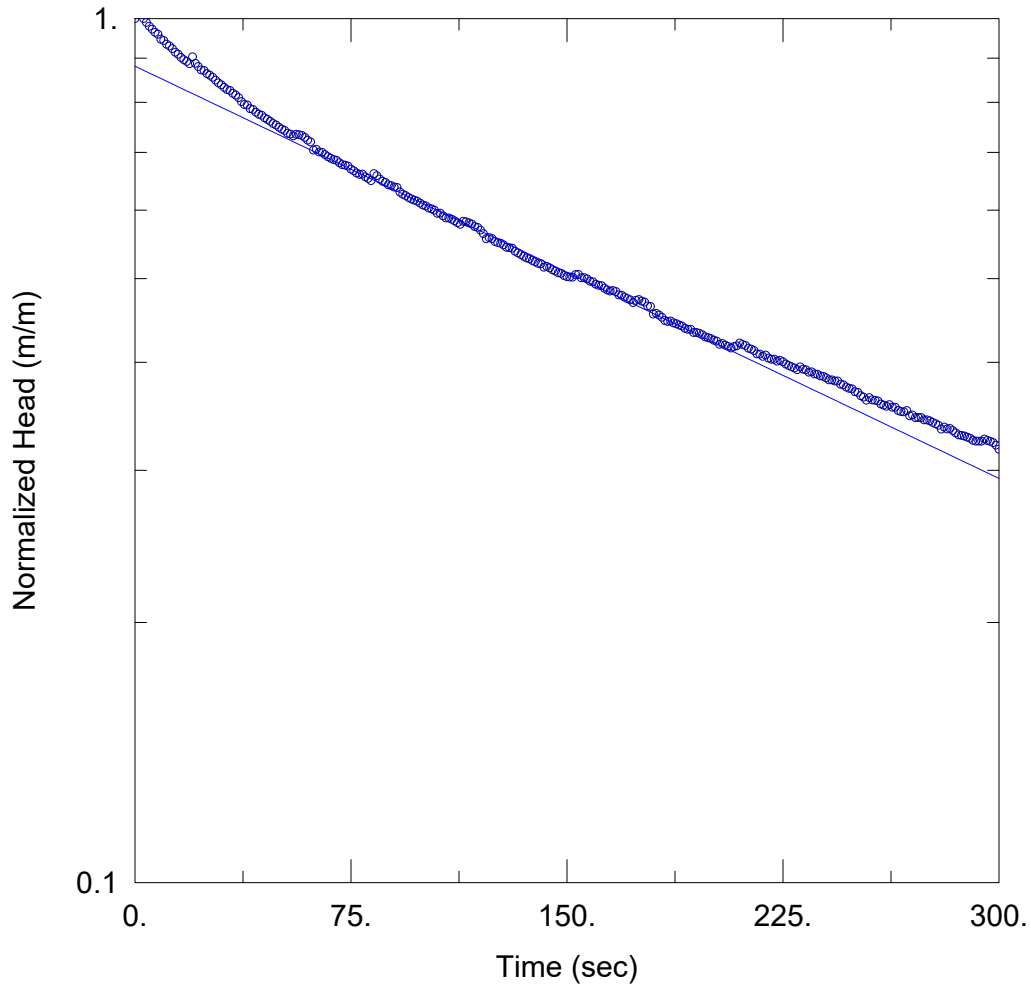
MW5-19 Falling Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW5-19 Falling Head Test Hvorslev.aqt
Date: 11/14/19 Time: 10:52:16

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

$K = 0.001529$ cm/sec $y_0 = 0.4053$ m

AQUIFER DATA

Saturated Thickness: 9.342 m Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW5-19)

Initial Displacement: 0.4601 m
Static Water Column Height: 9.342 m
Total Well Penetration Depth: 9.342 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



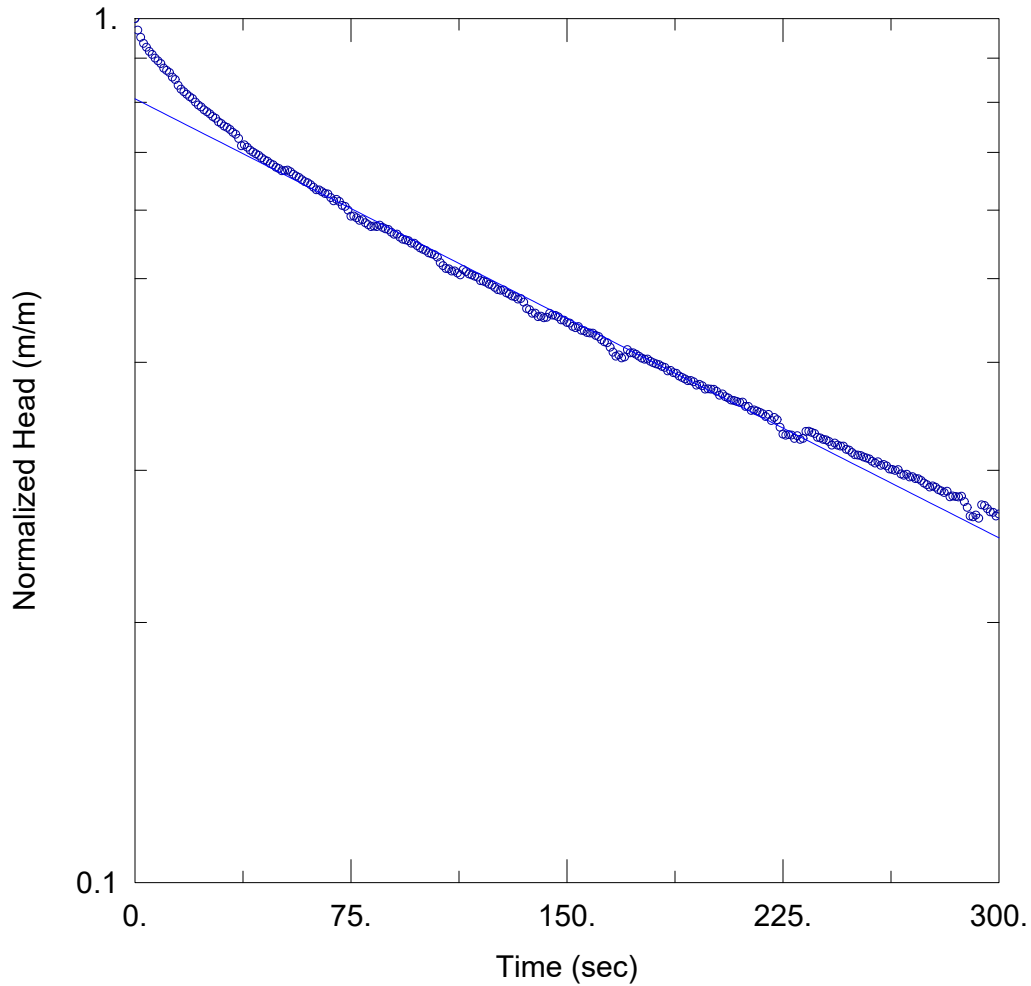
MW5-19 Rising Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW5-19 Rising Head Test Bouwer-Rice.aqt
Date: 11/14/19 Time: 10:52:45

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001394 cm/sec y0 = 0.4053 m

AQUIFER DATA

Saturated Thickness: 9.342 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5-19)

Initial Displacement: 0.5019 m
Static Water Column Height: 9.342 m
Total Well Penetration Depth: 9.342 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



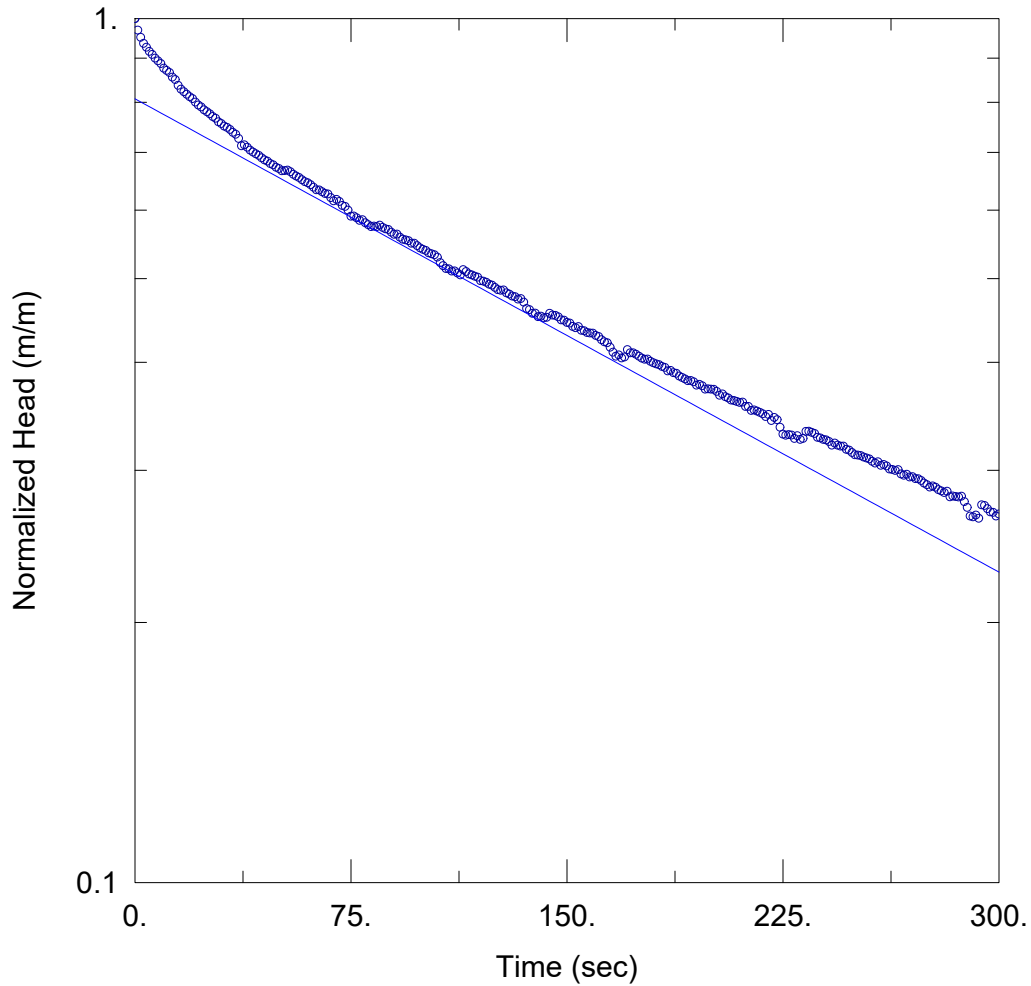
MW5-19 Rising Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW5-19 Rising Head Test Hvorslev.aqt
Date: 11/14/19 Time: 10:53:10

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

$K = \underline{0.001756}$ cm/sec $y_0 = \underline{0.4053}$ m

AQUIFER DATA

Saturated Thickness: 9.342 m Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW5-19)

Initial Displacement: 0.5019 m
Static Water Column Height: 9.342 m
Total Well Penetration Depth: 9.342 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



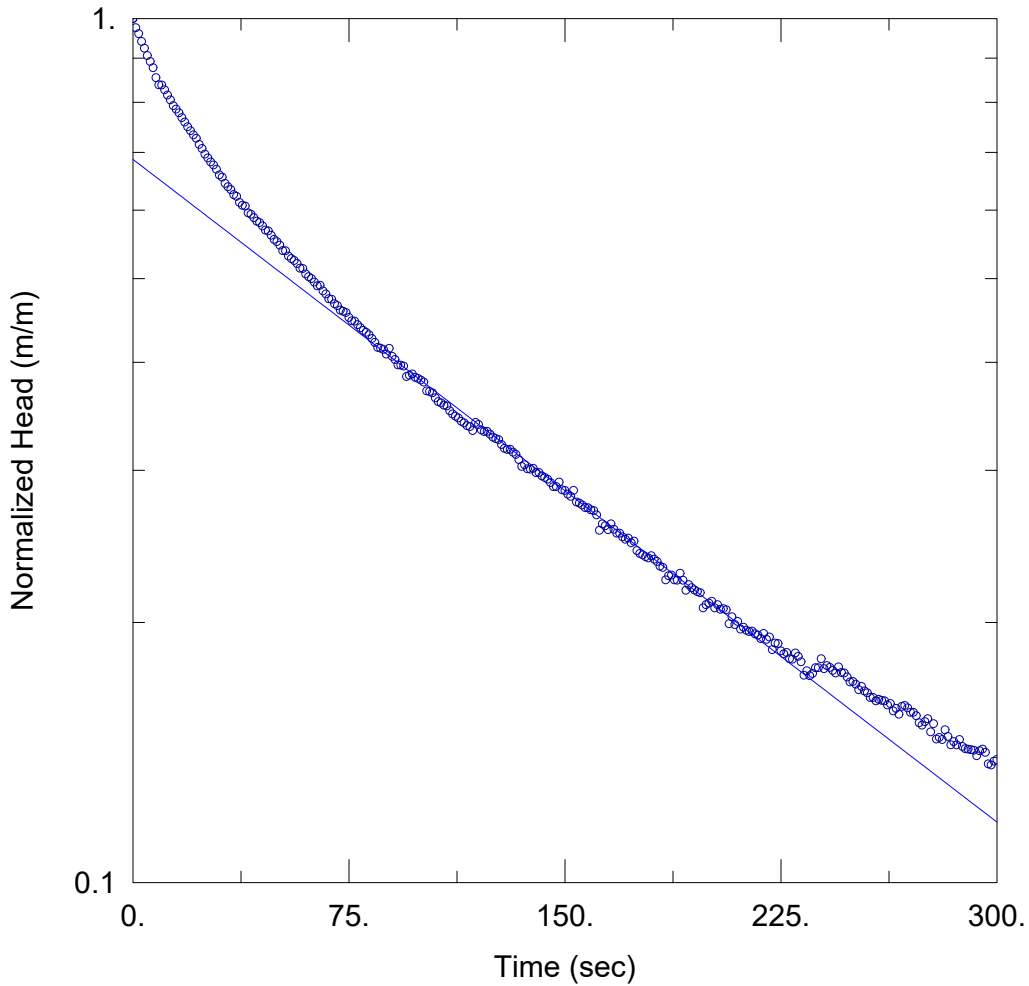
MW6-19 Falling Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \\...MW6-19 Falling Head Test Bower-Rice.aqt
Date: 11/14/19 Time: 10:53:31

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bower-Rice
K = 0.002261 cm/sec y0 = 0.3361 m

AQUIFER DATA

Saturated Thickness: 15.19 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW6-19)

Initial Displacement: 0.4892 m
Static Water Column Height: 15.19 m
Total Well Penetration Depth: 15.19 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



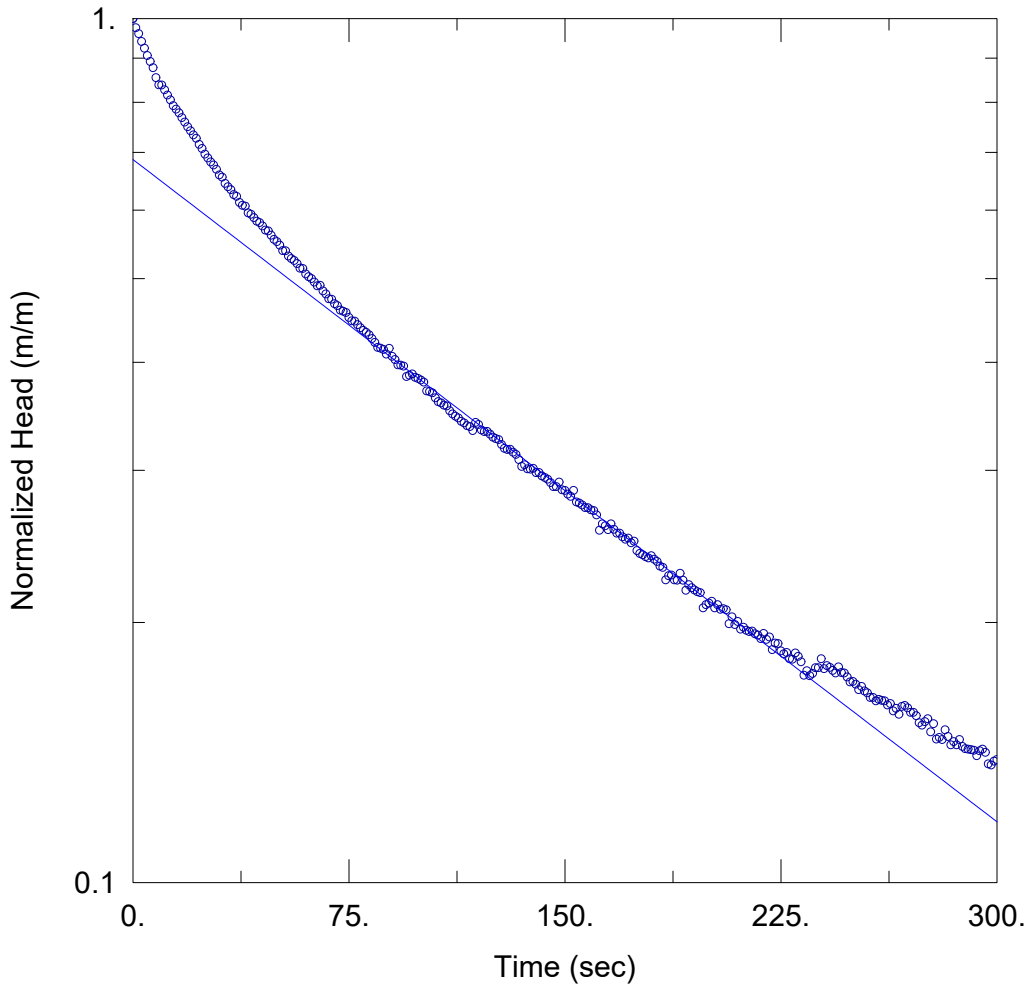
MW6-19 Falling Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \...MW6-19 Falling Head Test Hvorslev.aqt
Date: 11/14/19 Time: 10:53:57

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

$K = \underline{0.002456}$ cm/sec $y_0 = \underline{0.336}$ m

AQUIFER DATA

Saturated Thickness: 15.19 m Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW6-19)

Initial Displacement: 0.4892 m
Static Water Column Height: 15.19 m
Total Well Penetration Depth: 15.19 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



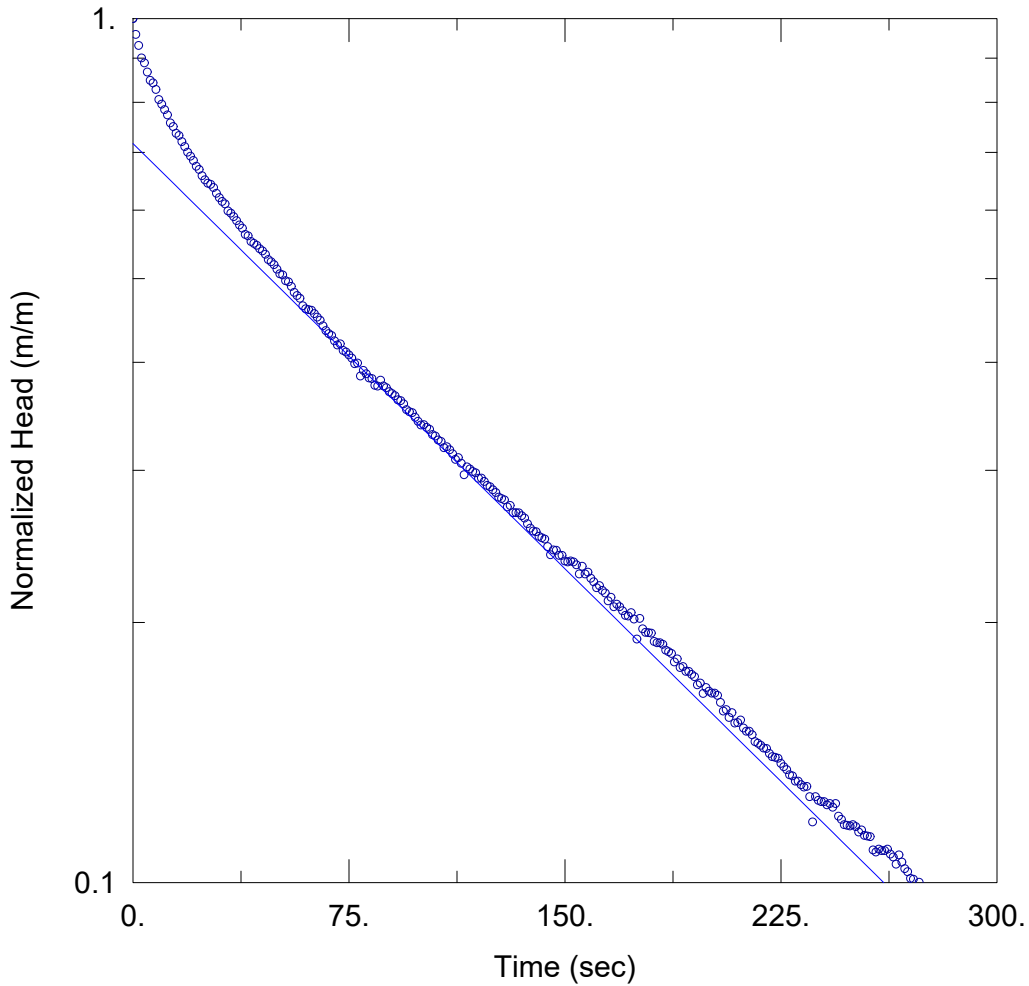
MW6-19 Rising Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \\...MW6-19 Rising Head Test Bouwer-Rice.aqt
Date: 11/14/19 Time: 10:54:18

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.002901 cm/sec y0 = 0.3495 m

AQUIFER DATA

Saturated Thickness: 15.19 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW6-19)

Initial Displacement: 0.4877 m
Static Water Column Height: 15.19 m
Total Well Penetration Depth: 15.19 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



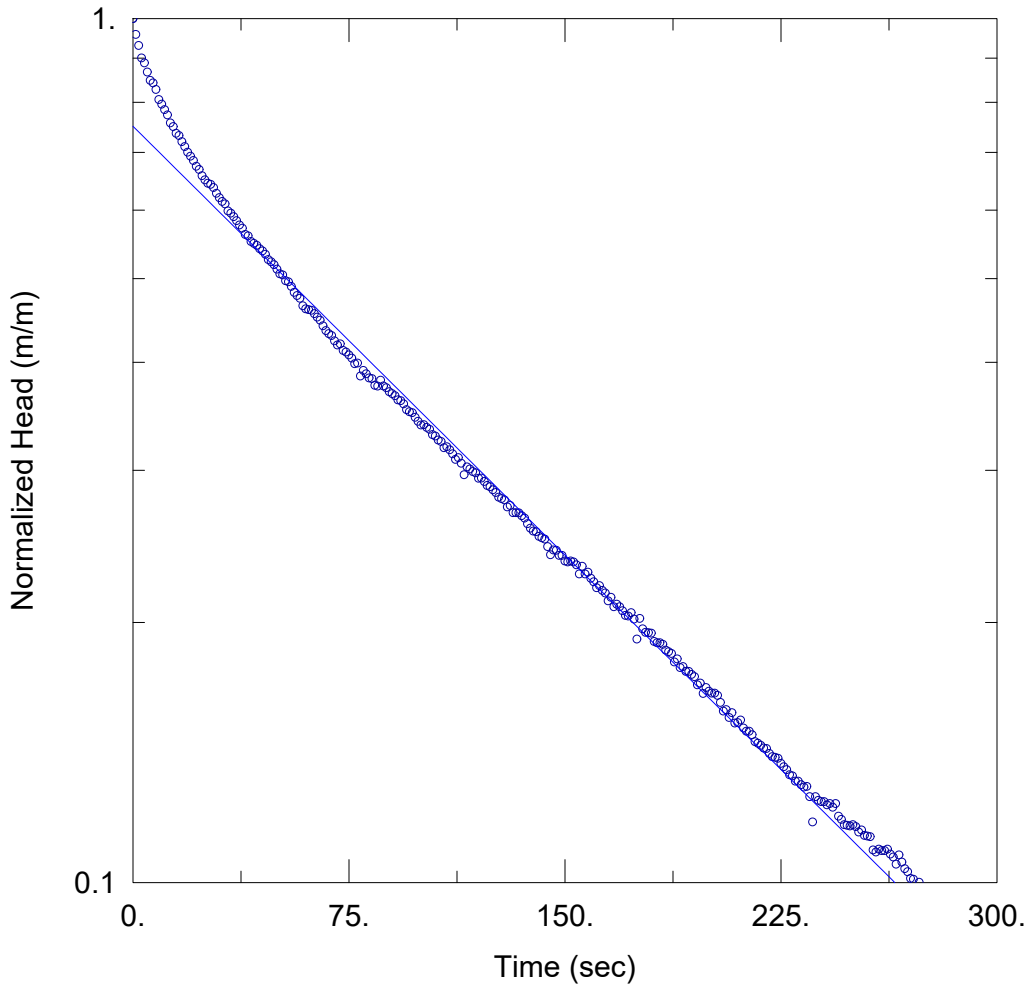
MW6-19 Rising Head Test

Prepared By:
GHD Limited

Prepared For:
Barrie Lakeshore Developments

Project:
11201680

Location:
51-75 Bradford St., Barrie, On



Data Set: \\...MW6-19 Rising Head Test Hvorslev.aqt
Date: 11/14/19 Time: 10:54:45

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

$K = 0.003181$ cm/sec $y_0 = 0.366$ m

AQUIFER DATA

Saturated Thickness: 15.19 m Anisotropy Ratio (K_z/K_r): 1.

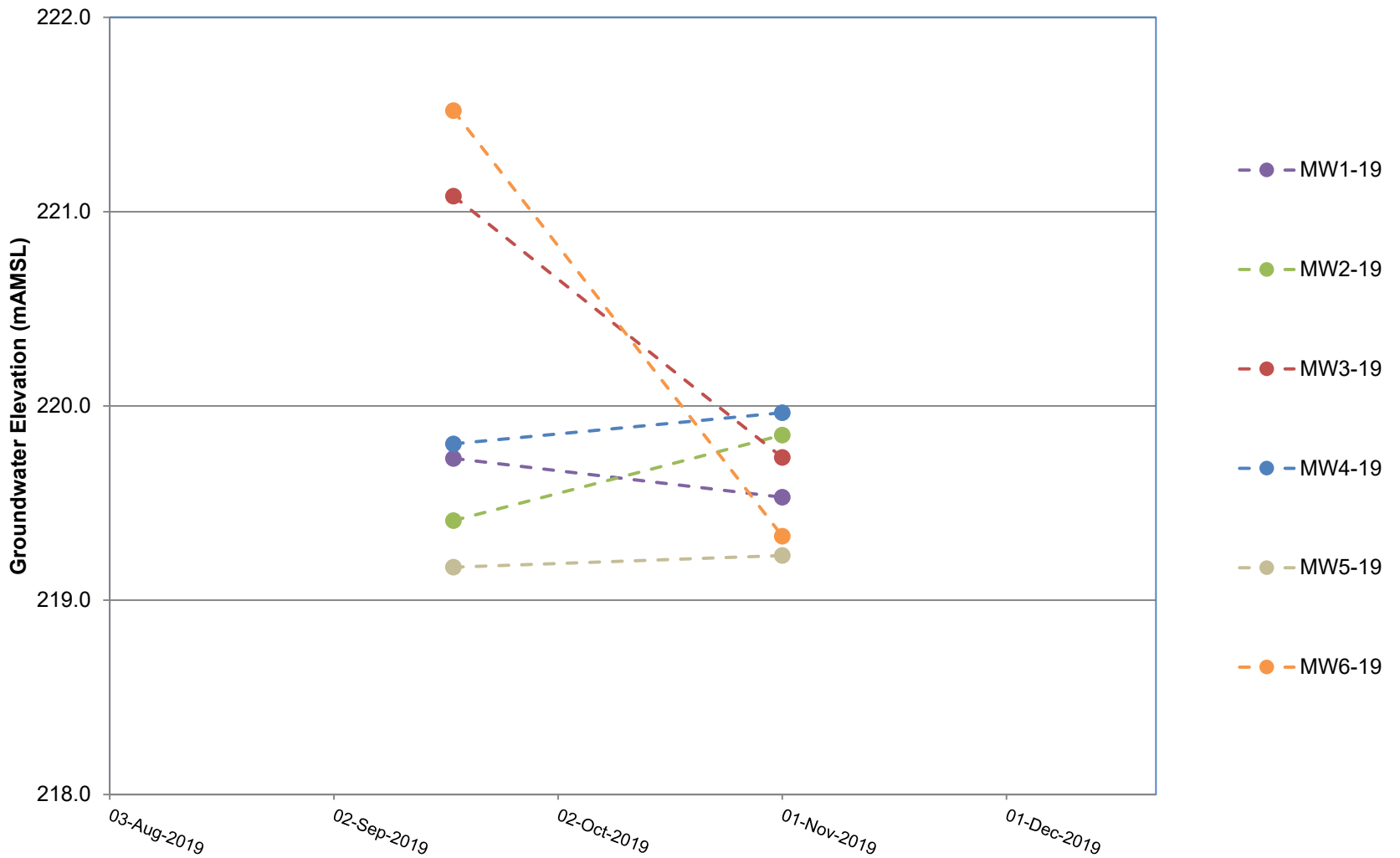
WELL DATA (MW6-19)

Initial Displacement: 0.4877 m
Static Water Column Height: 15.19 m
Total Well Penetration Depth: 15.19 m
Screen Length: 1.525 m
Casing Radius: 0.0254 m
Well Radius: 0.1016 m
Gravel Pack Porosity: 0.32



Appendix E

Groundwater Level Hydrographs



Barrie Lakeshore Developments
 51-75 Bradford Street, Barrie, Ontario
 Proposed Residential Development
 Hydrogeological Assessment
Groundwater Elevation Hydrograph

Appendix F

Laboratory Analytical Report



BV Labs - Partial/Rush Results

Your P.O. #: 73518034
Your Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your C.O.C. #: 747631-01-01

Attention: 11201680-PO-73518034

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2019/11/26
Report #: R5980508
Version: 1 - Partial

CERTIFICATE OF ANALYSIS – PARTIAL RESULTS

BV LABS JOB #: B9X1272

Received: 2019/11/23, 14:38

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date		Laboratory Method	Analytical Method
		Extracted	Analyzed		
Alkalinity	1	N/A	2019/11/25	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2019/11/25	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2019/11/25	CAM SOP-00463	SM 23 4500-Cl E m
Colour	1	N/A	2019/11/25	CAM SOP-00412	SM 23 2120C m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2019/11/25	CAM SOP-00446	SM 23 5310 B m
Fluoride	1	2019/11/25	2019/11/25	CAM SOP-00449	SM 23 4500-F C m
Hardness (calculated as CaCO3)	1	N/A	2019/11/25	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	1	N/A	2019/11/25	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2019/11/25	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	1	N/A	2019/11/25		
Total Ammonia-N	1	N/A	2019/11/25	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	1	N/A	2019/11/25	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Organic Nitrogen	1	N/A	2019/11/25		
pH	1	2019/11/25	2019/11/25	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	1	N/A	2019/11/25	CAM SOP-00461	EPA 365.1 m
Sulphate by Automated Colourimetry	1	N/A	2019/11/25	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	1	2019/11/23	2019/11/25	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	1	2019/11/25	2019/11/25	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2019/11/25	2019/11/25	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids	1	2019/11/23	2019/11/25	CAM SOP-00428	SM 23 2540D m

Remarks:

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

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



BV Labs - Partial/Rush Results

Your P.O. #: 73518034
Your Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your C.O.C. #: 747631-01-01

Attention: 11201680-PO-73518034

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2019/11/26
Report #: R5980508
Version: 1 - Partial

CERTIFICATE OF ANALYSIS – PARTIAL RESULTS

BV LABS JOB #: B9X1272

Received: 2019/11/23, 14:38

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

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

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

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

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

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

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ema Gitej, Senior Project Manager

Email: Ema.Gitej@bvlabs.com

Phone# (905)817-5829

=====
This report has been generated and distributed using a secure automated process.

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



BUREAU
VERITAS

BV Labs Job #: B9X1272
Report Date: 2019/11/26

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

RESULTS OF ANALYSES OF WATER

BV Labs ID		LJW079			LJW079		
Sampling Date		2019/11/22 10:05			2019/11/22 10:05		
COC Number		747631-01-01			747631-01-01		
	UNITS	RW-11201680-112219 -MM-MW2A-19	RDL	QC Batch	RW-11201680-112219 -MM-MW2A-19 Lab-Dup	RDL	QC Batch

Calculated Parameters							
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	240	1.0	6460260			
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.5	1.0	6460260			
Hardness (CaCO3)	mg/L	370	1.0	6460229			
Ion Balance (% Difference)	%	1.91	N/A	6460943			
Total Organic Nitrogen	mg/L	0.12	0.10	6460259			
Inorganics							
Total Ammonia-N	mg/L	ND	0.050	6460914	0.059	0.050	6460914
Colour	TCU	ND	2	6460217			
Total Dissolved Solids	mg/L	625	10	6460316			
Fluoride (F-)	mg/L	ND	0.10	6460878	ND	0.10	6460878
Total Kjeldahl Nitrogen (TKN)	mg/L	0.12	0.10	6460869	0.11	0.10	6460869
Dissolved Organic Carbon	mg/L	0.99	0.50	6460123			
Orthophosphate (P)	mg/L	ND	0.010	6460867			
pH	pH	7.84		6460883	7.84		6460883
Total Phosphorus	mg/L	0.012	0.004	6460863	0.012	0.004	6460863
Total Suspended Solids	mg/L	6	1	6459953			
Dissolved Sulphate (SO4)	mg/L	30	1.0	6460865			
Alkalinity (Total as CaCO3)	mg/L	240	1.0	6460887	240	1.0	6460887
Dissolved Chloride (Cl-)	mg/L	160	2.0	6460842			
Nitrite (N)	mg/L	ND	0.010	6460868	ND	0.010	6460868
Nitrate (N)	mg/L	ND	0.10	6460868	ND	0.10	6460868
Nitrate + Nitrite (N)	mg/L	ND	0.10	6460868	ND	0.10	6460868

RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Lab-Dup = Laboratory Initiated Duplicate
 N/A = Not Applicable
 ND = Not detected

BV Labs - Partial/Rush Results



BUREAU
VERITAS

BV Labs Job #: B9X1272
Report Date: 2019/11/26

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

BV Labs ID		LJW079			LJW079		
Sampling Date		2019/11/22 10:05			2019/11/22 10:05		
COC Number		747631-01-01			747631-01-01		
	UNITS	RW-11201680-112219 -MM-MW2A-19	RDL	QC Batch	RW-11201680-112219 -MM-MW2A-19 Lab-Dup	RDL	QC Batch

Metals							
Total Aluminum (Al)	ug/L	120	5.0	6460800			
Total Antimony (Sb)	ug/L	ND	0.50	6460800			
Total Arsenic (As)	ug/L	2.5	1.0	6460800			
Total Barium (Ba)	ug/L	28	2.0	6460800			
Total Beryllium (Be)	ug/L	ND	0.50	6460800			
Total Boron (B)	ug/L	19	10	6460800			
Total Cadmium (Cd)	ug/L	ND	0.10	6460800			
Dissolved Calcium (Ca)	ug/L	120000	200	6461084	120000	200	6461084
Total Chromium (Cr)	ug/L	ND	5.0	6460800			
Total Cobalt (Co)	ug/L	ND	0.50	6460800			
Total Copper (Cu)	ug/L	ND	1.0	6460800			
Total Iron (Fe)	ug/L	470	100	6460800			
Total Lead (Pb)	ug/L	ND	0.50	6460800			
Dissolved Magnesium (Mg)	ug/L	17000	50	6461084	17000	50	6461084
Total Manganese (Mn)	ug/L	680	2.0	6460800			
Total Molybdenum (Mo)	ug/L	1.3	0.50	6460800			
Total Nickel (Ni)	ug/L	ND	1.0	6460800			
Total Phosphorus (P)	ug/L	ND	100	6460800			
Dissolved Potassium (K)	ug/L	1400	200	6461084	1300	200	6461084
Total Selenium (Se)	ug/L	ND	2.0	6460800			
Total Silver (Ag)	ug/L	ND	0.10	6460800			
Dissolved Sodium (Na)	ug/L	66000	100	6461084	65000	100	6461084
Total Sodium (Na)	ug/L	66000	100	6460800			
Total Thallium (Tl)	ug/L	ND	0.050	6460800			
Total Tungsten (W)	ug/L	ND	1.0	6460800			
Total Uranium (U)	ug/L	0.93	0.10	6460800			
Total Vanadium (V)	ug/L	ND	0.50	6460800			
Total Zinc (Zn)	ug/L	ND	5.0	6460800			
Total Zirconium (Zr)	ug/L	ND	1.0	6460800			

RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch
 Lab-Dup = Laboratory Initiated Duplicate
 ND = Not detected

BV Labs - Partial/Rush Results



BUREAU
VERITAS

BV Labs Job #: B9X1272
Report Date: 2019/11/26

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

TEST SUMMARY

BV Labs ID: LJW079
Sample ID: RW-11201680-112219-MM-MW2A-19
Matrix: Water

Collected: 2019/11/22
Shipped:
Received: 2019/11/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	6460887	N/A	2019/11/25	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	6460260	N/A	2019/11/25	Automated Statchk
Chloride by Automated Colourimetry	KONE	6460842	N/A	2019/11/25	Deonarine Ramnarine
Colour	SPEC	6460217	N/A	2019/11/25	Christine Pham
Dissolved Organic Carbon (DOC)	TOCV/NDIR	6460123	N/A	2019/11/25	Mandeep Kaur
Fluoride	ISE	6460878	2019/11/25	2019/11/25	Surinder Rai
Hardness (calculated as CaCO3)		6460229	N/A	2019/11/25	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	6461084	N/A	2019/11/25	Azita Fazaeli
Total Metals Analysis by ICPMS	ICP/MS	6460800	N/A	2019/11/25	Azita Fazaeli
Ion Balance (% Difference)	CALC	6460943	N/A	2019/11/25	Automated Statchk
Total Ammonia-N	LACH/NH4	6460914	N/A	2019/11/25	Mazin Wakai
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	6460868	N/A	2019/11/25	Chandra Nandlal
Organic Nitrogen	CALC	6460259	N/A	2019/11/25	Automated Statchk
pH	AT	6460883	2019/11/25	2019/11/25	Surinder Rai
Orthophosphate	KONE	6460867	N/A	2019/11/25	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	6460865	N/A	2019/11/25	Deonarine Ramnarine
Total Dissolved Solids	BAL	6460316	2019/11/23	2019/11/25	Xinyue (Sarah) Hou
Total Kjeldahl Nitrogen in Water	SKAL	6460869	2019/11/25	2019/11/25	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	6460863	2019/11/25	2019/11/25	Shivani Shivani
Low Level Total Suspended Solids	BAL	6459953	2019/11/23	2019/11/25	Mandeep Kaur

BV Labs ID: LJW079 Dup
Sample ID: RW-11201680-112219-MM-MW2A-19
Matrix: Water

Collected: 2019/11/22
Shipped:
Received: 2019/11/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	6460887	N/A	2019/11/25	Surinder Rai
Fluoride	ISE	6460878	2019/11/25	2019/11/25	Surinder Rai
Dissolved Metals by ICPMS	ICP/MS	6461084	N/A	2019/11/25	Azita Fazaeli
Total Ammonia-N	LACH/NH4	6460914	N/A	2019/11/25	Mazin Wakai
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	6460868	N/A	2019/11/25	Chandra Nandlal
pH	AT	6460883	2019/11/25	2019/11/25	Surinder Rai
Total Kjeldahl Nitrogen in Water	SKAL	6460869	2019/11/25	2019/11/25	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	6460863	2019/11/25	2019/11/25	Shivani Shivani

BV Labs - Partial/Rush Results



BUREAU
VERITAS

BV Labs Job #: B9X1272
Report Date: 2019/11/26

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

GENERAL COMMENTS

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

Package 1	1.7°C
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Ion balance and Turbidity have been added to the submission, per client request.

Results relate only to the items tested.

BV Labs - Partial/Rush Results



BUREAU
VERITAS

BV Labs Job #: B9X1272
Report Date: 2019/11/26

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6459953	Total Suspended Solids	2019/11/25					ND, RDL=1	mg/L	12 (1)	25	101	85 - 115
6460123	Dissolved Organic Carbon	2019/11/25	95	80 - 120	98	80 - 120	ND, RDL=0.50	mg/L	1.0 (1)	20		
6460217	Colour	2019/11/25			100	80 - 120	ND, RDL=2	TCU	NC (1)	25		
6460316	Total Dissolved Solids	2019/11/25					ND, RDL=10	mg/L	0 (1)	25	102	90 - 110
6460800	Total Aluminum (Al)	2019/11/25	NC	80 - 120	101	80 - 120	ND, RDL=5.0	ug/L	2.1 (1)	20		
6460800	Total Antimony (Sb)	2019/11/25	103	80 - 120	105	80 - 120	ND, RDL=0.50	ug/L	3.7 (1)	20		
6460800	Total Arsenic (As)	2019/11/25	103	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	0.28 (1)	20		
6460800	Total Barium (Ba)	2019/11/25	107	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	2.0 (1)	20		
6460800	Total Beryllium (Be)	2019/11/25	101	80 - 120	103	80 - 120	ND, RDL=0.50	ug/L	1.9 (1)	20		
6460800	Total Boron (B)	2019/11/25	101	80 - 120	100	80 - 120	ND, RDL=10	ug/L	2.1 (1)	20		
6460800	Total Cadmium (Cd)	2019/11/25	101	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	19 (1)	20		
6460800	Total Chromium (Cr)	2019/11/25	100	80 - 120	97	80 - 120	ND, RDL=5.0	ug/L	0.36 (1)	20		
6460800	Total Cobalt (Co)	2019/11/25	98	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	0.45 (1)	20		
6460800	Total Copper (Cu)	2019/11/25	103	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	0.31 (1)	20		
6460800	Total Iron (Fe)	2019/11/25	105	80 - 120	97	80 - 120	ND, RDL=100	ug/L	2.4 (1)	20		
6460800	Total Lead (Pb)	2019/11/25	91	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	3.9 (1)	20		
6460800	Total Manganese (Mn)	2019/11/25	NC	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	2.2 (1)	20		
6460800	Total Molybdenum (Mo)	2019/11/25	108	80 - 120	102	80 - 120	ND, RDL=0.50	ug/L	1.8 (1)	20		
6460800	Total Nickel (Ni)	2019/11/25	95	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	0.99 (1)	20		
6460800	Total Phosphorus (P)	2019/11/25	NC	80 - 120	113	80 - 120	ND, RDL=100	ug/L				
6460800	Total Selenium (Se)	2019/11/25	102	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L	NC (1)	20		
6460800	Total Silver (Ag)	2019/11/25	96	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L	14 (1)	20		
6460800	Total Sodium (Na)	2019/11/25	NC	80 - 120	91	80 - 120	ND, RDL=100	ug/L	1.7 (1)	20		
6460800	Total Thallium (Tl)	2019/11/25	90	80 - 120	95	80 - 120	ND, RDL=0.050	ug/L	0.90 (1)	20		
6460800	Total Tungsten (W)	2019/11/25	94	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC (1)	20		
6460800	Total Uranium (U)	2019/11/25	91	80 - 120	94	80 - 120	ND, RDL=0.10	ug/L	4.0 (1)	20		
6460800	Total Vanadium (V)	2019/11/25	104	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	0.49 (1)	20		
6460800	Total Zinc (Zn)	2019/11/25	95	80 - 120	107	80 - 120	ND, RDL=5.0	ug/L	3.1 (1)	20		
6460800	Total Zirconium (Zr)	2019/11/25	123 (2)	80 - 120	104	80 - 120	ND, RDL=1.0	ug/L	20 (1)	20		

BV Labs - Partial/Rush Results



BUREAU
VERITAS

BV Labs Job #: B9X1272
Report Date: 2019/11/26

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6460842	Dissolved Chloride (Cl-)	2019/11/25	NC	80 - 120	103	80 - 120	ND, RDL=1.0	mg/L	0.62 (1)	20		
6460863	Total Phosphorus	2019/11/25	99 (3)	80 - 120	97	80 - 120	ND, RDL=0.004	mg/L	2.4 (4)	20	89	80 - 120
6460865	Dissolved Sulphate (SO4)	2019/11/25	NC	75 - 125	104	80 - 120	ND, RDL=1.0	mg/L	0.24 (1)	20		
6460867	Orthophosphate (P)	2019/11/25	98	75 - 125	100	80 - 120	ND, RDL=0.010	mg/L	NC (1)	25		
6460868	Nitrate (N)	2019/11/25	99 (5)	80 - 120	99	80 - 120	ND, RDL=0.10	mg/L	NC (6)	20		
6460868	Nitrite (N)	2019/11/25	110 (5)	80 - 120	109	80 - 120	ND, RDL=0.010	mg/L	NC (6)	20		
6460869	Total Kjeldahl Nitrogen (TKN)	2019/11/25	99 (3)	80 - 120	100	80 - 120	ND, RDL=0.10	mg/L	11 (4)	20	96	80 - 120
6460878	Fluoride (F-)	2019/11/25	102 (5)	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	NC (6)	20		
6460883	pH	2019/11/25			102	98 - 103			0 (6)	N/A		
6460887	Alkalinity (Total as CaCO3)	2019/11/25			97	85 - 115	ND, RDL=1.0	mg/L	0.65 (6)	20		
6460914	Total Ammonia-N	2019/11/25	97 (7)	75 - 125	99	80 - 120	ND, RDL=0.050	mg/L	17 (8)	20		
6461084	Dissolved Calcium (Ca)	2019/11/25	NC (9)	80 - 120	98	80 - 120	ND, RDL=200	ug/L	0.41 (10)	20		
6461084	Dissolved Magnesium (Mg)	2019/11/25	93 (9)	80 - 120	96	80 - 120	ND, RDL=50	ug/L	0.99 (10)	20		
6461084	Dissolved Potassium (K)	2019/11/25	96 (9)	80 - 120	96	80 - 120	ND, RDL=200	ug/L	1.6 (10)	20		

BV Labs - Partial/Rush Results



BUREAU
VERITAS

BV Labs Job #: B9X1272
Report Date: 2019/11/26

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6461084	Dissolved Sodium (Na)	2019/11/25	NC (9)	80 - 120	90	80 - 120	ND, RDL=100	ug/L	0.97 (10)	20		

N/A = Not Applicable

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

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

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

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

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

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

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

(1) Duplicate Parent ID

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(3) Matrix Spike Parent ID [LJW079-08]

(4) Duplicate Parent ID [LJW079-08]

(5) Matrix Spike Parent ID [LJW079-02]

(6) Duplicate Parent ID [LJW079-02]

(7) Matrix Spike Parent ID [LJW079-07]

(8) Duplicate Parent ID [LJW079-07]

(9) Matrix Spike Parent ID [LJW079-05]

(10) Duplicate Parent ID [LJW079-05]

BV Labs - Partial/Rush Results



BUREAU
VERITAS

BV Labs Job #: B9X1272
Report Date: 2019/11/26

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

VALIDATION SIGNATURE PAGE

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

Anastasiya Hamanov, Scientific Specialist

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

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

BV Labs - Partial/Rush Results

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:		
Company Name: #3000 GHD Limited	Company Name: Jennifer Balkwill (AP-735)	Quotation #: B90001	Attention: 11201680-PO-73518034	P.O. #: 73518034	Project: 11201680	Project Name: 51-75 Bradford St., Rainier	Project Manager: Erna Gitej	
Address: 455 Phillip St Waterloo ON N2L 3X2	Address: _____	Site #: _____	Tel: _____ Fax: (519) 725-1394	Sampled By: Pete Harknasth / A. McKenroll	Barcode: C#747631-01-01		Barcode: 747631	
Tel: (519) 884-0510	Fax: (519) 725-1394	Email: NationalEDDsupport@maxxam.ca; Jennifer Balkwill <Je				COC #: _____		
Email: APinvoices-735@ghd.com								

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BV LABS DRINKING WATER CHAIN OF CUSTODY					ANALYSIS REQUESTED (PLEASE BE SPECIFIC)										Turnaround Time (TAT) Required: Please provide advance notice for rush projects			
Regulation 153 (2011)			Other Regulations		Special Instructions	Field Filtered (please circle): Metals / Hg / Cr / VI	Alkalinity, Carbonate, Bicarbonate, pH, Color	Cl, NO2, NO3, SO4, PO4, Fluoride	DOC	Hardness	Total Ammonia-N, Un-ionized Ammonia	TKN, Organic Nitrogen, Total Phosphorous low level	Low Level TSS, TDS	Sulphide	Total Metals Analysis by ICPMS (select)	Dissolved Metals by ICPMS (select)	Regular (Standard) TAT: (will be applied if Rush TAT is not specified): Standard TAT = 5-7 Working days for most tests. Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.	
<input type="checkbox"/> Table 1	<input type="checkbox"/> Res/Park	<input type="checkbox"/> Medium/Fine	<input type="checkbox"/> CCME	<input type="checkbox"/> Sanitary Sewer Bylaw		N	X	X	X	X	X	X	X	X	X	Job Specific Rush TAT (if applied to entire submission) Date Required: Nov. 25/2019 Time Required: 2:00 PM		
<input type="checkbox"/> Table 2	<input type="checkbox"/> Ind/Comm	<input type="checkbox"/> Coarse	<input type="checkbox"/> Reg 558	<input type="checkbox"/> Storm Sewer Bylaw												Rush Confirmation Number: _____ (call lab for #)		
<input type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other	<input type="checkbox"/> For RSC	<input type="checkbox"/> MISA	<input type="checkbox"/> Municipality _____														
<input type="checkbox"/> Table _____			<input type="checkbox"/> PWQO	<input type="checkbox"/> Other _____														
Include Criteria on Certificate of Analysis (Y/N)? <input checked="" type="checkbox"/>																		
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix												# of Bottles	Comments	
1	RW-11201680-112219- MM - AW2A-19	NOV. 22 2019	10:05 AM	RW												9	Please contact Jennifer Balkwill with any questions. Thank you	
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

* RELINQUISHED BY: (Signature/Print) Pete Harknasth / Pete Harknasth		Date: (YY/MM/DD) 19/11/23	Time 2:30 PM	RECEIVED BY: (Signature/Print) FAREEN JETHA	Date: (YY/MM/DD) 2019/11/23	Time 14:38	# jars used and not submitted	Laboratory Use Only				
								Time Sensitive	Temperature (°C) on Reel 2112	Custody Seal Present Intact	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.								White: BV Labs		Yellow: Client		
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.								SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS				
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.												

on ice



Your P.O. #: 73518034
 Your Project #: 11201680
 Site Location: 51-75 BRADFORD ST, BARRIE
 Your C.O.C. #: 747626-01-01

Attention: 11201680-PO-73518034

GHD Limited
 455 Phillip St
 Waterloo, ON
 CANADA N2L 3X2

Report Date: 2019/12/02
 Report #: R5987810
 Version: 5 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B9X1273

Received: 2019/11/23, 14:39

Sample Matrix: Water
 # Samples Received: 1

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Biochemical Oxygen Demand (BOD)	1	2019/11/25	2019/11/30	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	1	N/A	2019/11/25	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	1	N/A	2019/11/26	CAM SOP-00416	SM 23 5220 D m
Total Cyanide	1	2019/11/25	2019/11/25	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2019/11/25	2019/11/25	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2019/11/25	2019/11/25	CAM SOP-00453	EPA 7470A m
Total Extractable Elements by ICP-MS (1)	1	2019/11/27	2019/11/27	STL SOP-00006	MA.200-Mét. 1.2 R5 m
Elements by ICPMS Low Level (total) (2)	1	2019/11/27	2019/11/27	BBY7SOP-00003	EPA 6020B R2 m
Animal and Vegetable Oil and Grease	1	N/A	2019/11/25	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2019/11/25	2019/11/25	CAM SOP-00326	EPA1664B m,SM5520A m
OC Pesticides (Selected) & PCB (3)	1	2019/11/25	2019/11/26	CAM SOP-00307	EPA 8081A/8082B m
PAH Compounds in Water by GC/MS (SIM)	1	2019/11/25	2019/11/26	CAM SOP-00318	EPA 8270D m
pH	1	2019/11/25	2019/11/25	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2019/11/25	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2019/11/25	CAM SOP-00464	EPA 375.4 m
Sulphide	1	N/A	2019/11/25	CAM SOP-00455	SM 23 4500-S G m
Total Kjeldahl Nitrogen in Water	1	2019/11/25	2019/11/25	CAM SOP-00938	OMOE E3516 m
Total PAHs (Barrie Sewer By-law) (4)	1	N/A	2019/11/26	CAM SOP - 00301	
Mineral/Synthetic O & G (TPH Heavy Oil) (5)	1	2019/11/25	2019/11/25	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2019/11/23	2019/11/25	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2019/11/25	CAM SOP-00228	EPA 8260C m

Remarks:

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

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



Your P.O. #: 73518034
Your Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your C.O.C. #: 747626-01-01

Attention: 11201680-PO-73518034

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2019/12/02
Report #: R5987810
Version: 5 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B9X1273

Received: 2019/11/23, 14:39

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

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

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

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

- (1) This test was performed by Campo to Montreal - Offsite
- (2) This test was performed by Campo to Burnaby - Offsite
- (3) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane
- (4) Total PAHs include only those PAHs specified in the sewer use by-by-law.
- (5) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ema Gitej, Senior Project Manager

Email: Ema.Gitej@bvlabs.com

Phone# (905)817-5829

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



BUREAU
VERITAS

BV Labs Job #: B9X1273
Report Date: 2019/12/02

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

CITY OF BARRIE SANITARY SEWER BY-LAW (WATER)

BV Labs ID		LJW080		
Sampling Date		2019/11/22 10:05		
COC Number		747626-01-01		
	UNITS	GW-11201680-112219 -MM-MW2A-19	RDL	QC Batch
Calculated Parameters				
Total Animal/Vegetable Oil and Grease	mg/L	1.3	0.50	6459880
Inorganics				
Total BOD	mg/L	ND	2	6461732
Total Chemical Oxygen Demand (COD)	mg/L	ND	4.0	6460874
Fluoride (F-)	mg/L	ND	0.10	6460878
Total Kjeldahl Nitrogen (TKN)	mg/L	ND	0.10	6460869
pH	pH	7.87		6460883
Phenols-4AAP	mg/L	ND	0.0010	6460831
Total Suspended Solids	mg/L	17	10	6459744
Dissolved Sulphate (SO4)	mg/L	30	1.0	6460865
Sulphide	mg/L	ND	0.020	6461419
Total Cyanide (CN)	mg/L	ND	0.0050	6458342
Dissolved Chloride (Cl-)	mg/L	150	2.0	6460842
Metals				
Total Aluminum (Al)	ug/L	161	3.0	6467084
Total Antimony (Sb)	ug/L	0.057	0.020	6467084
Total Arsenic (As)	ug/L	2.14	0.020	6467084
Total Barium (Ba)	ug/L	24.1	0.050	6467084
Total Bismuth (Bi)	ug/L	ND	0.010	6467084
Total Cadmium (Cd)	ug/L	ND	0.0050	6467084
Total Chromium (Cr)	ug/L	0.27	0.10	6467084
Total Cobalt (Co)	ug/L	0.188	0.010	6467084
Total Copper (Cu)	ug/L	0.24	0.10	6467084
Total Iron (Fe)	ug/L	372	5.0	6467084
Total Lead (Pb)	ug/L	0.146	0.020	6467084
Total Manganese (Mn)	ug/L	555	0.10	6467084
Total Molybdenum (Mo)	ug/L	1.20	0.050	6467084
Total Nickel (Ni)	ug/L	0.36	0.10	6467084
Total Phosphorus (P)	ug/L	14.2	5.0	6467084
Total Selenium (Se)	ug/L	ND	0.040	6467084
Total Silver (Ag)	ug/L	ND	0.010	6467084
Total Tin (Sn)	ug/L	ND	0.20	6467084
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected				



BUREAU
VERITAS

BV Labs Job #: B9X1273
Report Date: 2019/12/02

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

CITY OF BARRIE SANITARY SEWER BY-LAW (WATER)

BV Labs ID		LJW080		
Sampling Date		2019/11/22 10:05		
COC Number		747626-01-01		
	UNITS	GW-11201680-112219 -MM-MW2A-19	RDL	QC Batch
Total Vanadium (V)	ug/L	0.49	0.20	6467084
Total Zinc (Zn)	ug/L	1.0	1.0	6467084
Total Rhodium (Rh)	ug/L	ND	0.50	6468935
Total Gold (Au)	ug/L	ND (1)	0.10	6467084
Total Platinum (Pt)	ug/L	ND	0.10	6467084
Petroleum Hydrocarbons				
Total Oil & Grease	mg/L	1.3	0.50	6460723
Total Oil & Grease Mineral/Synthetic	mg/L	ND	0.50	6460735
Metals				
Mercury (Hg)	mg/L	ND	0.0001	6460743
Calculated Parameters				
Total PAHs	ug/L	ND	0.20	6460269
Polyaromatic Hydrocarbons				
Acenaphthene	ug/L	ND	0.050	6461640
Acenaphthylene	ug/L	ND	0.050	6461640
Anthracene	ug/L	ND	0.050	6461640
Benzo(a)anthracene	ug/L	ND	0.050	6461640
Benzo(a)pyrene	ug/L	ND	0.010	6461640
Benzo(b/j)fluoranthene	ug/L	ND	0.050	6461640
Benzo(g,h,i)perylene	ug/L	ND	0.050	6461640
Benzo(k)fluoranthene	ug/L	ND	0.050	6461640
Chrysene	ug/L	ND	0.050	6461640
Dibenzo(a,h)anthracene	ug/L	ND	0.050	6461640
Fluoranthene	ug/L	ND	0.050	6461640
Fluorene	ug/L	ND	0.050	6461640
Indeno(1,2,3-cd)pyrene	ug/L	ND	0.050	6461640
1-Methylnaphthalene	ug/L	ND	0.050	6461640
2-Methylnaphthalene	ug/L	ND	0.050	6461640
Naphthalene	ug/L	ND	0.050	6461640
Phenanthrene	ug/L	ND	0.030	6461640
Pyrene	ug/L	ND	0.050	6461640
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected (1) Matrix Spike outside acceptance criteria due to sample matrix interference.				



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VERITAS

BV Labs Job #: B9X1273
Report Date: 2019/12/02

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

CITY OF BARRIE SANITARY SEWER BY-LAW (WATER)

BV Labs ID		LJW080		
Sampling Date		2019/11/22 10:05		
COC Number		747626-01-01		
	UNITS	GW-11201680-112219 -MM-MW2A-19	RDL	QC Batch
Volatile Organics				
Benzene	ug/L	ND	0.40	6458299
1,2-Dichlorobenzene	ug/L	ND	1.0	6458299
1,4-Dichlorobenzene	ug/L	ND	1.0	6458299
Ethylbenzene	ug/L	ND	0.40	6458299
Methylene Chloride(Dichloromethane)	ug/L	ND	4.0	6458299
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	6458299
Tetrachloroethylene	ug/L	ND	0.40	6458299
Toluene	ug/L	ND	0.40	6458299
Trichloroethylene	ug/L	ND	0.40	6458299
p+m-Xylene	ug/L	ND	0.40	6458299
o-Xylene	ug/L	ND	0.40	6458299
Total Xylenes	ug/L	ND	0.40	6458299
Pesticides & Herbicides				
Hexachlorobenzene	ug/L	ND	0.005	6462366
Surrogate Recovery (%)				
2,4,5,6-Tetrachloro-m-xylene	%	81		6462366
Decachlorobiphenyl	%	90		6462366
D10-Anthracene	%	110		6461640
D14-Terphenyl (FS)	%	93		6461640
D8-Acenaphthylene	%	101		6461640
4-Bromofluorobenzene	%	97		6458299
D4-1,2-Dichloroethane	%	109		6458299
D8-Toluene	%	93		6458299
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected				



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VERITAS

BV Labs Job #: B9X1273
Report Date: 2019/12/02

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

TEST SUMMARY

BV Labs ID: LJW080
Sample ID: GW-11201680-112219-MM-MW2A-19
Matrix: Water

Collected: 2019/11/22
Shipped:
Received: 2019/11/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	6461732	2019/11/25	2019/11/30	Frank Zhang
Chloride by Automated Colourimetry	KONE	6460842	N/A	2019/11/25	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	6460874	N/A	2019/11/26	Viorica Rotaru
Total Cyanide	SKAL/CN	6458342	2019/11/25	2019/11/25	Gnana Thomas
Fluoride	ISE	6460878	2019/11/25	2019/11/25	Surinder Rai
Mercury in Water by CVAA	CV/AA	6460743	2019/11/25	2019/11/25	Medhat Nasr
Total Extractable Elements by ICP-MS	ICP/MSMS	6468935	2019/11/27	2019/11/27	Alex Thibert
Elements by ICPMS Low Level (total)	ICP/MS	6467084	2019/11/27	2019/11/27	Valentina Balada
Animal and Vegetable Oil and Grease	BAL	6459880	N/A	2019/11/25	Automated Statchk
Total Oil and Grease	BAL	6460723	2019/11/25	2019/11/25	Francis Afonso
OC Pesticides (Selected) & PCB	GC/ECD	6462366	2019/11/25	2019/11/26	Joy Zhang
PAH Compounds in Water by GC/MS (SIM)	GC/MS	6461640	2019/11/25	2019/11/26	Mitesh Raj
pH	AT	6460883	2019/11/25	2019/11/25	Surinder Rai
Phenols (4AAP)	TECH/PHEN	6460831	N/A	2019/11/25	Louise Harding
Sulphate by Automated Colourimetry	KONE	6460865	N/A	2019/11/25	Deonarine Ramnarine
Sulphide	ISE/S	6461419	N/A	2019/11/25	Kazzandra Adeva
Total Kjeldahl Nitrogen in Water	SKAL	6460869	2019/11/25	2019/11/25	Rajni Tyagi
Total PAHs (Barrie Sewer By-law)	CALC	6460269	N/A	2019/11/26	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	6460735	2019/11/25	2019/11/25	Francis Afonso
Total Suspended Solids	BAL	6459744	2019/11/23	2019/11/25	Mandeep Kaur
Volatile Organic Compounds in Water	GC/MS	6458299	N/A	2019/11/25	Manpreet Sarao



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BV Labs Job #: B9X1273

Report Date: 2019/12/02

GHD Limited

Client Project #: 11201680

Site Location: 51-75 BRADFORD ST, BARRIE

Your P.O. #: 73518034

Sampler Initials: PH

GENERAL COMMENTS

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

Package 1	1.7°C
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Sample LJW080 [GW-11201680-112219-MM-MW2A-19] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.



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VERITAS

BV Labs Job #: B9X1273
Report Date: 2019/12/02

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6458299	4-Bromofluorobenzene	2019/11/25	102	70 - 130	102	70 - 130	99	%				
6458299	D4-1,2-Dichloroethane	2019/11/25	102	70 - 130	102	70 - 130	103	%				
6458299	D8-Toluene	2019/11/25	103	70 - 130	103	70 - 130	97	%				
6461640	D10-Anthracene	2019/11/26	101	50 - 130	112	50 - 130	114	%				
6461640	D14-Terphenyl (FS)	2019/11/26	65	50 - 130	97	50 - 130	96	%				
6461640	D8-Acenaphthylene	2019/11/26	101	50 - 130	105	50 - 130	104	%				
6462366	2,4,5,6-Tetrachloro-m-xylene	2019/11/26	85 (2)	50 - 130	86	50 - 130	80	%				
6462366	Decachlorobiphenyl	2019/11/26	84 (2)	50 - 130	97	50 - 130	101	%				
6458299	1,1,2,2-Tetrachloroethane	2019/11/25	108	70 - 130	109	70 - 130	ND, RDL=0.50	ug/L	NC (1)	30		
6458299	1,2-Dichlorobenzene	2019/11/25	103	70 - 130	105	70 - 130	ND, RDL=0.50	ug/L	NC (1)	30		
6458299	1,4-Dichlorobenzene	2019/11/25	105	70 - 130	107	70 - 130	ND, RDL=0.50	ug/L	NC (1)	30		
6458299	Benzene	2019/11/25	98	70 - 130	102	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
6458299	Ethylbenzene	2019/11/25	103	70 - 130	107	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
6458299	Methylene Chloride(Dichloromethane)	2019/11/25	106	70 - 130	109	70 - 130	ND, RDL=2.0	ug/L	NC (1)	30		
6458299	o-Xylene	2019/11/25	101	70 - 130	108	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
6458299	p+m-Xylene	2019/11/25	106	70 - 130	109	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
6458299	Tetrachloroethylene	2019/11/25	99	70 - 130	102	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
6458299	Toluene	2019/11/25	100	70 - 130	103	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
6458299	Total Xylenes	2019/11/25					ND, RDL=0.20	ug/L	NC (1)	30		
6458299	Trichloroethylene	2019/11/25	99	70 - 130	103	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
6458342	Total Cyanide (CN)	2019/11/22	99	80 - 120	97	80 - 120	ND, RDL=0.0050	mg/L	NC (1)	20		
6459744	Total Suspended Solids	2019/11/25					ND, RDL=10	mg/L	NC (1)	25	97	85 - 115
6460723	Total Oil & Grease	2019/11/25			98	85 - 115	ND, RDL=0.50	mg/L	2.3 (1)	25		
6460735	Total Oil & Grease Mineral/Synthetic	2019/11/25			92	85 - 115	ND, RDL=0.50	mg/L	4.3 (1)	25		
6460743	Mercury (Hg)	2019/11/25	90	75 - 125	96	80 - 120	ND, RDL=0.0001	mg/L	NC (1)	20		
6460831	Phenols-4AAP	2019/11/25	101	80 - 120	98	80 - 120	ND, RDL=0.0010	mg/L	NC (1)	20		
6460842	Dissolved Chloride (Cl-)	2019/11/25	NC	80 - 120	103	80 - 120	ND, RDL=1.0	mg/L	0.62 (1)	20		



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BV Labs Job #: B9X1273
Report Date: 2019/12/02

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6460865	Dissolved Sulphate (SO4)	2019/11/25	NC	75 - 125	104	80 - 120	ND, RDL=1.0	mg/L	0.24 (1)	20		
6460869	Total Kjeldahl Nitrogen (TKN)	2019/11/25	99	80 - 120	100	80 - 120	ND, RDL=0.10	mg/L	11 (1)	20	96	80 - 120
6460874	Total Chemical Oxygen Demand (COD)	2019/11/26	99	80 - 120	93	80 - 120	ND, RDL=4.0	mg/L	8.9 (1)	20		
6460878	Fluoride (F-)	2019/11/25	102	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	NC (1)	20		
6460883	pH	2019/11/25			102	98 - 103			0 (1)	N/A		
6461419	Sulphide	2019/11/25	86	80 - 120	92	80 - 120	ND, RDL=0.020	mg/L	3.8 (1)	20		
6461640	1-Methylnaphthalene	2019/11/26	104	50 - 130	107	50 - 130	ND, RDL=0.050	ug/L	2.1 (1)	30		
6461640	2-Methylnaphthalene	2019/11/26	98	50 - 130	102	50 - 130	ND, RDL=0.050	ug/L	3.6 (1)	30		
6461640	Acenaphthene	2019/11/26	95	50 - 130	99	50 - 130	ND, RDL=0.050	ug/L	4.8 (1)	30		
6461640	Acenaphthylene	2019/11/26	91	50 - 130	95	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		
6461640	Anthracene	2019/11/26	72	50 - 130	96	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		
6461640	Benzo(a)anthracene	2019/11/26	57	50 - 130	98	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		
6461640	Benzo(a)pyrene	2019/11/26	54	50 - 130	91	50 - 130	ND, RDL=0.010	ug/L	NC (1)	30		
6461640	Benzo(b/j)fluoranthene	2019/11/26	56	50 - 130	94	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		
6461640	Benzo(g,h,i)perylene	2019/11/26	57	50 - 130	94	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		
6461640	Benzo(k)fluoranthene	2019/11/26	55	50 - 130	92	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		
6461640	Chrysene	2019/11/26	54	50 - 130	90	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		
6461640	Dibenzo(a,h)anthracene	2019/11/26	59	50 - 130	100	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		



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BV Labs Job #: B9X1273
Report Date: 2019/12/02

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6461640	Fluoranthene	2019/11/26	75	50 - 130	106	50 - 130	ND, RDL=0.050	ug/L	3.2 (1)	30		
6461640	Fluorene	2019/11/26	93	50 - 130	98	50 - 130	ND, RDL=0.050	ug/L	0.29 (1)	30		
6461640	Indeno(1,2,3-cd)pyrene	2019/11/26	56	50 - 130	95	50 - 130	ND, RDL=0.050	ug/L	NC (1)	30		
6461640	Naphthalene	2019/11/26	92	50 - 130	96	50 - 130	ND, RDL=0.050	ug/L	0.39 (1)	30		
6461640	Phenanthrene	2019/11/26	85	50 - 130	96	50 - 130	ND, RDL=0.030	ug/L	3.1 (1)	30		
6461640	Pyrene	2019/11/26	71	50 - 130	105	50 - 130	ND, RDL=0.050	ug/L	2.8 (1)	30		
6461732	Total BOD	2019/11/30					ND,RDL=2	mg/L	3.2 (1)	30	96	80 - 120
6462366	Hexachlorobenzene	2019/11/26	88 (2)	50 - 130	98	50 - 130	ND, RDL=0.005	ug/L	NC (1)	30		
6467084	Total Aluminum (Al)	2019/11/27	107 (3)	80 - 120	105	80 - 120	ND, RDL=3.0	ug/L				
6467084	Total Antimony (Sb)	2019/11/27	102 (3)	80 - 120	104	80 - 120	ND, RDL=0.020	ug/L				
6467084	Total Arsenic (As)	2019/11/27	107 (3)	80 - 120	103	80 - 120	ND, RDL=0.020	ug/L				
6467084	Total Barium (Ba)	2019/11/27	101 (3)	80 - 120	106	80 - 120	ND, RDL=0.050	ug/L				
6467084	Total Bismuth (Bi)	2019/11/27	97 (3)	80 - 120	105	80 - 120	ND, RDL=0.010	ug/L				
6467084	Total Cadmium (Cd)	2019/11/27	100 (3)	80 - 120	105	80 - 120	ND, RDL=0.0050	ug/L				
6467084	Total Chromium (Cr)	2019/11/27	100 (3)	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L				
6467084	Total Cobalt (Co)	2019/11/27	96 (3)	80 - 120	105	80 - 120	ND, RDL=0.010	ug/L				
6467084	Total Copper (Cu)	2019/11/27	93 (3)	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L				
6467084	Total Gold (Au)	2019/11/27	53 (4,3)	80 - 120	91	80 - 120	ND, RDL=0.10	ug/L				
6467084	Total Iron (Fe)	2019/11/27	97 (3)	80 - 120	107	80 - 120	ND, RDL=5.0	ug/L				



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BV Labs Job #: B9X1273
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QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6467084	Total Lead (Pb)	2019/11/27	102 (3)	80 - 120	106	80 - 120	ND, RDL=0.020	ug/L				
6467084	Total Manganese (Mn)	2019/11/27	NC (3)	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L				
6467084	Total Molybdenum (Mo)	2019/11/27	113 (3)	80 - 120	106	80 - 120	ND, RDL=0.050	ug/L				
6467084	Total Nickel (Ni)	2019/11/27	95 (3)	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L				
6467084	Total Phosphorus (P)	2019/11/27	105 (3)	80 - 120	103	80 - 120	ND, RDL=5.0	ug/L				
6467084	Total Platinum (Pt)	2019/11/27	101 (3)	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L				
6467084	Total Selenium (Se)	2019/11/27	105 (3)	80 - 120	102	80 - 120	ND, RDL=0.040	ug/L				
6467084	Total Silver (Ag)	2019/11/27	100 (3)	80 - 120	105	80 - 120	ND, RDL=0.010	ug/L				
6467084	Total Tin (Sn)	2019/11/27	101 (3)	80 - 120	103	80 - 120	ND, RDL=0.20	ug/L				
6467084	Total Vanadium (V)	2019/11/27	103 (3)	80 - 120	105	80 - 120	ND, RDL=0.20	ug/L				
6467084	Total Zinc (Zn)	2019/11/27	92 (3)	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L				



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BV Labs Job #: B9X1273
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QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6468935	Total Rhodium (Rh)	2019/11/27			101	70 - 130	ND, RDL=0.50	ug/L				

N/A = Not Applicable

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

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

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

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

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

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

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

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

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [LJW080-02]

(3) Matrix Spike Parent ID [LJW080-12]

(4) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



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VERITAS

BV Labs Job #: B9X1273
Report Date: 2019/12/02

GHD Limited
Client Project #: 11201680
Site Location: 51-75 BRADFORD ST, BARRIE
Your P.O. #: 73518034
Sampler Initials: PH

VALIDATION SIGNATURE PAGE

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

Anastasiya Hamanov, Scientific Specialist

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Jonathan Fauvel, B.Sc, Chimiste, Supervisor, Inorganics

Eva Pranjic, M.Sc., C.Chem, Scientific Specialist

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



Bureau Veritas Laboratories
5740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel: (905) 817-5700 Toll-free 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name: #3000 GHD Limited	Company Name:	Quotation #: B90001	BV Labs Job #:	Bottle Order #:	747626		
Attention: Jennifer Balkwill (AP-735)	Attention: 11201680-PO-73518034	P.O. #: 73518034	COC #:		Project Manager:		
Address: 455 Phillip St	Address:	Project: 11201680	C#747626-01-01		Ema Gitej		
Waterloo ON N2L 3X2		Project Name: 51-75 Broadford St., Barrie	Site #:		Same as above		
Tel: (519) 884-0510 Fax: (519) 725-1394	Tel: Fax:	Sampled By: Pete Hardcastle/M. McKeen	Turnaround Time (TAT) Required:		Please provide advance notice for rush projects		
Email: APinvoices-735@ghd.com	Email: NationalEDDSupport@maxxam.ca; Jennifer Balkwill <Je		Regular (Standard) TAT:		<input type="checkbox"/>		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BV LABS DRINKING WATER CHAIN OF CUSTODY						ANALYSIS REQUESTED (PLEASE BE SPECIFIC)										Turnaround Time (TAT) Required:		
Regulation 153 (2011)		Other Regulations		Special Instructions												Regular (Standard) TAT:		
<input type="checkbox"/> Table 1	<input type="checkbox"/> Res/Park	<input type="checkbox"/> CCME	<input checked="" type="checkbox"/> Sanitary Sewer Bylaw													(will be applied if Rush TAT is not specified):		
<input type="checkbox"/> Table 2	<input type="checkbox"/> Ind/Comm	<input type="checkbox"/> Reg 558	<input checked="" type="checkbox"/> Storm Sewer Bylaw													Standard TAT = 5-7 Working days for most tests.		
<input type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other	<input type="checkbox"/> MISA	Municipality: <u>Barrie</u>													Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.		
<input type="checkbox"/> Table	<input type="checkbox"/> For RSC	<input type="checkbox"/> PWQO	<input type="checkbox"/> Other													Job Specific Rush TAT (if applies to entire submission)		
Include Criteria on Certificate of Analysis (Y/N)? <u>N</u>																Date Required: <u>Nov. 25/2019</u> Time Required: <u>12:00PM</u> <input checked="" type="checkbox"/>		
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr / V /	Barrie San & Storm (plus Fe)											# of Bottles	Comments
1	GW-11201680-11 22 19-MM - MW2A-R	Nov. 22 2019	10:05 AM	GW	N	X											20	Please contact Jennifer Balkwill with any questions. Thank you!
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

23-Nov-19 14:39
Ema Gitej
B9X1273
FJE ENV-1372

* RELINQUISHED BY: (Signature/Print) <u>Pete Hardcastle / Pete Hardcastle</u>	Date: (YY/MM/DD) <u>19/11/23</u>	Time <u>2:30 PM</u>	RECEIVED BY: (Signature/Print) <u>FAREEN JETHA</u>	Date: (YY/MM/DD) <u>2019/11/23</u>	Time <u>14:39</u>	# jars used and not submitted	Laboratory Use Only			
						Time Sensitive	Temperature (°C) on Receipt <u>3/11/1</u>	Custody Seal Present <input checked="" type="checkbox"/>	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

on ice

Appendix G

Water Balance Analyses

Summary

Site	Project Name	Project Title	Storm Type	Runoff Continuity Error (%)	Flow Routing Continuity Error (%)
pre-development	11201680 - Pre-Development Barrie Waterfront	Barrie Waterfront - Pre-Development	avg-annual	-0.001	-0.047
post-development	11201680 - Post-Development Barrie Waterfront	Barrie Waterfront - Post-Development	avg-annual	-0.001	-0.018

These continuity errors represent the percent difference between initial storage+ total inflow for the entire drainage system versus final storage + total outflow for the entire drainage system. If the continuity error exceed some reasonable level, such as 10 percent, then the validity of the analysis results must be questioned. The most common reasons for an excessive continuity error are conduits that are too short, abrupt changes in storage (very small or very large storage areas), or flooding losses in the model (insufficient node depth).

Water Balance Comparison

Site	Site Area	Site Rainfall	Site Infiltration	Site Evapotranspiration	External Outflow	Rainfall Reduction
		(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (%)
Barrie Waterfront - Pre- Development Total	3.45 ha	944.7 mm 32,544.92 m ³	192.54 mm 6,633 m ³	513.29 mm 17,682.84 m ³	238.03 mm 8,200 m ³	706.67 mm 74.8 %
Barrie Waterfront - Post- Development Total	3.45 ha	944.7 mm 32,544.92 m ³	47.2 mm 1,626.04 m ³	257.29 mm 8,863.64 m ³	638.61 mm 22,000 m ³	306.09 mm 32.4 %
Difference	0 ha	0 mm 0 m³	-145.34 mm -5,006.96 m³	-256 mm -8,819.2 m³	400.58 mm 13,800 m³	-400.58 mm -42.4 %
Difference	0 %	0 %	-75.49 %	-49.87 %	168.29 %	-56.69 %

Water Balance | Barrie Waterfront - Pre-Development

Catchment	Site Area	Site Rainfall	Site Infiltration	Site Evapotranspiration	External Outflow	Rainfall Reduction
		(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (%)
1	3.45 ha	944.7 mm 32,544.92 m ³	192.54 mm 6,633 m ³	513.29 mm 17,682.84 m ³	238.03 mm 8,200 m ³	706.67 mm 74.8 %
TOTAL	3.45 ha	944.7 mm 32,544.92 m³	192.54 mm 6,633 m³	513.29 mm 17,682.84 m³	238.03 mm 8,200 m³	706.67 mm 74.8 %

Water Balance | Barrie Waterfront - Post-Development

Catchment	Site Area	Site Rainfall	Site Infiltration	Site Evapotranspiration	External Outflow	Rainfall Reduction
		(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (m ³)	(mm) (%)
1	3.45 ha	944.7 mm 32,544.92 m ³	47.2 mm 1,626.04 m ³	257.29 mm 8,863.64 m ³	638.61 mm 22,000 m ³	306.09 mm 32.4 %
TOTAL	3.45 ha	944.7 mm	47.2 mm	257.29 mm	638.61 mm	306.09 mm

		32,544.92 m³	1,626.04 m³	8,863.64 m³	22,000 m³	32.4 %
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Storage Volumes | Barrie Waterfront - Pre-Development

Catchment 1

Subcatchment

Name	Initial Soil Water (fraction)	Final Soil Water (fraction)
Pre-Dev	0.284	0.28

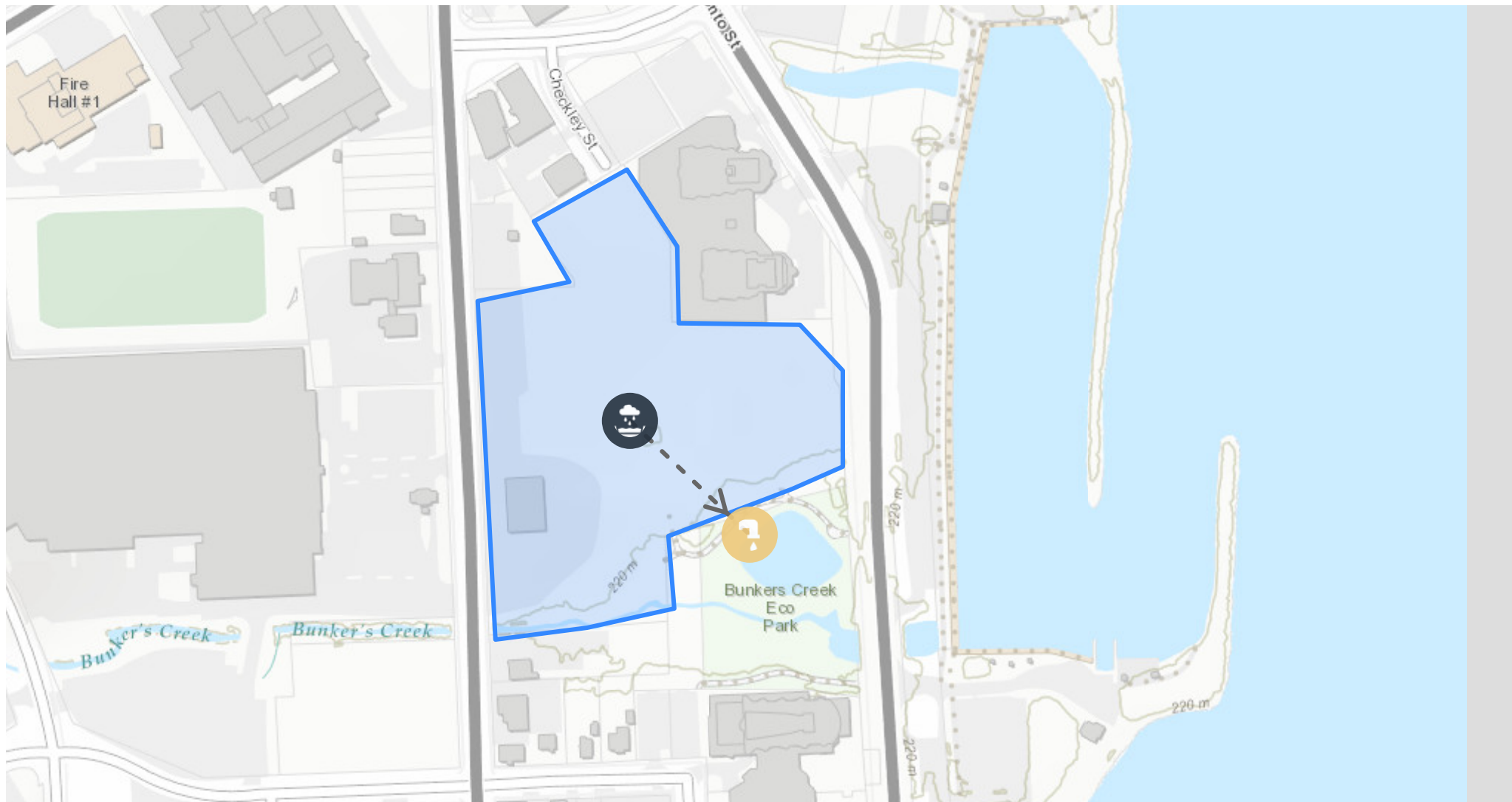
Storage Volumes | Barrie Waterfront - Post-Development

Catchment 1

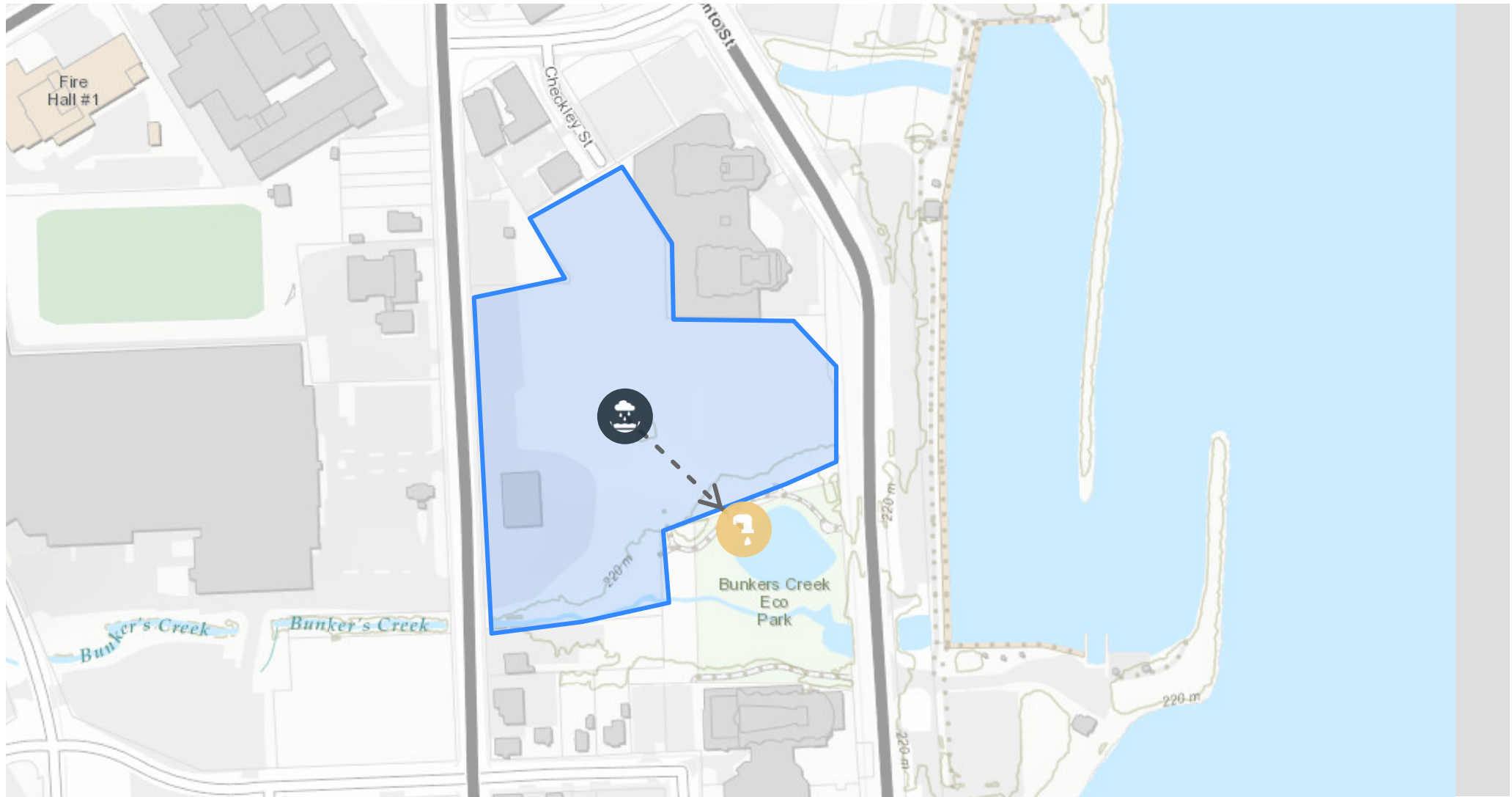
Subcatchment

Name	Initial Soil Water (fraction)	Final Soil Water (fraction)
Post-Dev	0.284	0.28

Map | Barrie Waterfront - Pre-Development



Map | Barrie Waterfront - Post-Development



LID Summary | Barrie Waterfront - Pre-Development

Element	Type	LID Area	Drawdown Time	Effective Impervious to Pervious Ratio	FLOW	TSS	TP
					Flow In (m ³)	Load In (kg)	Load In (kg)
					Flow Out (m ³)	Load Out (kg)	Load Out (kg)
					Actual Reduction (%)	Actual Reduction (%)	Actual Reduction (%)

LID Summary | Barrie Waterfront - Post-Development

Element	Type	LID Area	Drawdown Time	Effective Impervious to Pervious Ratio	FLOW	TSS	TP
					Flow In (m ³)	Load In (kg)	Load In (kg)
					Flow Out (m ³)	Load Out (kg)	Load Out (kg)
					Actual Reduction (%)	Actual Reduction (%)	Actual Reduction (%)

Loading Summary TSS | Barrie Waterfront - Pre-Development

Catchment	Total Catchment TSS Removal	Peak Outflow	Generated	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	-0.012 %	0.164 m ³ /s	32,544.915 m ³	8,199 m ³
			37.444 mg/l	37.448 mg/l
			1,218.609 kg	307.04 kg
Total	74.804 %	0.164 m³/s	32,544.915 m³	8,199 m³
			37.444 mg/l	37.448 mg/l
			1,218.609 kg	307.04 kg

Loading Summary TSS | Barrie Waterfront - Post-Development

Catchment	Total Catchment TSS Removal	Peak Outflow	Generated	Outgoing
			Total Flow (m ³) Average Concentration (mg/l) Total Load (kg)	Total Flow (m ³) Average Concentration (mg/l) Total Load (kg)
Catchment 1	0.014 %	0.437 m ³ /s	32,544.915 m ³ 46.848 mg/l 1,524.664 kg	22,003 m ³ 46.842 mg/l 1,030.656 kg
Total	32.401 %	0.437 m³/s	32,544.915 m³ 46.848 mg/l 1,524.664 kg	22,003 m³ 46.842 mg/l 1,030.656 kg

Loading Summary TP | Barrie Waterfront - Pre-Development

Catchment	Total Catchment TP Removal	Peak Outflow	Generated	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	-0.012 %	0.164 m ³ /s	32,544.915 m ³	8,199 m ³
			0.203 mg/l	0.203 mg/l
			6.614 kg	1.666 kg
Total	74.804 %	0.164 m³/s	32,544.915 m³	8,199 m³
			0.203 mg/l	0.203 mg/l
			6.614 kg	1.666 kg

Loading Summary TP | Barrie Waterfront - Post-Development

Catchment	Total Catchment TP Removal	Peak Outflow	Generated	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Average Concentration (mg/l)	Average Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Catchment 1	0.014 %	0.437 m ³ /s	32,544.915 m ³	22,003 m ³
			0.172 mg/l	0.172 mg/l
			5.593 kg	3.78 kg
Total	32.401 %	0.437 m³/s	32,544.915 m³	22,003 m³
			0.172 mg/l	0.172 mg/l
			5.593 kg	3.78 kg

Peak Flow | Barrie Waterfront - Pre-Development

Catchment	Element	Description	Peak outflow
1	Pre-Dev	PEAK RUNOFF FLOW from	0.16 m ³ /s
	SWMFeature	MAXIMUM FLOW at	0.164 m ³ /s

Peak Flow | Barrie Waterfront - Post-Development

Catchment	Element	Description	Peak outflow
1	Post-Dev	PEAK RUNOFF FLOW from	0.44 m ³ /s
	SWMFeature	MAXIMUM FLOW at	0.437 m ³ /s

Loading TSS | Barrie Waterfront - Pre-Development

TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Pre-Dev	0 %	0.16 m ³ /s	32,544.915 m ³	8,200 m ³
			37.444 mg/l	37.444 mg/l
			1,218.609 kg	307.04 kg
SWMFeature	0 %	0.164 m ³ /s	8,199 m ³	8,199 m ³
			37.448 mg/l	37.448 mg/l
			307.04 kg	307.04 kg

Loading TSS | Barrie Waterfront - Post-Development

TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Post-Dev	0 %	0.44 m ³ /s	32,544.915 m ³	22,000 m ³
			46.848 mg/l	46.848 mg/l
			1,524.664 kg	1,030.656 kg
SWMFeature	0 %	0.437 m ³ /s	22,003 m ³	22,003 m ³
			46.842 mg/l	46.842 mg/l
			1,030.656 kg	1,030.656 kg

Loading TP | Barrie Waterfront - Pre-Development

TP - Catchment 1

Name	LID Type	Peak Outflow	Incoming	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Pre-Dev	0 %	0.16 m ³ /s	32,544.915 m ³	8,200 m ³
			0.203 mg/l	0.203 mg/l
			6.614 kg	1.666 kg
SWMFeature	0 %	0.164 m ³ /s	8,199 m ³	8,199 m ³
			0.203 mg/l	0.203 mg/l
			1.666 kg	1.666 kg

Loading TP | Barrie Waterfront - Post-Development

TP - Catchment 1

Name	LID Type	Peak Outflow	Incoming	Outgoing
			Total Flow (m ³)	Total Flow (m ³)
			Concentration (mg/l)	Concentration (mg/l)
			Total Load (kg)	Total Load (kg)
Post-Dev	0 %	0.44 m ³ /s	32,544.915 m ³	22,000 m ³
			0.172 mg/l	0.172 mg/l
			5.593 kg	3.78 kg
SWMFeature	0 %	0.437 m ³ /s	22,003 m ³	22,003 m ³
			0.172 mg/l	0.172 mg/l
			3.78 kg	3.78 kg

Detailed Report Parameters | Barrie Waterfront - Pre-Development

Pre-Dev

Field	Value
Subcatchment name	Pre-Dev
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	37.44
Weighted EMC TP (mg/L)	0.2
Total AREA (HA)	3.445
Impervious area (HA)	0.5901285
Roof area (HA)	0.059942999999999996
Landscaped area (HA)	0
Row Crop area (HA)	0
Open Space / Parkland area (HA)	2.7949284999999997
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0

% Impervious (%)	18.869999999999997
Subcatchment Width (m)	230
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	76

SWMFeature

Field	Value
Name	SWMFeature
Catchment	1
Outfall Elevation (m)	0

Detailed Report Parameters | Barrie Waterfront - Post-Development

Post-Dev

Field	Value
Subcatchment name	Post-Dev
Catchment	1
Soil type	Silt Loam
Weighted EMC TSS (mg/L)	46.85
Weighted EMC TP (mg/L)	0.17
Total AREA (HA)	3.445
Impervious area (HA)	0.8819199999999999
Roof area (HA)	1.87408
Landscaped area (HA)	0.6890000000000001
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
% Impervious (%)	80

Subcatchment Width (m)	230
Subcatchment Slope (%)	1
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.2
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	5
Weighted Curve Number	82

SWMFeature

	Field	Value
	Name	SWMFeature
	Catchment	1
	Outfall Elevation (m)	0



about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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