Hydrogeological Assessment

Proposed Mixed-Use Condominium Development

1012 Yonge Street, Barrie, Ontario

Crown Barrie Developments Inc

February 08, 2022

→ The Power of Commitment

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1. Introduction

GHD Limited (GHD) was retained by Crown Barrie Developments Inc. (Crown) to complete a hydrogeological assessment for the proposed mix use condominium development at 1012 Yonge Street, Barrie, Ontario (hereinafter referred to as the 'Site' or 'Property'). The Site location is shown on **Figure 1.1,** and the proposed development layout is shown on **Figure 1.2**.

The proposed development will consist of the construction of a three and six storey mix use condominium building with one level of underground parking to 6.1 metres below ground surface (m BGS) with the area surrounding the buildings consisting of paved driveway and parking and landscaping.

The objectives of this investigation were to:

- Assess current groundwater conditions and assess potential impacts to the local groundwater regime (quality and quantity).
- Assess the requirement for groundwater control during construction and long-term and options for mitigation measures.

Geotechnical investigations (GHD, 2021)[1] 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 seasonal fluctuations of the groundwater table.
4. Collection of two groundwater samples for laboratory analysis that would be used to assess groundwater quality and options for the management of groundwater potentially collected during development activities.

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 descriptions of the existing Site conditions, background information and surrounding land uses, as well as an outline of the proposed development. The regional environmental setting, including the physiography, topography and the main surface water features and surficial geology are also 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 and any longer term takings. Current groundwater monitoring results are also provided.

Section 5.0 – 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.

[1] GHD 2021. Geotechnical Investigation Proposed Mixed-Use Condominium Development 1012 Yonge Street, Barrie, Ontario. Prepared for Crown Barrie Developments Inc. September 7th, 2021

2. Background

2.1 Regional Setting

The Site is located in the Peterborough Drumlin Fields physiographic region, and the Simcoe Lowlands physiographic region is located to the north and east of the Site (Chapman and Putnam,1984)[2]. The Peterborough Drumlin Fields is characterized by drumlinized till plains, sand plains and drumlins (**Figure 2.1**). The topography is generally flat to undulating on the drumlin fields with gradual slopes to the east towards Lake Simcoe. The majority of the Site is relatively flat at an elevation of approximately 270.0 metres above mean sea level (mAMSL).

Regional surficial geology mapping of the area (OGS, 2010)[3] indicates that the Site and surrounding lands are underlain by Ice-contact stratified deposits of sand and gravel, with minor silt and clay, and till deposit, stone poor sandy silt to silty sand-textured till (**Figure 2.2**). Coarse-textured glaciolacustrine deposits that consist of sand and gravel are mapped in the surrounding area.

Overburden underlying the Site is generally described as a thick sequence of glaciolacustrine and till deposits overlying shale and limestone bedrock of the Simcoe Group, Shadow Lake Formation. The surficial geology and general stratigraphic framework for the Site and surrounding area consists of the following deposits:

- Surficial material – topsoil and fill
- Ice-contact stratified deposits – silt to sandy silt, and sand
- Till deposits – silty sand till
- Bedrock (Shadow Lake Formation) – shale and limestone

The location of water wells recorded by the Ministry of the Environment Conservation and Parks (MECP) within 500 m of the Site is shown on **Figure 2.3**, and a summary of the records is presented in **Appendix F**. Based on review of the well records there is a domestic water supply well located on the southeast portion of the Site. There are also numerous domestic water supply well records located within 100 m of the Site to the south, east and north. These supply wells are screened between 12 to15 metres below ground surface (mBGS) in a coarse sand deposit and have yields between 3 to 5 gallons per minute (gpm).

2.2 Site Description

The Site is located within a rural area within the City of Barrie and is surrounded by agricultural lands (**Figure 2.4**). The subject property is located on the west side of Yonge Street, north of Lockhart Road in the City of Barrie. The existing Site was previously occupied by an orchard and is currently vacant. The surrounding areas of the proposed development consist of agricultural land to the north, west and south, with the Yonge Street right of way forming the east boundary. The property has approximately 152 m of frontage along Yonge Street. The property is 4.94 hectares (ha) in gross area, with net development area of 4.76 ha due to the road widening and new right of way.

The Site and surrounding properties are anticipated to be on private water supply wells and septic systems based on the rural setting, however municipal services are present approximately 1 km to the north and south of the Site based on the urban setting and land use in these areas.

There are no natural surface water features on the Site. Hewitt's Creek is located approximately 770 metres (m) to the east of the Site, and Lover's Creek is located 1.2 kilometers (km) west of the Site with both draining north to Lake Simcoe (**Figure 2.5**)

[2] Chapman, L.J. and Putnam, D.F., 1984. The Physiography of Southern Ontario. Ontario Geological Survey, Special Volume 2.
[3] Surficial Geology of Southern Ontario - Miscellaneous Release--Data 128-REV. Ontario Geological Survey, 2010.

Source Water Protection

The Site is situated within the South Georgian Bay Lake Simcoe Region's Source Protection Plan area (SGB LSR SPP Jan, 2015)[4]. The Site is not located within any Wellhead Protection areas but is located within a Highly Vulnerable Aquifer (HVA), and a Significant Groundwater Recharge Area (SGRA).

The majority of the City of Barrie municipal water supply wells (Wells 11, 12, 14, and 15) are located within the city core area. 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)[5]. These aquifers are locally overlain by relatively thick protective clay and silt aquitard deposits, however localized windows may exist in areas. The top of the municipal A3 Aquifer is at an elevation of 175 mAMSL at a distance of approximately 5 kilometres (km) to the northwest of the Site (former Municipal Well #10). As the Site is at an elevation of 168 mAMSL, the top of the municipal aquifer is more than 90 m below the Site.

City of Barrie Environmental Risk Management

As the Site is within an HVA and SGRA, the City of Barrie Environmental Risk Management stipulates that building supports are not permitted to be constructed within the municipal supply aquifer, and permanent long term groundwater seepage to a building foundation drainage system (e.g., weepers) is not allowed (City of Barrie, January 11, 2022)[6].

The following Site information is provided related to the City of Barrie Environmental Risk Assessment, and construction groundwater takings and water balance:

- Maximum Expected Depth of Excavation: ranges from 263.4 to 265.85 mAMSL, or from 4.8 to 5.4 mBGS.
- Maximum Expected Depth of Foundation (i.e. piles, caissons, shoring etc.) **=** 15 mBGS.
- Percentage of Site to be developed **=** 65% (total impervious area).

Based on the City of Barrie's, Environmental Risk Assessment internal model (City of Barrie, January 11, 2022), the upper most aquifer is anticipated to be encountered at a depth of 5 m (Aquifer A1), and the water table is estimated to be at a depth of 11 m. The depth to the Confined Municipal Aquifer is approximately to be 90 m.

2.3 Previous Investigations

The following background reports were provided to GHD for review prior to this Hydrogeological Assessment:

- 'A Geotechnical Investigation for Proposed Townhouse Development – 1012 Yonge Street, Barrie, Ontario', prepared by Soil Engineers Ltd., Reference NO. 2002-S036, dated February 2021
- 'Hydrogeological investigation - 1012 Yonge Street, Barrie, Ontario', prepared by IBI Group, dated February 19, 2021

The investigations included the advancement of seven boreholes (denoted as Borehole 1 to Borehole 7) to a maximum depth of 9.3 m below ground surface (mBGS), and four monitoring wells (BH1, BH2, BH4, and BH5) were installed to depths ranging from 6.0 to 7.6 mBGS. These investigations involved the installation of groundwater monitoring wells that were screened within the shallow subsurface above the water table or slightly straddling the water table.

[4] Approved South Georgian Bay Lake Simcoe Source Protection Plan; This document contains the Source Protection Plans for:
-Lakes Simcoe and Couchiching / Black River Source Protection Area -Nottawasaga Valley Source Protection Area -Severn Sound Source Protection Area (Approval Date: January 26, 2015, Effective: July 1, 2015, Amended: June 16, 2021)
[5] Golder Associates, 2004. South Simcoe Municipal Groundwater Study.
[6] City of Barrie Memorandum, Steven Holden, Risk Management Inspector Subject: D30-005-2021, ZBA/OPA/Draft Plan of Subdivision 1012 Yonge St. (January 11, 2022).

Based on these investigations, the stratigraphy underlying the Site consists of surficial topsoil underlain by native sandy silt till, and sand deposits that extended to the termination depths of the boreholes. Groundwater levels on-site ranged between 263.75 and 264.33 mAMSL, and the hydraulic conductivity of the overburden materials ranges from 1.1×10^{-2} cm/s to 6.5×10^{-4} cm/sec. Groundwater quality samples collected on January 20, 2021 indicated that copper at concentrations (0.017 mg/L) were above the City of Barrie storm sewer by-law criteria of 0.01 mg/L. The remaining parameters analyzed had concentrations below the City of Barrie storm sewer by-law criteria. All analyzed parameters had concentrations the City of Barrie sanitary/combined sewer by-law criteria.

3. Methodology

The following activities were undertaken to achieve the project objectives regarding hydrogeological conditions:

- Borehole advancement and installation of monitoring wells in selected boreholes to facilitate the collection of groundwater levels to determine groundwater flow conditions.
- SWRT's to determine hydraulic conductivity of the saturated stratigraphic deposits investigated to estimate potential water takings.
- Groundwater monitoring collected on over a 4 month period to determine seasonal fluctuations of the groundwater table and groundwater gradients.
- One groundwater quality sample collected from a representative monitoring well and analyzed for the City of Barrie Sewer Use By Law parameters for both Sanitary and Storm (By-Law 2021-002) to determine management options for the discharge of construction groundwater takings as well as a sample compared to the Provincial Water Quality Objectives[7] (PWQO) and Ontario Drinking Water Standards[8] (ODWS).

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

3.1 Borehole Advancement and Monitoring Well Installations

Five (5) boreholes were advanced between July 6 to 14, 2021, with four (4) boreholes instrumented with monitoring wells denoted as MW1-21, MW2-21, MW4-21 and MW5-21. The well completion details for the monitoring wells are presented in **Table 3.1.** The monitoring well locations are shown on **Figure 3.1**. Copies of the Stratigraphic and Instrumentation logs are presented in **Appendix B.**

All monitoring wells were installed by MECP licensed well drillers, Landshark Drilling (Landshark) 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 A**.

The monitoring well was constructed with 50 mm (2-inch) Schedule 40 PVC screen and casing. The well screen is 3 m (10 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 extended 0.6 m above the screen. The remaining annular space was sealed with bentonite, and the well was completed with protective monument style casings set in concrete. The monitoring well screens were installed below the water table from approximately 7 to 10 mBGS and extend below the parking level.

[7] Policies Guidelines Provincial Water Quality Objectives of The Ministry of Environment And Energy, July, 1994

[8] Ontario Regulation 169/03, Ontario Drinking Water Quality Standards. Safe Drinking Water Act, 2002.

The boreholes were advanced utilizing track mounted power auger drilling rigs (B57), supplied, and operated by Landshark under the full-time supervision of GHD technical personnel. The borehole drilling was conducted using a CME 55 LC track-mount drill rig by advancing the boring using conventional drilling method.

Soil samples were collected every 0.75 m depth intervals to 6.0 m below ground surface and at 1.5 m intervals thereafter: to the termination depth of the drilled boreholes. 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). 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.

3.2 Hydraulic Testing

SWRT's were completed at all monitoring wells installed by GHD to estimate the horizontal hydraulic conductivity of the saturated geologic deposits underlying the Site.

SWRT 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) and Hvorslev (1951) solution for unconfined 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 that will be used to estimate groundwater takings The SWRTs are summarized in **Table 3.2** and the procedures are discussed in **Appendix A**. The results of the testing are presented in **Appendix C** and are discussed in Section 4.0.

3.2.1 Infiltration Testing

Confirmatory, infiltration testing of the native surficial deposits will be completed in the spring season when weather conditions permit. Testing will be undertaken within the proposed low impact development (LID) infiltration chamber footprint area at the invert depth and below to determine the infiltration rate and safety factor. A conservative infiltration rate of 10 mm/hr (1 x 10^{-5} cm/s) with a 2.5 safety factor was assumed for design of the low impact development infiltration chamber (GHD, 2022)[9].

3.3 Groundwater Level Monitoring

Groundwater level monitoring will be undertaken monthly for a four month period (4 events) to assess the "high" groundwater levels through a wet season (spring or autumn) and to determine stable levels and seasonal fluctuations. Manual groundwater level measurements will be collected using a water level meter (Solinst Model 101). Groundwater levels will be monitored using an electronic water level meter. Electronic dataloggers will be installed in three monitoring wells to collect continuous water levels between manual monitoring events.

Groundwater levels collected from the on-site monitoring wells are summarized in **Tables 3.3** and **3.4,** and a hydrograph of the observed levels is presented in **Appendix D**.

3.4 Groundwater Quality

On July 21, 2021, one groundwater quality sample was collected from MW5-21 and analyzed for the complete City of Barrie sewer use bylaw discharge parameters and selected parameters from the Provincial Water Quality Objectives

[9] Functional Servicing and Stormwater Management Report, Proposed Mixed-Use Condominium Development, 1012 Yonge Street, City of Barrie. Prepared for Crown (Barrie) Developments Inc. February 2022.

(PWQOs) and Ontario Drinking Water Standards (ODWS). The sample analyses included total metals (unfiltered) as required by the bylaw, and a separate sample was collected for dissolved metals (filtered).

The data is used to determine management options for the discharge of construction groundwater takings. Prior to sampling, the wells were 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 A**).

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

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 an east-west direction across the Site were prepared based on the data collected. The locations of the profiles are presented on **Figure 3.1,** and the profiles are shown on **Figures 4.1** and **4.2**, respectively**.**

4.1 Site Geology

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

Surficial Materials

Surficial materials consist of topsoil or fill from ground surface to 2.29 mBGS. All boreholes encountered a layer of topsoil at the ground surface that was between 200 and 350 mm in thickness. Fill was encountered at each borehole with a composition of sandy silt. The sandy silt fill was encountered between 1 to 3 mBGS. The sandy silt was brown with trace clay. The material is very loose to loose and moist.

Ice Contact Deposits

Ice contact deposits consisting of silt, sandy silt and sand was encountered below the fill from 0.76 to 15.85 mBGS. The silt, silty sand and sand was typically encountered at depths of 1 mBGS to termination depth of the borehole logs. The deposits contain trace gravel, trace clay and are typically light brown to brown to grey and have a dense to very dense consistency. The deposit is very moist to wet.

A silt layer with sand was encountered in MW1-21 at depths 12.2 to 15.85 mBGS, BH3-21 at depths 3.0 to 3.81 mBGS and MW4-21 at depths 6.10 to 12.2. The silt layers contain trace clay and gravel and are brown, moist to wet and very dense.

Interbedded in the silt, silty sand and sand deposit are silty sand beds. The beds were encountered in BH3-21 at depths of 1.52 to 3.0 mBGS and 3.81 to 5.34 mBGS, and in MW5-21 at a depth of 2.29 to 7.62 mBGS. The beds contain trace gravel, and are typically brown, moist and very dense.

4.2 Site Hydrogeology

The Site is primarily underlain by medium to coarse textured ice contact stratified drift deposits that forms an unconfined aquifer. The Site investigations are consistent with the City of Barrie’s, Environmental Risk Assessment internal model.

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 aquifer/aquitard hydraulic properties is presented in **Table 4.1**.

A review of the geologic cross-sections (**Figures 4.1** and **4.2**) and **Table 4.1** indicates that the Site is underlain by Ice Contact Deposits (Aquifer***).*** Based on the results from the SWRTSs, the horizontal hydraulic conductivity (K_h) ranges from 1.1 x 10^{-5} to 1.1 x 10^{-2} cm/s, due to the compositional variability of the deposit (**Table 4.1**). The horizontal hydraulic conductivity (geomean) of the ice contact deposits is 4.4 x 10^{-4} cm/s, and accounting for the variability of the deposit the hydraulic conductivity (geomean) plus one standard deviation is 4.3 x 10^{-3} cm/s, which is representative of a sand aquifer (**Table 4.1**).

Manual groundwater level monitoring was undertaken from July 19 to September 21, 2021 and is ongoing at all onsite monitoring wells to demonstrate fully-recovered stable water level conditions in each well as well as seasonal fluctuations (**Table 3.3** and **3.4**). The groundwater level monitoring will be used to determine the high-water table, and to verify groundwater gradients and flow direction. The groundwater level hydrographs are presented in **Appendix D**.

Groundwater levels measured in metres below ground surface (mBGS) are presented in **Figure 4.3** and **Table 3.3**, based on the September 21, 2021 monitoring event. Based on review of the groundwater levels collected, the levels ranged from 3.75 mBGS at MW2-21 to 7.47 mBGS at BH1, and on average are about 5.7 mBGS. The depth to water table is consistent with the City of Barrie's internal Risk Assessment model, which indicates the water table at a depth of 5 m in the vicinity of the Site.

Groundwater levels measured in mAMSL are presented in **Figure 4.4** and **Table 3.4,** based on the September 21, 2021 monitoring event. Based on review of the groundwater levels collected, the levels ranged from 263.53 mAMSL at BH1 to 264.82 mAMSL at BH4. Based on the data, groundwater flow is east to west across the Site towards the tributary of Lover's Creek.

Groundwater levels remained relatively consistent throughout the monitoring period (**Appendix D**). The above groundwater levels do not necessarily represent stable conditions due to the short monitoring period. Manual groundwater level monitoring will continue to be undertaken at all onsite wells for the remainder of the four month monitoring period to demonstrate fully recovered stable water level conditions in each well as well as seasonal fluctuations.

4.3 Water Taking Evaluation

The proposed mixed-use condominium development is anticipated to consist of three to six storey buildings with one level of underground parking. Based on the conceptual design the Site covers an area of 39,606.3 m^2, and the one level of underground parking will encompass 35,283.5 m^2. The majority of the Site will include construction excavation for the installation of the underground parking. The buildings will be surrounded by landscaped areas and additional above ground parking and paved driveways (**Figure 1.2**).

The one level of below ground parking is anticipated to be completed to a depth of 6.1 mBGS, which will intersect the water table within permeable silt, silty sand and sand deposits. Therefore, construction groundwater control requirements will be required to lower the water table below the base of the underground parking excavation to provide safe dry working conditions.

The construction excavations and foundations are well above the Confined Municipal Aquifer, which is approximately 90 m below the Site elevation and development activities.

4.3.1 Water Taking Evaluation – Underground Parking

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

Table 4.2 Summary of Relevant Construction Dewatering Depths – Underground Parking Structure

Utility Excavation	Depth (m BGS)	Elevation (m AMSL)
a) Ground	0.0	268.24
b) Water Table	3.75	264.49*
c) Bottom Excavation	6.1	262.14
d) Bottom Dewatering	7.1	261.14

Note: *Based on a seasonal high observed at MW2-21 on September 21, 2021
mBGS - metres below ground surface
mAMSL - metres above mean sea level.

The required water table drawdown is anticipated to be generally about 3.35 metre within the excavation area, based on the above (264.49 mAMSL – 261.14 mAMSL = 3.35 m).

The temporary water takings and area of influence during an open cut excavation were determined using the field test results and the analytical solution for groundwater seepage (unconfined flow) to a trench (CGS, 2013), as presented below.

EQUATION AND PARAMETERS

1) $$Q = \frac{\pi K(H^2-h^2)}{\ln R_O/r_w} + 2\left[\frac{xK(H^2-h^2)}{2L}\right]$$

2) $$r_w = \frac{a+b}{\pi}$$

3) $$L = R_O = 3000(\Delta H)\sqrt{K}$$

where:
Q = constant pumping rate (m^3/day)
K = hydraulic conductivity (m/day)
H = height of groundwater pressure (m)
h_w = dewatering height (m)
R_o = radius of influence (m)
rw = radius of footprint (m)
a = length of excavation (m)
b = width of excavation (m)

The analytical model input parameters are provided on **Table G.1**, and are summarized as follows:
Q = calculated groundwater seepage rate for an excavation with dimensions 112 m x 315 m
K = 3.7 m/day (4.3 x10^{-3} cm/s)
H = 3.35 m height of water table
h_w = 0 m dewatering height
R_o = 188.11 m
r_w = 135.99 m
a = 315 m
b = 112 m

Note: Height measurements are relative to base of the active groundwater flow system.

Due to the variability of the geologic deposits the geometric mean plus one standard deviation was conservatively used for the hydraulic conductivity of the silt, silty sand and sand deposit. The geometric mean plus one standard deviation hydraulic conductivity observed for the deposit is 4.3 x 10^{-3} cm/sec.

The steady state groundwater seepage into the excavation was estimated to be approximately 396.53 cubic metres per day (m^3/day) (**Table G.1**) or 396,530 L/day, or 275.35 L/min into the excavation. A water taking at this rate was predicted to result in an area of influence of approximately 200 m from the open cut excavation. A safety factor of 3X was then applied to account for the removal of the initial groundwater storage during the early stages of the water taking. Based on this, the maximum water takings were estimated to be up to 1,189.59 m^3/day (1,189,590 L/day).

A Ministry of the Environment, Conservation and Parks (MECP) Environmental Activity and Sector Registry (EASR) is required for temporary construction groundwater takings of between 50,000 to 400,000 L/day, and a MECP Permit to Take Water (PTTW) is required for construction water takings of more than 400,000 L/day.

The estimated construction water taking of 1,189,590 L/day is above the PTTW limit of 400,000 L/day. Based on this, a PTTW is anticipated to be required for the construction dewatering for the underground parking structure dewatering activities.

4.4 Underground Parking Structure - Long Term Groundwater Management

There are two alternative methods to manage the hydrostatic pressures against the foundation structure:

1. A subfloor and perimeter drainage system (Permanent Drainage System – (PDS)) and a waterproofing membrane compatible with the drainage system installed beneath the slab. The purpose of the subfloor drainage system is primarily to depress the water table thus preventing a build-up of hydrostatic pressure so that the floor slab and foundation walls do not need to be designed to resist hydrostatic load. The drainage system must be designed to collect and dispose of groundwater at a rate sufficient to prevent build-up of hydrostatic pressure. The purpose of the waterproofing membrane is to minimize potential for seepage of groundwater through the slab and walls. Ongoing groundwater collection and discharge is required for this option.
2. The basement and/or tank can be designed as a watertight structure. This will eliminate the need to install and maintain the subfloor drains but is otherwise likely to be more costly. The walls and slabs will have to be designed to resist hydrostatic and uplift pressures. Groundwater collection is not required for this option.

The Site design considers that permanent dewatering is not permitted, and as such a watertight “bathtub” foundation has been included in the design.

4.5 Groundwater Management - Quality

During construction, the collected groundwater may be temporarily discharged to the municipal sanitary or storm sewers. One groundwater sample was collected on July 21, 2021 from monitoring well MW5-21 for laboratory analysis of the City of Barrie sewer use bylaw discharge parameters and selected parameters from the PWQO and ODWS. The sample analyses included total metals (unfiltered) as required by the bylaw, and a separate sample was collected for dissolved metals (filtered) to assess treatment options in the event that one of the metal parameters exceeds the sewer use criteria. The results from the laboratory analyses are summarized in **Table 4.3,** and the laboratory analytical reports are provided in **Appendix E.**

Based on of the groundwater analytical results presented in **Table 4.3**, all analyzed parameters had concentrations below the City of Barrie sanitary sewer criteria.

Based on review of **Table 4.3**, the groundwater analytical results do not meet all criteria for discharge to the City of Barrie storm sewer, or all PWQOs in the event of discharge to land drainage. Total suspended solids (TSS) had elevated concentrations above the by-law criteria for discharge to the City of Barrie storm sewers. The following constituents had elevated concentrations above the PWQOs; phosphorus, iron, cobalt and aluminum. It is anticipated that pre-treatment such as, settlement, filtration and other treatment processes will be required prior to discharge. Treatment methods will need to be assessed to determine if the discharge can be treated to meet the onsite storm sewer use criteria or for discharge to land drainage.

As the water that accumulates in the excavation will primarily be a combination of groundwater, surface water runoff 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 prior to discharge to the municipal sewer or land drainage to confirm acceptable discharge quality.

4.6 Water Balance Analysis

A water balance has been prepared and is presented in the Functional Servicing and Stormwater Management Report[10]. Due to the sandy soils and generally deep groundwater table found on site, the underground infiltration chambers are proposed to be located along the northern limit of the Site Plan. The water balance and infiltration will be further evaluated subsequent to the confirmatory infiltration testing to be undertaken in the Spring of 2022.

5. Summary and Conclusions

Based on the results of the hydrogeological investigation and monitoring, the following summary and conclusion are provided:

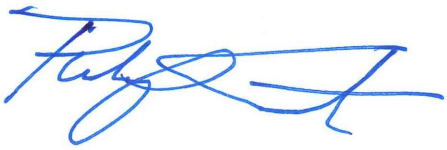
1. The Site is underlain by ice contact silt, silty sand to sand deposits. The Site investigations are consistent with the City of Barrie's, Environmental Risk Assessment internal model, which indicates the presence of a shallow aquifer (A1 aquifer) with a deep water table.
2. The construction excavations and foundations are not expected to intersect the Confined Municipal Aquifer, which is anticipated to be at a depth of approximately 90 m.
3. The horizontal hydraulic conductivity (K_h) of the ice contact deposit ranges from 1.1×10^{-5} to 1.1×10^{-2} cm/s. Accounting for the variability of the deposit, the horizontal hydraulic conductivity is 4.3×10^{-3} cm/s (geomean plus one standard deviation).
4. Groundwater levels range from 3.75 mBGS at MW2-21 to 7.47 mBGS at BH1, and on average are about 5.7 mBGS. The groundwater level elevations ranged from 263.53 mAMSL at BH1 to 264.82 mAMSL at BH4. Groundwater flow is going east to west across the Site towards the tributary of Lover's Creek.
5. The proposed mixed-use condominium development underground parking structure is anticipated to intersect permeable silty sand to sand deposits on Site and require dewatering activities during construction. The underground parking structure maximum construction water takings are estimated at 1,189,590 L/day, which is above the MECP construction groundwater taking EASR limit of 400,000 L/day. Based on this, a PTTW will be required for the underground parking structure dewatering activities.
6. The Site design considers that permanent dewatering is not permitted, and as such a watertight "bathtub" foundation has been included in the design.
7. All analyzed parameters for groundwater samples collected had concentrations below the City of Barrie sanitary sewer criteria. However, some parameters had concentrations above the City of Barrie Storm Sewer Use By Law for total suspended solids, or PWQO criteria for phosphorus, iron, cobalt and aluminum in the event of construction water discharge to land drainage. It is anticipated that pre-treatment such as, settlement, filtration and other treatment processes will be required prior to discharge. Treatment methods will need to be assessed to determine if the discharge can be treated to meet the onsite storm sewer use, or land drainage criteria.

[10] Functional Servicing and Stormwater Management Report, Proposed Mixed-Use Condominium Development, 1012 Yonge Street, City of Barrie. Prepared for Crown Barrie Developments Inc. February 2022.

All of Which is Respectfully Submitted,

GHD

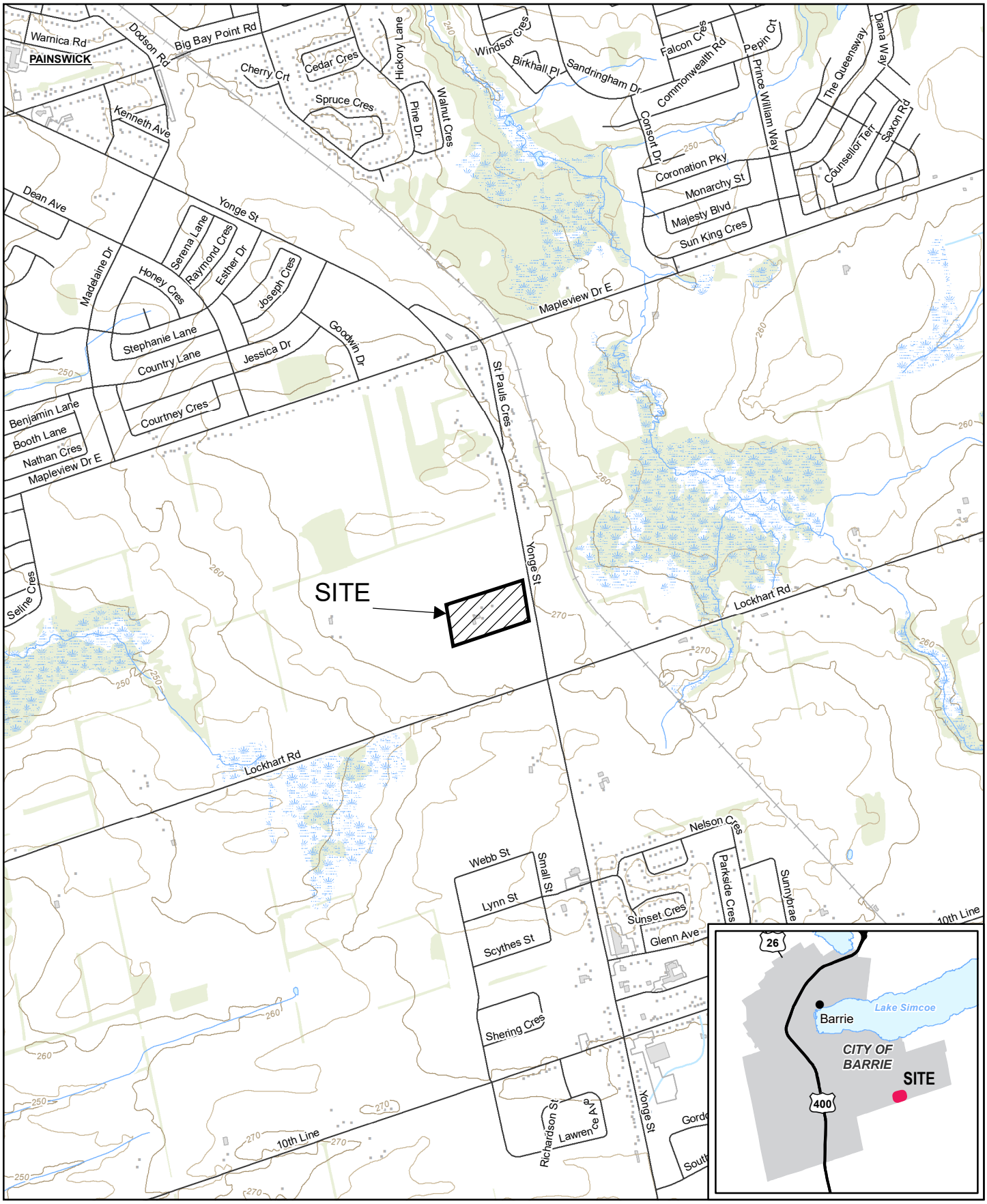
Michael McKerrall, B.E.S



Philip Smart, M. Sc., P. Geo.

Thomas Guoth, P. Eng.

Figures



Paper Size ANSI A

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **11226647**
Revision No. **-**
Date **Feb 7, 2022**

SITE LOCATION MAP

FIGURE 1.1

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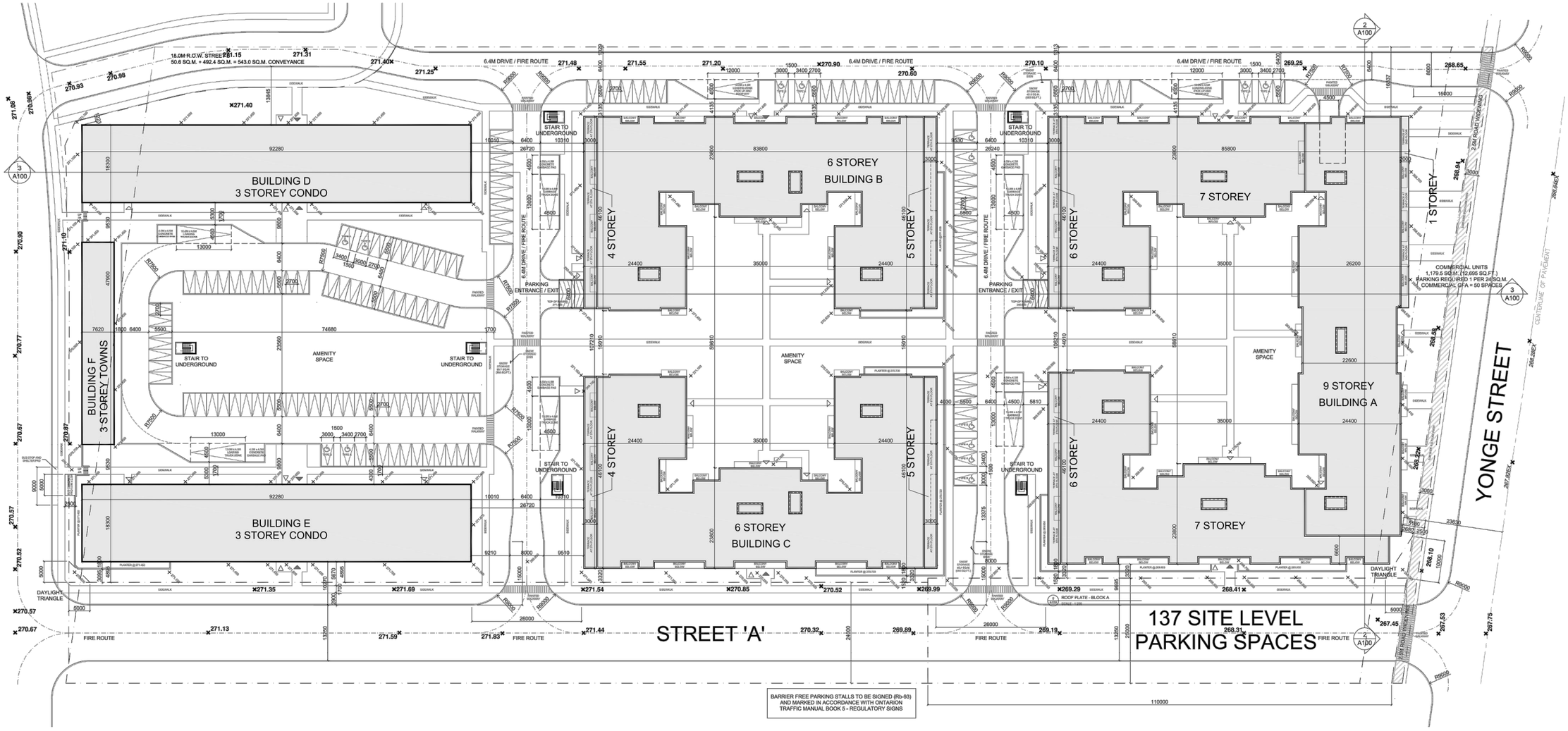

0 10 20 30m

1:1000

Coordinate System:
UTM ZONE 17
NAD83 METRES

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

SITE PLAN

Project No. **11226647**
Date **February 2022**

FIGURE 1.2

Filename: \\ghdnet\ghd\CA\Mississauga\Projects\662\11226647\Digital_Design\ACAD\Figures\RPT-Hydrogeological_Assmt\11226647-GHD-0000-RPT-EN-0104_WA-Hydrogeological_Assmt.dwg
Plot Date: 07 February 2022 10:04 AM

Data Source: SRN ARCHITECTS, SITE PLAN, STATS AND OBC MATRIX, PROJECT NUMBER S19013, DRAWING A100, DATED 14/12/2020

Paper Size ANSI A

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **11226647**
Revision No. **-**
Date **Feb 7, 2022**

LAND USE (AERIAL IMAGERY)

FIGURE 2.1

O:\GIS\PROJECTS\11226000s\11226647\Layouts\Hydrogeological Assessment\11226647_HydrogeologicalAssessment_GIS005.mxd
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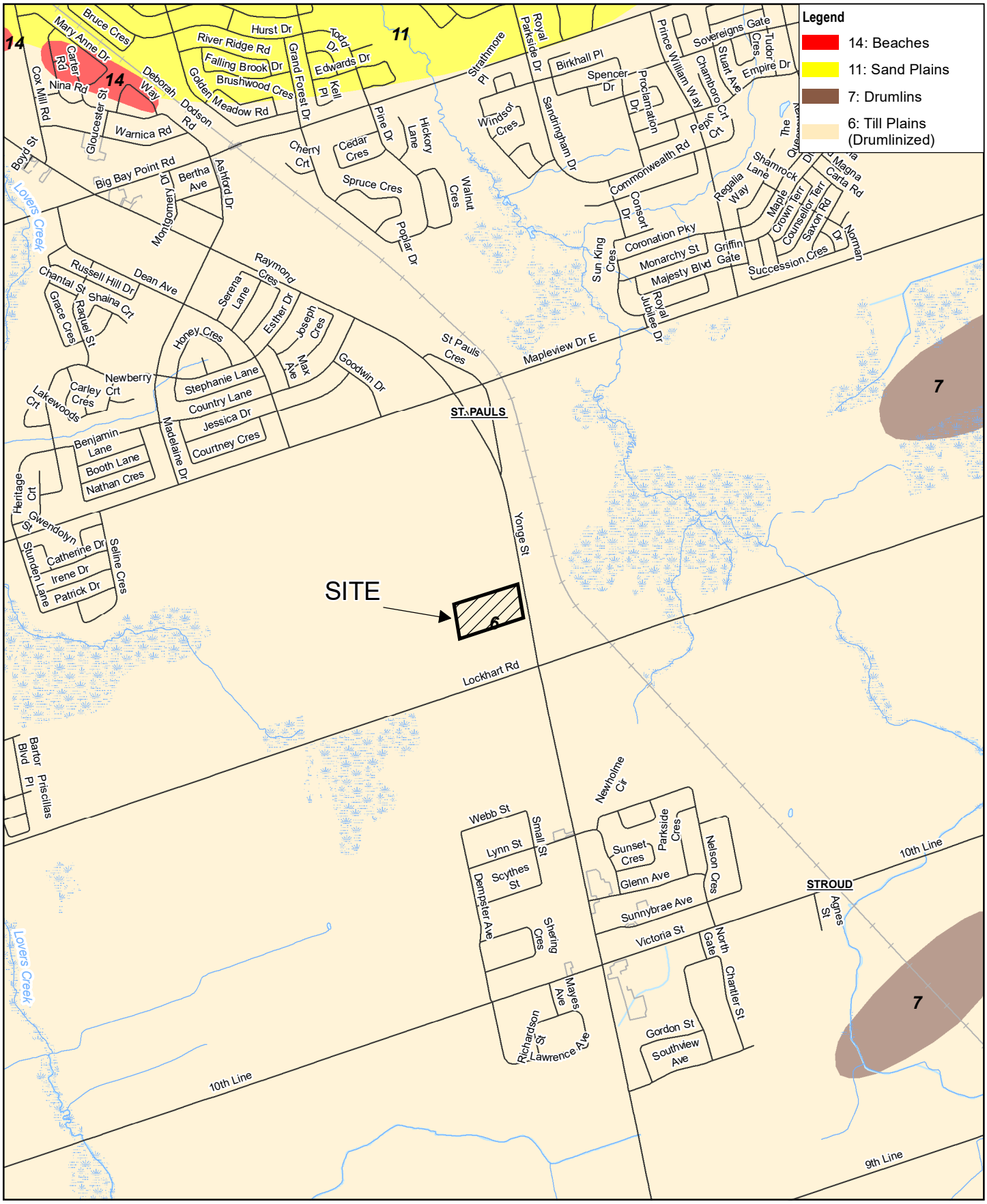


Paper Size ANSI A

0 200 400 600

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

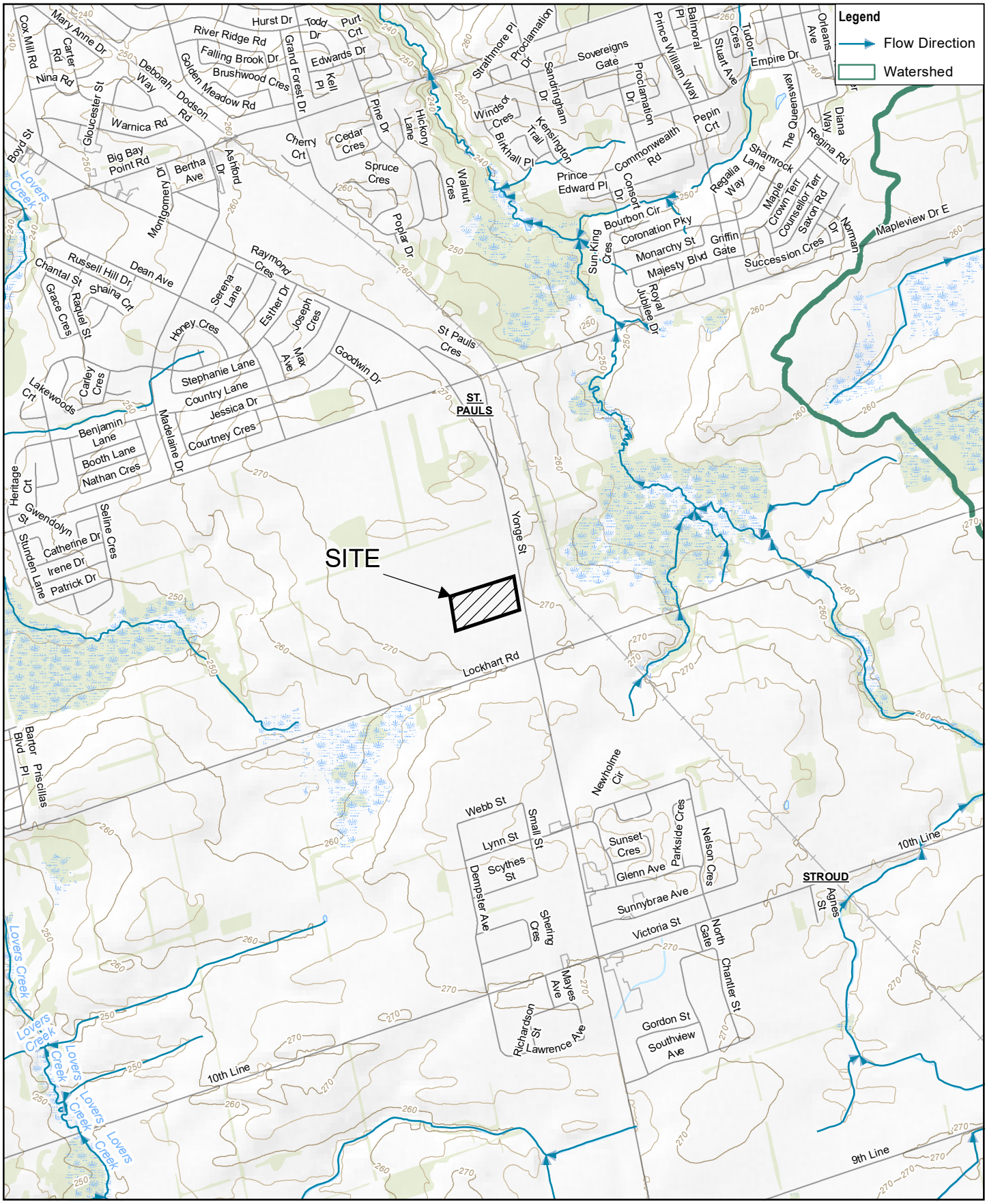
Project No. **11226647**
Revision No. **-**
Date **Feb 7, 2022**

PHYSIOGRAPHY

FIGURE 2.2

O:\GIS\PROJECTS\11226000s\11226647\Layouts\Hydrogeological Assessment\11226647_HydrogeologicalAssessment_GIS002.mxd
Print date: 07 Feb 2022 - 12:37

Data source: .MNRF NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2022; Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.



Paper Size ANSI A

0 200 400 600

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

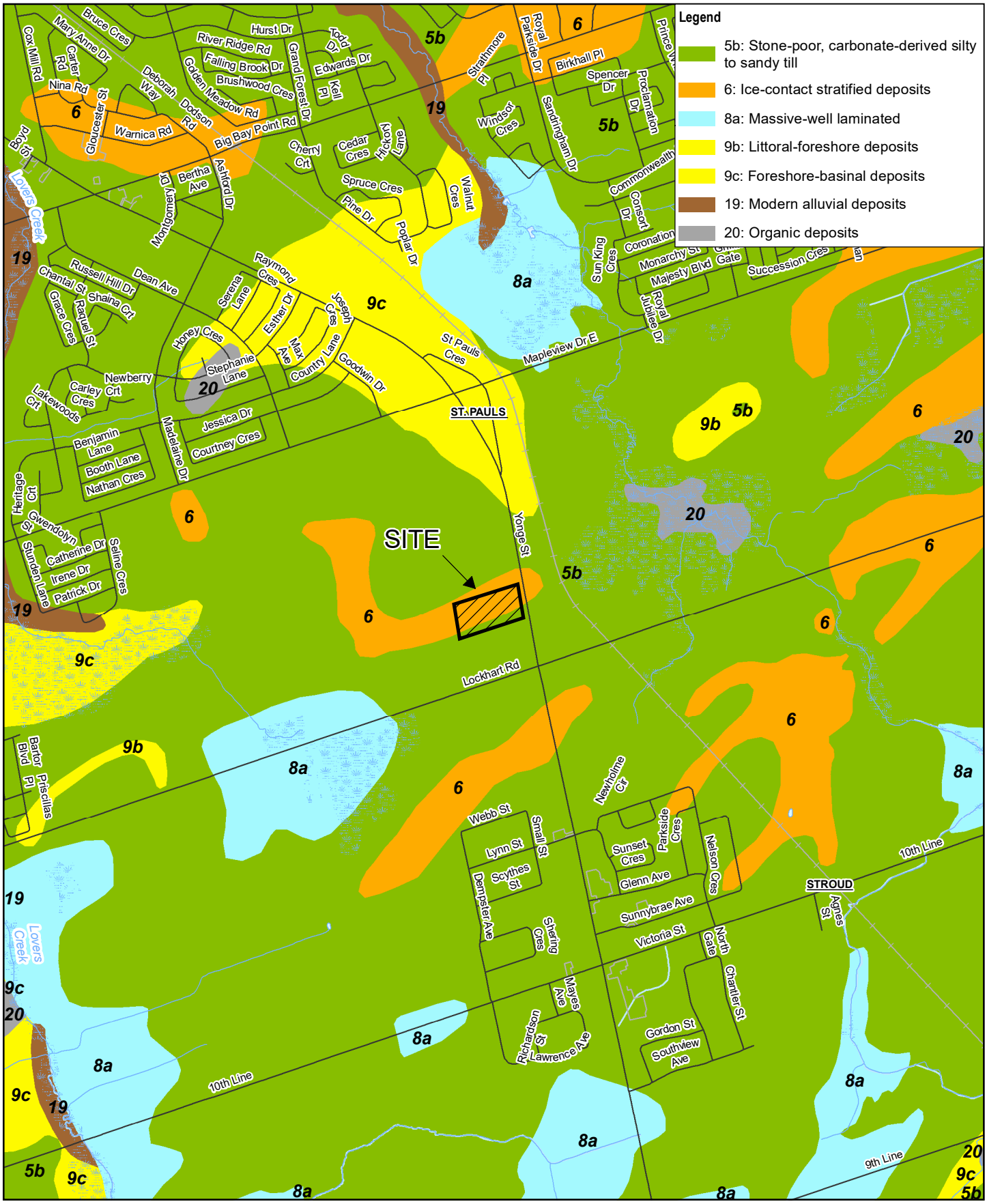
CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **11226647**
Revision No. **-**
Date **Feb 7, 2022**

SURFACE WATER FLOW DIRECTION

FIGURE 2.3

O:\GIS\PROJECTS\11226000s\11226647\Layouts\Hydrogeological Assessment\11226647_HydrogeologicalAssessment_GIS006.mxd
Print date: 07 Feb 2022 - 12:39



Paper Size ANSI A

0 200 400 600

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **11226647**
Revision No. **-**
Date **Feb 7, 2022**

SURFICIAL GEOLOGY

FIGURE 2.4

O:\GIS\PROJECTS\11226000s\11226647\Layouts\Hydrogeological Assessment\11226647_HydrogeologicalAssessment_GIS003.mxd
Print date: 07 Feb 2022 - 12:39

Source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2022; Ontario Geological Survey 2003. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release---Data 128.

Paper Size ANSI A

0 100 200 300

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

Project No. **11226647**
Revision No. **-**
Date **Feb 7, 2022**

MECP WATER WELL RECORDS

FIGURE 2.5

Q:\GIS\PROJECTS\11226000s\11226647\Layouts\Hydrogeological Assessment\11226647_HydrogeologicalAssessment_GIS004.mxd
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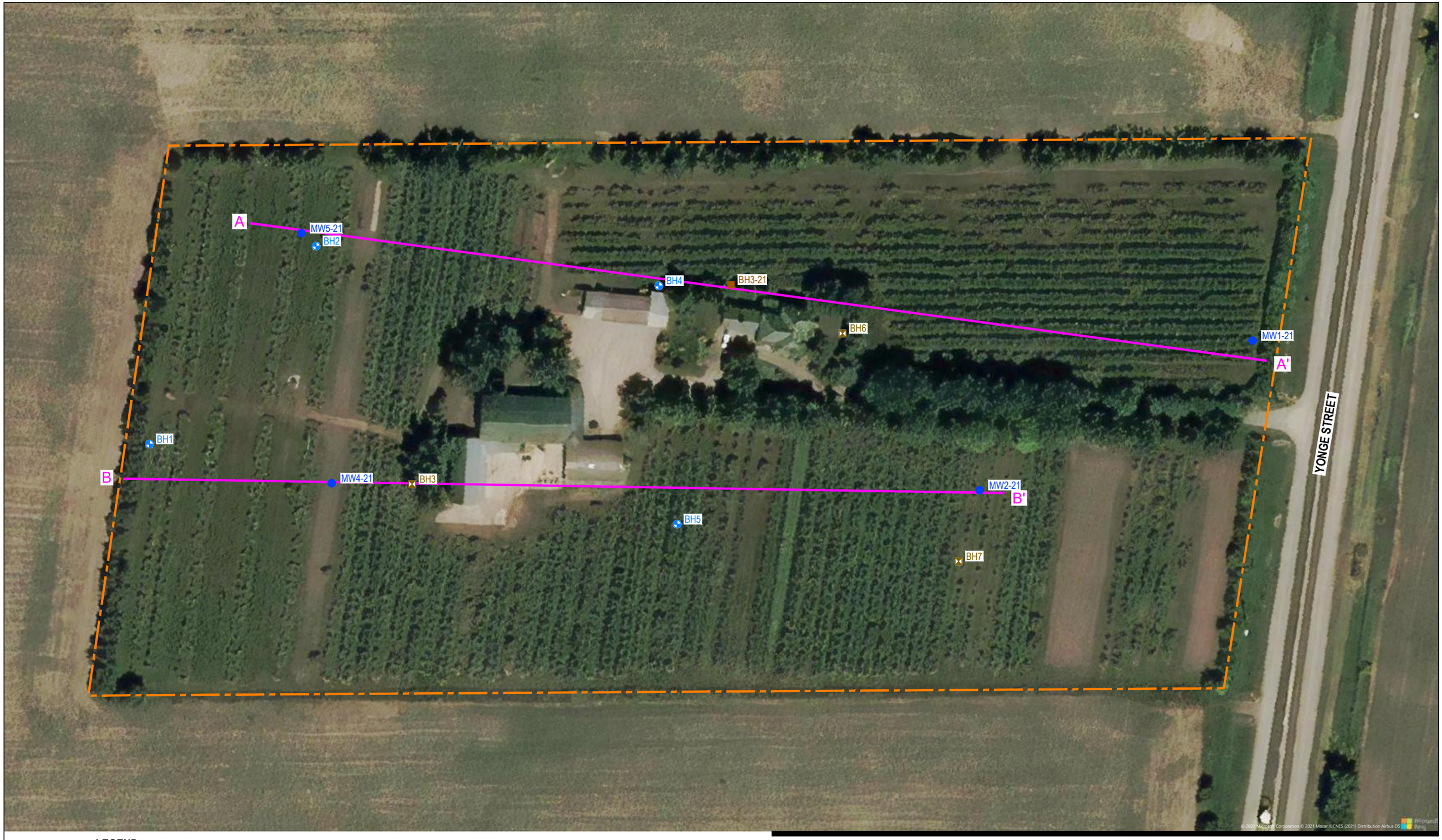


LEGEND

- PROPERTY BOUNDARY
- BOREHOLE LOCATION (GHD)
- MONITORING WELL LOCATION (GHD)
- BOREHOLE LOCATION (SOIL ENGINEERS LTD.)
- MONITORING WELL LOCATION (SOIL ENGINEERS LTD.)
- A — A' LOCATION OF CROSS-SECTION

0 10 20 30m

1:1000

Coordinate System:
UTM ZONE 17
NAD83 METRES

N

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

INVESTIGATIVE LOCATIONS

Project No. **11226647**
Date **February 2022**

FIGURE 3.1

Filename: N:\CA\Mississauga\Projects\662\11226647\Digital_Design\ACAD\Figures\RPT-Hydrogeological_Assmt\11226647-GHD-0000-RPT-EN-0101_WA-Hydrogeological_Assmt.dwg
Plot Date: 07 February 2022 10:05 AM

A
NORTHWEST

A'
SOUTHEAST

MW5-21 (O/S -0.9)
BH2 (O/S -3.9)
BH4 (O/S -2.1)
BH6 (O/S -8.4)
MW1-21 (O/S 5.1)

ELEVATION (mASD)

272
270
268
266
264
262
260
258
256
254
252

0
50
100
150
200
250

DISTANCE (metre)

LEGEND

MW104-19
WELL DESIGNATION
GROUND SURFACE
STRATIGRAPHIC BOUNDARY
GROUNDWATER ELEVATION (mASD) (DATED JULY 2021)
SCREENED INTERVAL

TOPSOIL
FILL
CLAY
SAND
SANDY SILT/SILTY SAND
SILTY SAND TILL
SILT

GROUNDWATER ELEVATION
GROUNDWATER FLOW DIRECTION

HORIZONTAL
1:1000
0 10 20 30

VERTICAL
1:100
0 1 2 3

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

CROSS-SECTION A-A'

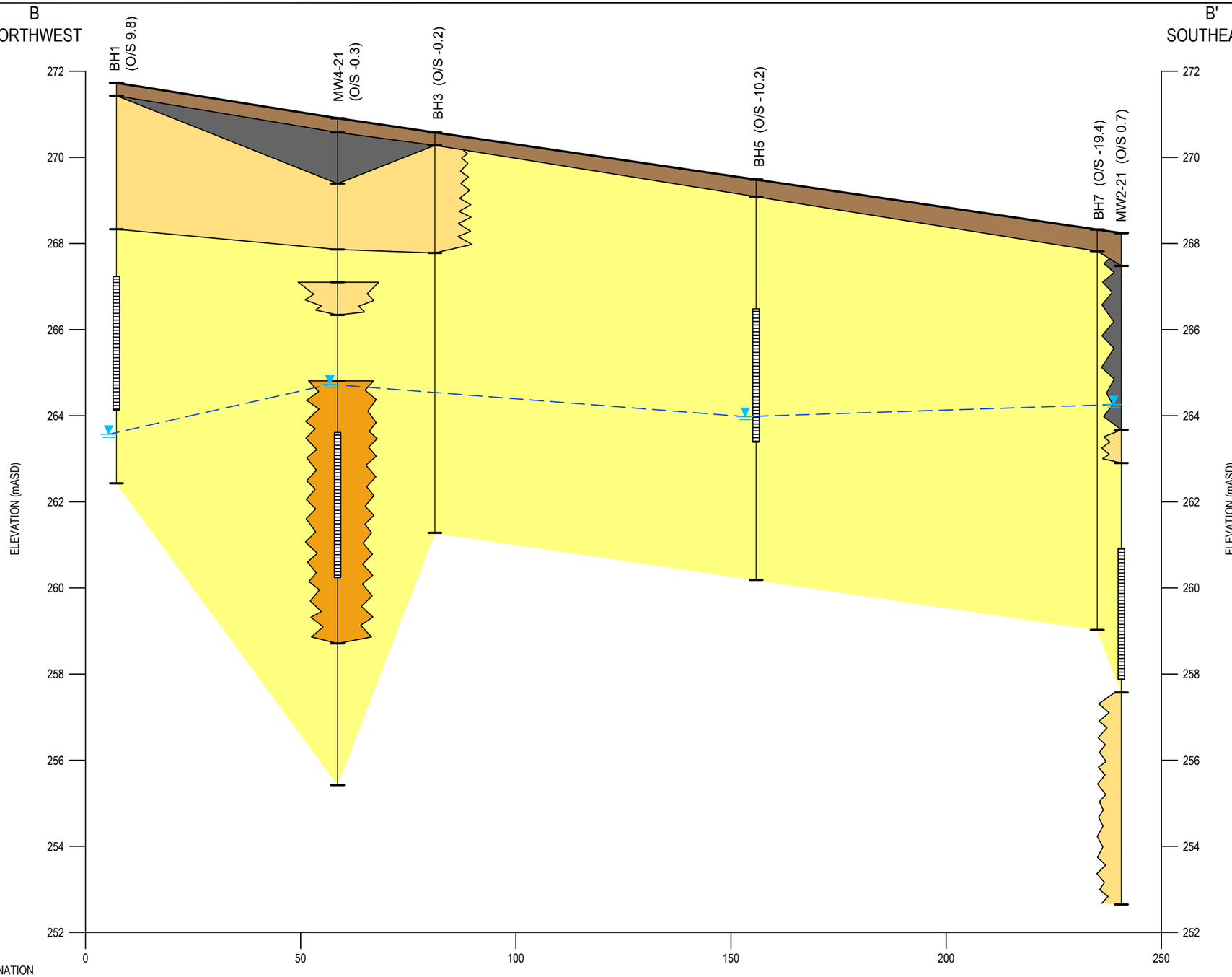
Project No. **11226647**
Date **February 2022**

FIGURE 4.1

Filename: N:\CA\Mississauga\Projects\662\11226647\Digital_Design\ACAD\Figures\RPT-Hydrogeological_Assmt\11226647-GHD-0000-RPT-EN-0101_WA-Hydrogeological_Assmt.dwg
Plot Date: 07 February 2022 10:05 AM

B
NORTHWEST

B'
SOUTHEAST



LEGEND

MW104-19

- WELL DESIGNATION
- GROUND SURFACE
- STRATIGRAPHIC BOUNDARY
- GROUNDWATER ELEVATION (mASD) (DATED JULY 2021)
- SCREENED INTERVAL

- TOPSOIL
- FILL
- SAND
- SANDY SILT/SILTY SAND
- SILT
- GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION

HORIZONTAL
1:1000
0 10 20 30

VERTICAL
1:100
0 1 2 3

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

CROSS-SECTION B-B'

Project No. **11226647**
Date **February 2022**

FIGURE 4.2

Filename: N:\CA\Mississauga\Projects\662\11226647\Digital_Design\ACAD\Figures\RPT-Hydrogeological_Assmt\11226647-GHD-0000-RPT-EN-0101_WA-Hydrogeological_Assmt.dwg
Plot Date: 07 February 2022 10:05 AM

LEGEND

- PROPERTY BOUNDARY
- BOREHOLE LOCATION (GHD)
- MONITORING WELL LOCATION (GHD)
- BOREHOLE LOCATION (SOIL ENGINEERS LTD.)
- MONITORING WELL LOCATION (SOIL ENGINEERS LTD.)

(4.95) DEPTH TO WATER (m BGS)

m BGS METRES BELOW GROUND SURFACE

0 10 20 30m

1:1000

Coordinate System:
UTM ZONE 17
NAD83 METRES

N

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

DEPTH TO WATER TABLE
(SEPTEMBER 21, 2021)

Project No. **11226647**
Date **February 2022**

FIGURE 4.3

Filename: N:\CA\Mississauga\Projects\662\11226647\Digital_Design\ACAD\Figures\RPT-Hydrogeological_Assmt\11226647-GHD-0000-RPT-EN-0102_WA-Hydrogeological_Assmt.dwg
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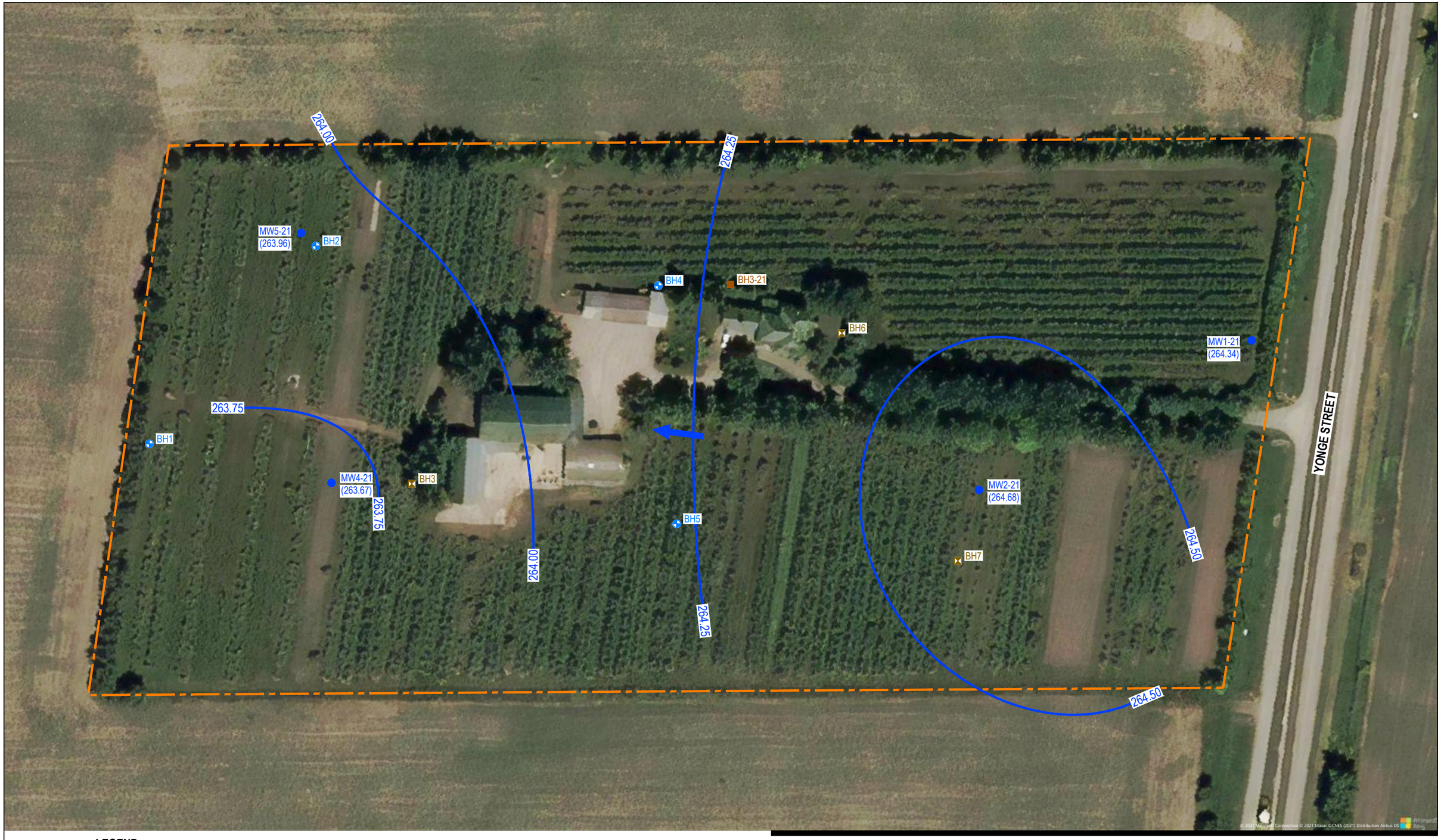


LEGEND

- PROPERTY BOUNDARY
- BOREHOLE LOCATION (GHD)
- MONITORING WELL LOCATION (GHD)
- BOREHOLE LOCATION (SOIL ENGINEERS LTD.)
- MONITORING WELL LOCATION (SOIL ENGINEERS LTD.)
- (263.67) GROUNDWATER ELEVATION (mAMSL)
- mAMSL METRES ABOVE MEAN SEA LEVEL
- 263.00 GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION

0 10 20 30m

1:1000

Coordinate System:
UTM ZONE 17
NAD83 METRES

N

GHD

CROWN BARRIE DEVELOPMENTS INC.
1012 YONGE STREET, BARRIE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT

GROUNDWATER ELEVATION CONTOURS (SEPTEMBER 21, 2021)

Project No. **11226647**
Date **February 2022**

FIGURE 4.4

Filename: N:\CA\Mississauga\Projects\662\11226647\Digital_Design\ACAD\Figures\RPT-Hydrogeological_Assmt\11226647-GHD-0000-RPT-EN-0103_WA-Hydrogeological_Assmt.dwg
Plot Date: 07 February 2022 10:05 AM

Tables

Table 3.1

Monitoring Well Completion Details
Hydrogeological Assessment
Crown Barrie Developments Inc
1012 Yonge Street, Barrie, ON

Well ID	Date Installed	Northing	Easting	Ground Elevation (m AMSL)	Top of Riser Elevation (m AMSL)	Total Depth (mBGS)	Screened Interval (m BGS) Top	Screened Interval (m BGS) Bottom	Screened Interval (m AMSL) Top	Screened Interval (m AMSL) Bottom	Sandpack Interval (m BGS) Top	Sandpack Interval (m BGS) Bottom	Sandpack Interval (m AMSL) Top	Sandpack Interval (m AMSL) Bottom	Screened Material
Monitoring Wells															
MW1-21	14-Jul-21	4910545.4	609712.1	268.23	269.29	10.98	7.62	10.67	260.61	257.56	6.89	10.98	261.34	257.25	Silty Sand
MW2-21	11-Jul-21	4910481.4	609652.4	268.24	269.21	10.98	7.30	10.37	260.94	257.87	6.71	10.98	261.53	257.26	Sand
MW4-21	8-Jul-21	4910426.1	609478.9	270.91	271.97	10.98	7.30	10.67	263.61	260.24	7.01	10.67	263.90	260.24	Silt with Sand
MW5-21	7-Jul-21	4910490.2	609448.7	271.10	272.02	10.98	7.62	10.67	263.48	260.43	7.16	10.98	263.94	260.12	Sand
Other Consultants Monitoring Wells															
BH1	12-Mar-20	4910420.0	609427.0	271.00	271.84	9.30	4.50	7.60	266.50	263.40	2.90	7.60	268.10	263.40	Sand
BH2	12-Mar-20	4910488.0	609454.0	271.20	272.06	9.30	3.00	6.10	268.20	265.10	2.40	6.10	268.80	265.10	Sand
BH4	12-Mar-20	4910507.0	609549.0	271.70	272.34	9.30	4.50	7.60	267.20	264.10	2.90	7.60	268.80	264.10	Sand
BH5	17-Mar-20	4910469.0	609617.0	268.80	269.61	9.30	3.00	6.10	265.80	262.70	2.40	6.10	266.40	262.70	Sand
Boreholes															
BH3-21	9-Jul-21	4910514.3	609568.0	270.66	-	15.64	-	-	-	-	-	-	-	-	-
Other Consultants Boreholes															
BH3	12-Mar-20	-	-	270.20	-	9.30	-	-	-	-	-	-	-	-	-
BH6	19-Mar-20	-	-	269.90	-	9.30	-	-	-	-	-	-	-	-	-
BH7	18-Mar-20	-	-	268.10	-	9.30	-	-	-	-	-	-	-	-	-

Notes:
- Elevations were established using a geodetic benchmark (BM) and the UTM-17 NAD 83 (2010) CSRS using Leica CS20 Controller (GPS) and Leica GS16 Receiver (GPS).
mBGS - metres below ground surface
mAMSL - metres above mean sea level

Table 3.2

Summary of Single Well Response Tests
Hydrogeological Assessment
Crown Barrie Developments Inc
1012 Yonge Street, Barrie, ON

Borehole ID	Hydraulic Conductivity (cm/s) Rising	Hydraulic Conductivity (cm/s) Falling	Method
MW1-21	2.60E-05	1.15E-04	Bouwer-Rice
	3.50E-05	1.50E-04	Hvorslev
MW2-21	9.76E-06	1.14E-05	Bouwer-Rice
	1.22E-05	1.48E-05	Hvorslev
MW4-21	6.05E-05	1.12E-04	Bouwer-Rice
	8.43E-05	1.51E-04	Hvorslev
MW5-21	9.22E-03	8.97E-03	Bouwer-Rice
	1.21E-02	1.10E-03	Hvorslev
*BH4	-	6.50E-04	Hvorslev
*BH5	1.10E-02	-	Hvorslev

*SWRTs were completed by IBI. Information collected from the Final Hydrogeological Investigation Report dated February 19, 2021. Prepared for Crown (Barrie) Developments Inc.

Table 3.3

Summary of Groundwater Levels (mBGS)
Hydrogeological Assessment
1012 Yonge Street, Barrie, ON
Crown Barrie Developments Inc

	MW1-21	MW2-21	MW4-21	MW5-21	BH1	BH2	BH4	BH5
Top of Riser (mAMSL)	269.29	269.21	271.97	272.02	271.84	272.06	272.34	269.61
Ground Surface (mAMSL)	268.23	268.24	270.91	271.09	271.00	271.20	271.70	268.80
24-Mar-20	-	-	-	-	Dry	Dry	7.07	4.73
22-Apr-20	-	-	-	-	7.34	Dry	6.74	4.61
25-May-20	-	-	-	-	7.41	Dry	6.77	4.70
21-Jan-21	-	-	-	-	Dry	Dry	7.11	4.97
19-Jul-21	4.19	3.75	6.16	6.87	-	-	-	-
21-Jul-21	-	-	-	6.88	-	-	-	-
22-Jul-21	4.20	3.80	6.11	6.86	7.47	Dry	6.96	4.67
21-Sep-21	4.40	3.98	6.18	6.78	7.43	Dry	6.88	4.82
19-Oct-21	4.41	4.02	6.24	6.87	7.45	Dry	6.96	4.86

Notes:

-	No data available (inaccessible, not found, damaged, destroyed, not measured)
mBGS	metres below ground surface
mAMSL	metres above mean sea level

Table 3.4

Summary of Groundwater Elevation (mAMSL)
Hydrogeological Assessment
1012 Yonge Street, Barrie, ON
Crown Barrie Developments Inc

	MW1-21	MW2-21	MW4-21	MW5-21	BH1	BH2	BH4	BH5
Top of Riser (mAMSL)	269.29	269.21	271.97	272.02	271.84	272.06	272.34	269.61
Ground Surface (mAMSL)	268.23	268.24	270.91	271.09	271	271.2	271.7	268.8
24-Mar-20	-	-	-	-	Dry	Dry	264.63	264.07
22-Apr-20	-	-	-	-	263.66	Dry	264.96	264.19
25-May-20	-	-	-	-	263.59	Dry	264.93	264.10
21-Jan-21	-	-	-	-	Dry	Dry	264.59	263.83
19-Jul-21	264.04	264.49	264.75	264.22	-	-	-	-
21-Jul-21	-	-	-	264.21	-	-	-	-
22-Jul-21	264.03	264.44	264.80	264.23	263.53	Dry	264.74	264.13
21-Sep-21	263.83	264.26	264.73	264.31	263.57	Dry	264.82	263.98
19-Oct-21	263.82	264.22	264.67	264.22	263.55	Dry	264.74	263.94

Notes:

- No data available (inaccessible, not found, damaged, destroyed, not measured)
mBGS metres below ground surface
mAMSL metres above mean sea level

Table 4.1

Summary of Hydraulic Conductivity
Hydrogeological Assessment
Crown Barrie Developments Inc
1012 Yonge Street, Barrie, ON

Borehole ID	Geologic Unit (Screened):	Screen Depth (mBGS)	Hydraulic Conductivity (cm/s) Rising	Hydraulic Conductivity (cm/s) Falling	Method
Silt					
MW4-21	Silt (very dense)	7.30 - 10.67	6.05E-05 8.43E-05	1.12E-04 1.51E-04	Bouwer-Rice Hvorslev
Silty Sand					
MW1-21	Silty Sand (very dense)	7.62 - 10.67	2.60E-05 3.50E-05	1.15E-04 1.50E-04	Bouwer-Rice Hvorslev
Sand					
MW2-21	Sand (very dense)	7.30 - 10.37	9.76E-06 1.22E-05	1.14E-05 1.48E-05	Bouwer-Rice Hvorslev
MW5-21	Sand (very dense)	7.62 - 10.67	9.22E-03 1.21E-02	8.97E-03 1.10E-03	Bouwer-Rice Hvorslev
*BH4	Sand	4.50 - 7.60	-	6.50E-04	Hvorslev
*BH5	Sand	3.0 - 6.10	1.10E-02	-	Hvorslev
			Geomean	**4.41E-04**	
			(Geomean plus one Standard Deviation)	4.27E-03	

*SWRTs were completed by IBI Group (February 19, 2021)

Table 4.3

Groundwater Analytical Results Summary
Hydrogeological Assessment
Crown Barrie Developments Inc
1012 Yonge Street, Barrie, ON

Sample Location:						**MW5**	**MW5**	**MW5**
Sample ID:						**GW-11226647-072121-DB-MW5**	**GW-11226647-072221-DB-MW5-D-METALS**	**GW-11226647-072221-DB-MW5-SEWERUSE**
Sample Date:						**07/21/2021**	**07/22/2021**	**07/22/2021**
Field SDG:						**C1K4167**	**C1K6265**	**C1K6179**
Parameters	**Units**	**BARRIE Sanitary a**	**BARRIE Storm b**	**ODWS c**	**PWQO d**			
Volatile Organic Compounds								
1,1,1,2-Tetrachloroethane	mg/L	-	-	-	0.02	--	--	ND(0.01)
1,1,1-Trichloroethane	mg/L	-	-	-	0.01	--	--	ND(0.004)
1,1,2,2-Tetrachloroethane	mg/L	0.06	-	-	0.07	--	--	ND(0.008)
1,1,2-Trichloroethane	mg/L	-	-	-	0.8	--	--	ND(0.008)
1,1-Dichloroethane	mg/L	-	-	-	0.2	--	--	ND(0.004)
1,1-Dichloroethene	mg/L	-	-	0.014	0.04	--	--	ND(0.004)
1,2-Dibromoethane (Ethylene dibromide)	mg/L	-	-	-	0.005	--	--	ND(0.0038)
1,2-Dichlorobenzene	mg/L	0.05	-	0.2	0.0025	--	--	ND(0.008)
1,2-Dichloroethane	mg/L	-	-	0.005	0.1	--	--	ND(0.0098)
1,2-Dichloropropane	mg/L	-	-	-	0.0007	--	--	ND(0.004)
1,3-Dichlorobenzene	mg/L	-	-	-	0.0025	--	--	ND(0.008)
1,4-Dichlorobenzene	mg/L	0.08	-	0.005	0.004	--	--	ND(0.008)
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	-	-	-	0.4	--	--	ND(0.2)
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	-	-	-	-	--	--	ND(0.1)
Acetone	mg/L	-	-	-	-	--	--	ND(0.2)
Benzene	mg/L	0.01	-	0.001	0.1	--	--	ND(0.004)
Bromodichloromethane	mg/L	-	-	-	0.2	--	--	ND(0.01)
Bromoform	mg/L	-	-	-	0.06	--	--	ND(0.02)
Bromomethane (Methyl bromide)	mg/L	-	-	-	0.0009	--	--	ND(0.01)
Carbon tetrachloride	mg/L	-	-	0.002	-	--	--	ND(0.0038)
Chlorobenzene	mg/L	-	-	-	0.015	--	--	ND(0.004)
Chloroethane	mg/L	-	-	-	-	--	--	ND(0.02)
Chloroform (Trichloromethane)	mg/L	-	-	-	-	--	--	ND(0.004)
Chloromethane (Methyl chloride)	mg/L	-	-	-	0.7	--	--	ND(0.1)
cis-1,2-Dichloroethene	mg/L	-	-	-	0.2	--	--	ND(0.01)
cis-1,3-Dichloropropene	mg/L	-	-	-	-	--	--	ND(0.006)
Dibromochloromethane	mg/L	-	-	-	0.04	--	--	ND(0.01)
Dichlorodifluoromethane (CFC-12)	mg/L	-	-	-	-	--	--	ND(0.02)
Ethylbenzene	mg/L	0.06	-	0.14	0.008	--	--	ND(0.004)
Hexane	mg/L	-	-	-	-	--	--	ND(0.02)
m&p-Xylenes	mg/L	-	-	-	0.002	--	--	ND(0.004)
Methyl tert butyl ether (MTBE)	mg/L	-	-	-	0.2	--	--	ND(0.01)
Methylene chloride	mg/L	0.09	-	0.05	0.1	--	--	ND(0.04)
o-Xylene	mg/L	-	-	-	0.04	--	--	ND(0.004)
Styrene	mg/L	-	-	-	0.004	--	--	ND(0.008)
Tetrachloroethene	mg/L	0.06	-	0.01	0.05	--	--	ND(0.004)
Toluene	mg/L	0.02	-	0.06	0.0008	--	--	ND(0.004)
trans-1,2-Dichloroethene	mg/L	-	-	-	0.2	--	--	ND(0.01)
trans-1,3-Dichloropropene	mg/L	-	-	-	0.007	--	--	ND(0.008)
Trichloroethene	mg/L	0.05	-	0.005	0.02	--	--	ND(0.004)
Trichlorofluoromethane (CFC-11)	mg/L	-	-	-	-	--	--	ND(0.01)
Trihalomethanes	mg/L	-	-	0.1	-	--	--	ND(0.02)
Vinyl chloride	mg/L	-	-	0.001	0.6	--	--	ND(0.004)
Xylenes (total)	mg/L	0.03	-	0.09	-	--	--	ND(0.004)
Semi Volatile Organic Compounds								
1-Methylnaphthalene	mg/L	-	-	-	0.002	--	--	ND(0.00005)
2-Methylnaphthalene	mg/L	-	-	-	0.002	--	--	ND(0.00005)

Table 4.3

Groundwater Analytical Results Summary
Hydrogeological Assessment
Crown Barrie Developments Inc
1012 Yonge Street, Barrie, ON

Sample Location:						**MW5**	**MW5**	**MW5**
Sample ID:						**GW-11226647-072121-DB-MW5**	**GW-11226647-072221-DB-MW5-D-METALS**	**GW-11226647-072221-DB-MW5-SEWERUSE**
Sample Date:						**07/21/2021**	**07/22/2021**	**07/22/2021**
Field SDG:						**C1K4167**	**C1K6265**	**C1K6179**
Parameters	**Units**	**BARRIE Sanitary**	**BARRIE Storm**	**ODWS**	**PWQO**			
Acenaphthene	mg/L	-	-	-	-	--	--	ND(0.00005)
Acenaphthylene	mg/L	-	-	-	-	--	--	ND(0.00005)
Anthracene	mg/L	-	-	-	0.0000008	--	--	ND(0.00005)
Benzo(a)anthracene	mg/L	-	-	-	0.0000004	--	--	ND(0.00005)
Benzo(a)pyrene	mg/L	-	-	0.00001	-	--	--	ND(0.000009)
Benzo(b)fluoranthene/Benzo(j)fluoranthene	mg/L	-	-	-	-	--	--	ND(0.00005)
Benzo(g,h,i)perylene	mg/L	-	-	-	0.00000002	--	--	ND(0.00005)
Benzo(k)fluoranthene	mg/L	-	-	-	0.0000002	--	--	ND(0.00005)
Chrysene	mg/L	-	-	-	0.0000001	--	--	ND(0.00005)
Dibenz(a,h)anthracene	mg/L	-	-	-	0.000002	--	--	ND(0.00005)
Fluoranthene	mg/L	-	-	-	0.0000008	--	--	ND(0.00005)
Fluorene	mg/L	-	-	-	0.0002	--	--	ND(0.00005)
Indeno(1,2,3-cd)pyrene	mg/L	-	-	-	-	--	--	ND(0.00005)
Naphthalene	mg/L	-	-	-	0.007	--	--	ND(0.00005)
Phenanthrene	mg/L	-	-	-	0.00003	--	--	ND(0.00003)
Pyrene	mg/L	-	-	-	-	--	--	ND(0.00005)
Total PAH	mg/L	0.05	-	-	-	--	--	ND(0.0002)
Metals (Total)								
Aluminum	mg/L	50	-	-	0.075	**0.34[d]**	--	**0.125[d]**
Antimony	mg/L	5	-	0.006	0.02	ND(0.0005)	--	0.000109
Arsenic	mg/L	1	-	0.01	0.005	ND(0.001)	--	0.000231
Barium	mg/L	5	-	1	-	0.05	--	0.0498
Beryllium	mg/L	-	-	-	0.011	ND(0.0004)	--	--
Bismuth	mg/L	5	-	-	-	--	--	ND(0.00001)
Boron	mg/L	-	-	5	0.2	0.026	--	--
Cadmium	mg/L	0.7	0.001	0.005	0.0002	ND(0.00009)	--	ND(0.000005)
Chromium	mg/L	2	0.08	0.05	0.001	ND(0.005)	--	0.00025
Cobalt	mg/L	5	-	-	0.0009	**0.0012[d]**	--	0.000873
Copper	mg/L	2	0.01	-	0.005	0.0015	--	0.00071
Gold	mg/L	5	-	-	-	--	--	ND(0.0001)
Iron	mg/L	50	-	-	0.3	**0.43[d]**	--	0.0736
Lead	mg/L	0.7	0.05	0.01	0.005	ND(0.0005)	--	0.000093
Manganese	mg/L	5	-	-	-	0.14	--	0.124
Mercury	mg/L	0.01	-	0.001	0.0002	--	--	ND(0.00010)
Molybdenum	mg/L	5	-	-	0.04	0.0076	--	0.00738
Nickel	mg/L	2	0.05	-	0.025	0.0019	--	0.0017
Phosphorus	mg/L	10	-	-	0.01	--	--	0.0061
Platinum	mg/L	5	-	-	-	--	--	ND(0.0001)
Rhodium	mg/L	5	-	-	-	--	--	ND(0.0005)
Selenium	mg/L	1	-	0.05	0.1	ND(0.002)	--	0.000097
Silver	mg/L	0.4	-	-	0.0001	ND(0.00009)	--	ND(0.00001)
Sodium	mg/L	-	-	-	-	14	--	--
Thallium	mg/L	-	-	-	0.0003	ND(0.00005)	--	--
Tin	mg/L	5	-	-	-	--	--	0.00025
Tungsten	mg/L	-	-	-	0.03	ND(0.001)	--	--
Uranium	mg/L	-	-	0.02	0.005	0.00078	--	--
Vanadium	mg/L	5	-	-	0.006	0.0011	--	0.00033
Zinc	mg/L	2	0.04	-	0.03	ND(0.005)	--	0.0018
Zirconium	mg/L	-	-	-	0.004	ND(0.001)	--	--

Table 4.3

Groundwater Analytical Results Summary
Hydrogeological Assessment
Crown Barrie Developments Inc
1012 Yonge Street, Barrie, ON

Sample Location:						**MW5**	**MW5**	**MW5**
Sample ID:						**GW-11226647-072121-DB-MW5**	**GW-11226647-072221-DB-MW5-D-METALS**	**GW-11226647-072221-DB-MW5-SEWERUSE**
Sample Date:						**07/21/2021**	**07/22/2021**	**07/22/2021**
Field SDG:						**C1K4167**	**C1K6265**	**C1K6179**
Parameters	**Units**	**BARRIE Sanitary**	**BARRIE Storm**	**ODWS**	**PWQO**			
Metals (Dissolved)								
Aluminum (dissolved)	mg/L	50	-	-	0.075	--	ND(0.0049)	--
Antimony (dissolved)	mg/L	5	-	0.006	0.02	--	ND(0.0005)	--
Arsenic (dissolved)	mg/L	1	-	0.01	0.005	--	ND(0.001)	--
Barium (dissolved)	mg/L	5	-	1	-	--	0.046	--
Beryllium (dissolved)	mg/L	-	-	-	0.011	--	ND(0.0004)	--
Bismuth (dissolved)	mg/L	5	-	-	-	--	ND(0.001)	--
Boron (dissolved)	mg/L	-	-	5	0.2	--	0.011	--
Cadmium (dissolved)	mg/L	0.7	0.001	0.005	0.0002	--	ND(0.00009)	--
Calcium (dissolved)	mg/L	-	-	-	-	100	100	--
Chromium (dissolved)	mg/L	2	0.08	0.05	0.001	--	ND(0.005)	--
Cobalt (dissolved)	mg/L	5	-	-	0.0009	--	0.00076	--
Copper (dissolved)	mg/L	2	0.01	-	0.005	--	ND(0.0009)	--
Iron (dissolved)	mg/L	50	-	-	0.3	--	ND(0.1)	--
Lead (dissolved)	mg/L	0.7	0.05	0.01	0.005	--	ND(0.0005)	--
Lithium (dissolved)	mg/L	-	-	-	-	--	ND(0.005)	--
Magnesium (dissolved)	mg/L	-	-	-	-	11	11	--
Manganese (dissolved)	mg/L	5	-	-	-	--	0.12	--
Mercury (dissolved)	mg/L	0.01	-	0.001	0.0002	--	--	ND(0.0001)
Molybdenum (dissolved)	mg/L	5	-	-	0.04	--	0.007	--
Nickel (dissolved)	mg/L	2	0.05	-	0.025	--	0.0016	--
Phosphorus (dissolved)	mg/L	10	-	-	0.01	--	ND(0.1)	--
Potassium (dissolved)	mg/L	-	-	-	-	1.6	1.6	--
Selenium (dissolved)	mg/L	1	-	0.05	0.1	--	ND(0.002)	--
Silicon (dissolved)	mg/L	-	-	-	-	--	6.8	--
Silver (dissolved)	mg/L	0.4	-	-	0.0001	--	ND(0.00009)	--
Sodium (dissolved)	mg/L	-	-	-	-	14	13	--
Strontium (dissolved)	mg/L	-	-	-	-	--	0.22	--
Tellurium (dissolved)	mg/L	-	-	-	-	--	ND(0.001)	--
Thallium (dissolved)	mg/L	-	-	-	0.0003	--	ND(0.00005)	--
Tin (dissolved)	mg/L	5	-	-	-	--	ND(0.001)	--
Titanium (dissolved)	mg/L	-	-	-	-	--	ND(0.005)	--
Tungsten (dissolved)	mg/L	-	-	-	0.03	--	ND(0.001)	--
Uranium (dissolved)	mg/L	-	-	0.02	0.005	--	0.0008	--
Vanadium (dissolved)	mg/L	5	-	-	0.006	--	ND(0.0005)	--
Zinc (dissolved)	mg/L	2	0.04	-	0.03	--	ND(0.005)	--
Zirconium (dissolved)	mg/L	-	-	-	0.004	--	ND(0.001)	--
Pesticides								
Hexachlorobenzene	mg/L	0.0001	-	-	0.0000065	--	--	ND(0.000005)
General Chemistry								
%difference/ion balance	%	-	-	-	-	0.890	--	--
Alkalinity, bicarbonate (calculated)	mg/L	-	-	-	-	290	--	--
Alkalinity, carbonate (calculated)	mg/L	-	-	-	-	1.9	--	--
Alkalinity, total (as CaCO3)	mg/L	-	-	-	-	290	--	--
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)

Table 4.3

Groundwater Analytical Results Summary
Hydrogeological Assessment
Crown Barrie Developments Inc
1012 Yonge Street, Barrie, ON

Sample Location:						**MW5**	**MW5**	**MW5**
Sample ID:						**GW-11226647-072121-DB-MW5**	**GW-11226647-072221-DB-MW5-D-METALS**	**GW-11226647-072221-DB-MW5-SEWERUSE**
Sample Date:						**07/21/2021**	**07/22/2021**	**07/22/2021**
Field SDG:						**C1K4167**	**C1K6265**	**C1K6179**
Parameters	**Units**	**BARRIE Sanitary**	**BARRIE Storm**	**ODWS**	**PWQO**			
Chloride (dissolved)	mg/L	1500	-	-	-	8.1	--	6.7
Color	TCU	-	-	-	-	ND(2)	--	--
Cyanide (total)	mg/L	1.2	-	0.2	0.005	--	--	ND(0.0050)
Cyanide, weak acid dissociable	mg/L	-	-	-	-	--	--	ND(0.001)
Dissolved organic carbon (DOC) (dissolved)	mg/L	-	-	-	-	1.3	--	--
Fluoride	mg/L	10	-	1.5	-	0.12	--	ND(0.10)
Hardness	mg/L	-	-	-	-	300	--	--
Hydroxide (as CaCO3)	mg/L	-	-	-	-	ND(1.0)	--	--
Nitrate (as N)	mg/L	-	-	10	-	3.64	--	--
Nitrite (as N)	mg/L	-	-	1	-	0.022	--	--
Nitrite/Nitrate	mg/L	-	-	-	-	3.66	--	--
Nitrogen	mg/L	-	-	-	-	3.8	--	--
Nitrogen, organic	mg/L	-	-	-	-	0.15	--	--
Oil and grease	mg/L	-	-	-	-	--	--	ND(0.50)
Oil and grease, animal	mg/L	150	-	-	-	--	--	ND(0.50)
Oil and grease, mineral/synthetic	mg/L	15	-	-	-	--	--	ND(0.50)
Orthophosphate	mg/L	-	-	-	-	ND(0.050)	--	--
pH, field	s.u.	-	6.0-9.5	-	6.5-8.5	7.36	--	--
pH, lab	s.u.	6.0-9.5	6.0-9.5	-	6.5-8.5	7.85	--	7.89
Phenolics (total)	mg/L	0.1	-	-	0.001	--	--	ND(0.0010)
Phosphorus	mg/L	10	-	-	0.01	**0.015**[d]	--	--
Sulfate (dissolved)	mg/L	1500	-	-	-	21	--	22
Sulfide	mg/L	1	-	-	-	ND(0.020)	--	ND(0.020)
Temperature, field	Deg C	60	30	-	-	17.12	--	--
Total dissolved solids (TDS)	mg/L	-	-	-	-	330	--	--
Total kjeldahl nitrogen (TKN)	mg/L	100	-	-	-	0.15	--	ND(0.10)
Total suspended solids (TSS)	mg/L	350	15	-	-	**28**[b]	--	14
Turbidity	NTU	-	-	-	-	28	--	--
Un-ionized ammonia	mg/L	-	-	-	0.02	ND(0.00061)	--	--

Footnotes:
ND- Not detected at the associated reporting limit.

Appendices

Appendix A

Field Methodology and Protocols

Appendix A 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 rests) 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 B

Stratigraphy Logs

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

☐ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

JOB NO.: 2002-S036

LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger

PROJECT LOCATION: 1012 Yonge Street, City of Barrie

DRILLING DATE: March 12, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
271.0	Ground Surface							
0.3	**25 cm TOPSOIL**	1	DO	6	0		21	
	ploughed Brown, compact to very dense							
	SANDY SILT TILL traces of clay and gravel occ. sand seams and layers, cobbles and boulders	2	DO	11	1		15	
		3	DO	50/15	2		7	
		4	DO	91/24	3		7	
267.6		5	DO	87/24			12	
3.4	Brown, very dense **SAND** fine to medium grained occ. silt seams and gravel	6	DO	50/12	4		4	
		7	DO	70/28	6		3	
		8	DO	50/10	7		17	
261.7		9	DO	50/12	9		16	
9.3	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 7.6 m completed with 3.1 m screen Sand backfill from 2.9 m to 7.6 m Bentonite seal from 0.0 m to 2.9 m Provided with a momument steel casing				10 11 12			

W.L. @ El. of 263.4 m upon completion of drilling.

Well was dry on March 25, 2020
W.L @ El. of 263.66 m on April 22, 2020.

Soil Engineers Ltd.

JOB NO.: 2002-S036

LOG OF BOREHOLE NO.: 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger

PROJECT LOCATION: 1012 Yonge Street, City of Barrie

DRILLING DATE: March 12, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
271.2	Ground Surface							
0.3	**30 cm TOPSOIL**	1	DO	6	0		27	
	ploughed Brown, compact to dense							
	SANDY SILT TILL traces of clay and gravel occ. sand seams and layers, cobbles and boulders	2	DO	19	1		9	
		3	DO	44	2		9	
268.8 2.4	Brown, very dense	4	DO	50/8			7	
	SAND medium grained occ. silt seams and gravel	5	DO	67	3		8	
		6	DO	50/12	4		5	
		7	DO	50/12	5		7	
		8	DO	50/10	6		17	
261.9 9.3	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.1 m completed with 3.1 m screen Sand backfill from 2.4 m to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a momument steel casing	9	DO	50/12	7 8 9 10 11 12		20	W.L. @ El. of 263.9 m upon completion of drilling. Well was dry on March 25, 2020 and April 22, 2020

Soil Engineers Ltd.

JOB NO.: 2002-S036

LOG OF BOREHOLE NO.: 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger

PROJECT LOCATION: 1012 Yonge Street, City of Barrie

DRILLING DATE: March 12, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
270.2	Ground Surface							
0.3	**25 cm TOPSOIL**	1	DO	8	0		16	
	Brown, loose to very dense							
	SANDY SILT TILL traces of clay and gravel occ. sand seams and layers, cobbles and boulders	2	DO	8	1		13	
		3	DO	20	2		11	
267.4		4	DO	73/25			8	
2.8	Brown, very dense	5	DO	78/23	3		7	
	SAND fine to medium grained occ. cobbles and boulders	6	DO	50/8	4		3	
		7	DO	50/15	5		10	
		8	DO	50/15	6		15	
260.9		9	DO	50/15	7		18	
9.3	**END OF BOREHOLE**				8			
					9			
					10			
					11			
					12			

W.L. @ El. of 264.4m upon completion of drilling.
Cave-in @ El. of 264.1 m upon completion of drilling.

Soil Engineers Ltd.

JOB NO.: 2002-S036

LOG OF BOREHOLE NO.: 4

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger

PROJECT LOCATION: 1012 Yonge Street, City of Barrie

DRILLING DATE: March 12, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
271.7	Ground Surface				
	33 cm TOPSOIL	1	DO	4	0
0.3	ploughed Brown, loose to very dense				
	SANDY SILT TILL traces of clay and gravel occ. sand seams and layers, cobbles and boulders	2	DO	9	1
		3	DO	29	2
		4	DO	67	
268.8					
2.9	Brown, very dense	5	DO	50/12	3
	SAND fine to medium grained traces of silt and gravel occ. cobbles and boulders				4
		6	DO	50/10	5
					6
		7	DO	50/15	
					7
		8	DO	50/10	
					8
262.4		9	DO	50/15	9
9.3	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 7.6 m completed with 3.1 m screen Sand backfill from 2.9 m to 7.6 m Bentonite seal from 0.0 m to 2.9 m Provided with a momument steel casing				10
					11
					12

Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40

40 11 8 7 3 4 3 12 15

WATER LEVEL

W.L. @ El. of 262.6 m upon completion of drilling.

W.L @ El. of 264.63 m on March 24, 2020.

W.L @ El. of 264.96 m on April 22, 2020.

Soil Engineers Ltd.

JOB NO.: 2002-S036

LOG OF BOREHOLE NO.: 5

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger

PROJECT LOCATION: 1012 Yonge Street, City of Barrie

DRILLING DATE: March 17, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
268.8	Ground Surface							
	36 cm TOPSOIL	1	DO	2	0		15	
0.4	ploughed Brown, loose very dense							
	SAND fine to medium grained a trace of silt occ. gravel	2	DO	24	1		17	
		3	DO	57	2		7	
		4	DO	72			5	
		5	DO	91/28	3		4	
		6	DO	50/15	4		14	
		7	DO	50/8	5		16	
		8	DO	50/15	6		12	
259.5		9	DO	50/15	7		18	
9.3	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.1 m completed with 3.1 m screen Sand backfill from 2.4 m to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a momument steel casing				8			
					9			
					10			
					11			
					12			

W.L. @ El. of 264.1 m upon completion of drilling.

W.L @ El. of 264.07 m on March 24, 2020.
W.L @ El. of 264.19 m on April 22, 2020.

Soil Engineers Ltd.

JOB NO.: 2002-S036

LOG OF BOREHOLE NO.: 6

FIGURE NO.: 6

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger

PROJECT LOCATION: 1012 Yonge Street, City of Barrie

DRILLING DATE: March 19, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
269.9	Ground Surface							
	36 cm TOPSOIL	1	DO	4	0		16	
0.4	ploughed Brown, loose to compact							
	SAND fine grained a trace of silt	2	DO	15	1		4	
		3	DO	15	2		11	
267.8								
2.1	Brown, compact to very dense							
	SANDY SILT TILL traces of clay and gravel occ. sand seams and layers, cobbles and boulders	4	DO	29	3		9	
266.5		5	DO	67			7	
3.4	Brown, very dense				4			
	SAND fine grained occ. silt seams and gravel	6	DO	57	5		5	
		7	DO	50/12	6		8	
		8	DO	50/8	7		18	
					8			
260.6		9	DO	50/10	9		22	
9.3	**END OF BOREHOLE**				10			
					11			
					12			

W.L. @ El. of 263.5 m upon completion of drilling.
Cave-in @ El. of 263.2 m upon completion of drilling.

JOB NO.: 2002-S036

LOG OF BOREHOLE NO.: 7

FIGURE NO.: 7

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger

PROJECT LOCATION: 1012 Yonge Street, City of Barrie

DRILLING DATE: March 18, 2020

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
268.1	Ground Surface							
	45 cm TOPSOIL	1	DO	2	0		14	W.L. @ El. of 264.0 m upon completion of drilling. Cave-in @ El. of 263.8 m upon completion of drilling.
0.5	Brown, loose to very dense ~~— — —~~ ploughed							
	SAND fine to medium grained traces of silt and gravel occ. cobbles and boulders	2	DO	6	1		14	
		3	DO	41	2		4	
		4	DO	45			2	
		5	DO	65	3		3	
		6	DO	50/12	4		12	
		7	DO	50/28	5		16	
		8	DO	50/8	6		18	
258.8		9	DO	50/12	7		18	
9.3	**END OF BOREHOLE**				8			
					9			
					10			
					11			
					12			

Soil Engineers Ltd.

REFERENCE No.: 11226647 ENCLOSURE No.: 1

GHD

BOREHOLE No.: MW1-21
ELEVATION: 268.23 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Crown Barrie Developments Inc.
PROJECT: Geotechnical Investigation - Hydrogeological Investigation
LOCATION: 1012 Yonge Street, Barrie, Ontario
DESCRIBED BY: C. Radway CHECKED BY: P. Verma
DATE (START): July 13, 2021 DATE (FINISH): July 14, 2021

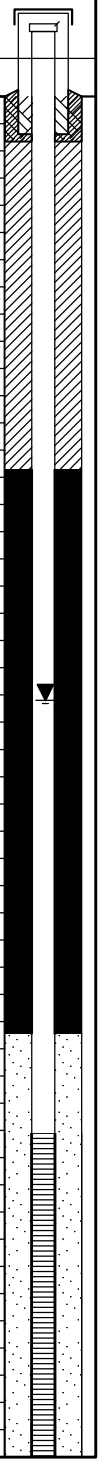
NORTHING: 4910545.39 EASTING: 609712.088

LEGEND
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS 268.23	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
0				GROUND SURFACE						
				TOPSOIL : 250 mm		SS1A		19	--	--
1	0.25	267.98		FILL : SANDY SILT, trace clay, rootlets, brown, moist, very loose to loose		SS1B	100	14	1-1-2-2	3
2										
3	1.0					SS2	92	15	2-3-2-3	5
4										
5										
6						SS3	83	4	2-2-2-4	4
7	2.0									
	2.29	265.94		NATIVE : SM-SILTY SAND with gravel, light brown, moist, dense Gravel : 22%, Sand : 63%, Clay : 2%, Silt : 13%		SS4	75	3	8-14-35-40	49
8										
9										
10	3.0			very dense		SS5	100	4	20-30-35-50/ 100mm	65
11										
12										
13	4.0			moist to wet, dense		SS6	75	8	12-20-28-40	48
14										
15				very dense						
16	5.0					SS7	83	19	10-22-35-45	57
17										
	5.34	262.89		SP-SM-SAND with silt, poorly graded, trace gravel, light brown, wet, dense		SS8	83	21	10-20-25-28	45
18										
19										
20	6.0			compact Gravel : 0%, Sand : 91%, Clay : 0%, Silt : 9%		SS9		18	3-8-20-45	28
21										
22										
23	7.0									
24										
25	7.62	260.61		SM-SILTY SAND, trace clay, light brown, wet, very dense		SS10	75	20	15-20-30-35	50
26	8.0									
27										
28										
29										
30	9.0			trace gravel, wet, compact						
31						SS11		18	2-4-8-16	12
32										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
Atterberg limits (%) W_p W_l
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



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REFERENCE No.: 11226647 ENCLOSURE No.: 1

BOREHOLE No.: MW1-21
ELEVATION: 268.23 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Crown Barrie Developments Inc.
PROJECT: Geotechnical Investigation - Hydrogeological Investigation
LOCATION: 1012 Yonge Street, Barrie, Ontario
DESCRIBED BY: C. Radway CHECKED BY: P. Verma
DATE (START): July 13, 2021 DATE (FINISH): July 14, 2021

LEGEND

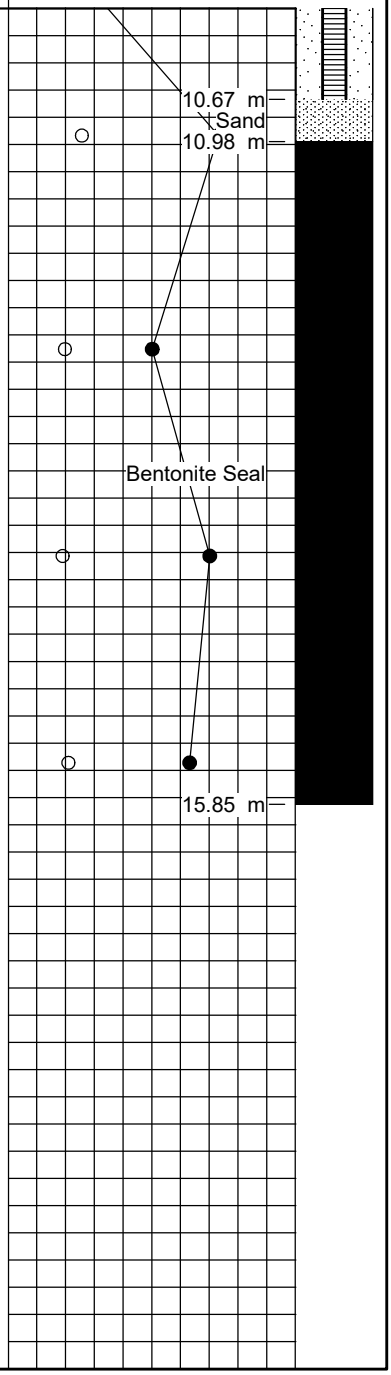
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4910545.39 EASTING: 609712.088

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		268.23		GROUND SURFACE				%		
	11.0			brown, very dense		SS12	67	26	14-25-48-50/ 75mm	73
	12.0									
	12.20	256.03		ML-SILT with sand, trace clay, wet, very dense Gravel : 0%, Sand : 24%, Clay : 3%, Silt : 73%		SS13	75	20	10-20-30-48	50
	13.0									
	14.0			very dense		SS14	67	19	20-30-40-50/ 50mm	70
	15.0									
				trace clay, grey		SS15		21	15-28-35-48	63
	15.85	252.38								
	16.0			**END OF BOREHOLE :** **NOTE :** - End of Borehole at 15.85 m bgs - 50 mm diameter monitoring well installed at 10.67 m bgs - Ground water level found at 4.27 m bgs - Groundwater level found at 4.44 m on Aug 18, 2021 - bgs denotes 'below ground surface'						
	17.0									
	18.0									
	19.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



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REFERENCE No.: 11226647 ENCLOSURE No.: 2

BOREHOLE No.: MW2-21
ELEVATION: 268.24 m

BOREHOLE REPORT

Page: 1 of 2

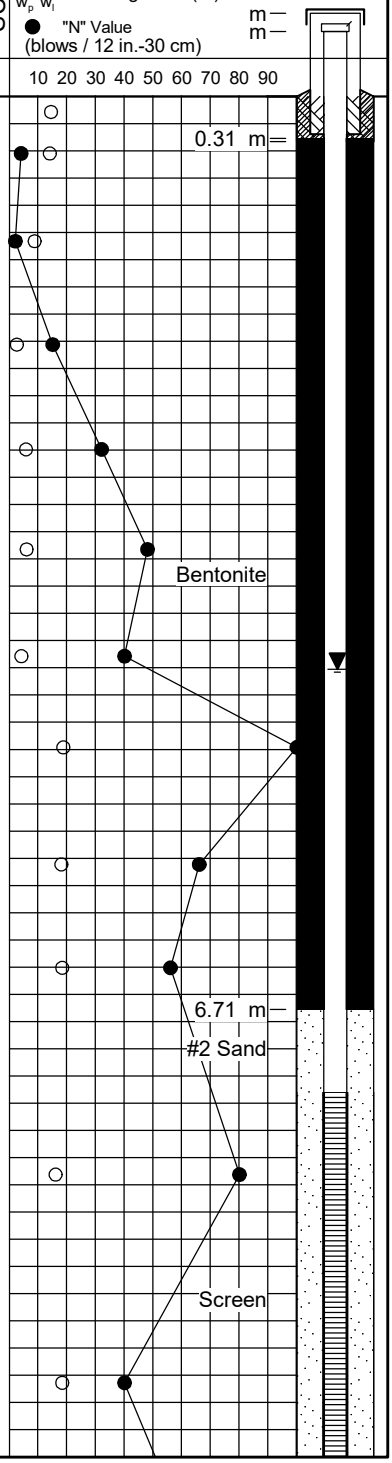
CLIENT: Crown Barrie Developments Inc.
PROJECT: Geotechnical Investigation - Hydrogeological Investigation
LOCATION: 1012 Yonge Street, Barrie, Ontario
DESCRIBED BY: C. Radway CHECKED BY: P. Verma
DATE (START): July 10, 2021 DATE (FINISH): July 11, 2021

LEGEND
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4910481.407 EASTING: 609652.447

Depth Feet	Depth Metres	Elevation (m) BGS 268.24	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
0				GROUND SURFACE						
				TOPSOIL : 225 mm		SS1A		14	--	--
1	0.23	268.01		FILL : SANDY SILT, trace clay, occasional rootlets, brown, moist, loose		SS1B	83	14	1-2-2-2	4
2	0.76	267.48		SAND, some silt, light brown, moist, very loose		SS2	83	9	1-1-1-1	2
3	1.0			compact		SS3	75	3	2-7-8-8	15
4				dense		SS4	75	6	3-12-20-40	32
5						SS5	100	6	10-18-30-35	48
6	2.0					SS6	75	4	10-20-20-30	40
7						SS7	94	19	15-35-50/ 125mm	100
8						SS8	79	18	20-28-38-45	66
9						SS9	83	18	10-12-44-50/ 150mm	56
10	3.0					SS10	75	16	28-38-42-45	80
11						SS11	75	18	15-20-20-55	40
12										
13	4.0									
14										
15	4.57	263.67		NATIVE : ML-SANDY SILT, trace clay, brown, wet, very dense						
16				Gravel : 0%, Sand : 39%, Clay : 3%, Silt : 58%						
17	5.0									
18	5.34	262.90		SAND, trace to some silt, brown, wet, very dense						
19										
20	6.0									
21										
22										
23	7.0									
24										
25										
26	8.0									
27										
28										
29	9.0									
30										
31										
32										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)
m
m
10 20 30 40 50 60 70 80 90



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REFERENCE No.: 11226647 ENCLOSURE No.: 2

BOREHOLE No.: MW2-21
ELEVATION: 268.24 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Crown Barrie Developments Inc.
PROJECT: Geotechnical Investigation - Hydrogeological Investigation
LOCATION: 1012 Yonge Street, Barrie, Ontario
DESCRIBED BY: C. Radway CHECKED BY: P. Verma
DATE (START): July 10, 2021 DATE (FINISH): July 11, 2021

NORTHING: 4910481.407 EASTING: 609652.447

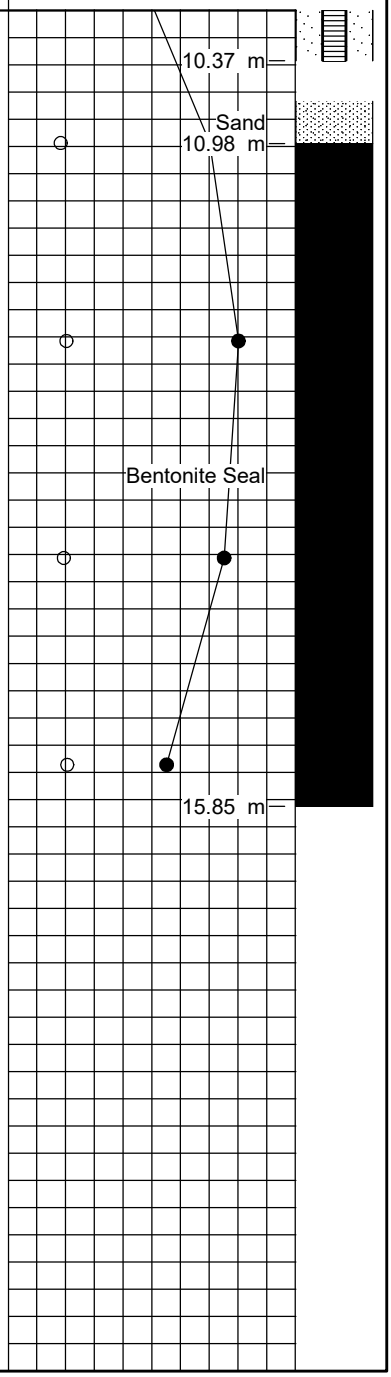
LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		268.24		GROUND SURFACE				%		
	10.67	257.57		SILTY SAND, trace clay, brown, wet, very dense Gravel : 0%, Sand : 61%, Clay : 4%, Silt : 35%		SS12	83	18	15-30-40-50	70
	11.0									
	12.0					SS13	75	20	20-30-50/ 150mm	80
	13.0									
	14.0					SS14	75	19	15-35-40-50/ 150mm	75
	15.0									
						SS15	67	20	16-25-30-50/ 150mm	55
	15.85	252.39		**END OF BOREHOLE :** **NOTE :** - End of Borehole at 15.85 m bgs - 50 mm diameter monitoring well installed at 10.37 m bgs - Ground water level found at 4.57 m bgs - Groundwater level found at 4.21 m on Aug 18, 2021 - bgs denotes 'below ground surface'						
	16.0									
	17.0									
	18.0									
	19.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



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REFERENCE No.: 11226647 ENCLOSURE No.: 3

GHD

BOREHOLE No.: MW3-21

ELEVATION: 270.66 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Crown Barrie Developments Inc.

PROJECT: Geotechnical Investigation - Hydrogeological Investigation

LOCATION: 1012 Yonge Street, Barrie, Ontario

DESCRIBED BY: C. Radway CHECKED BY: P. Verma

DATE (START): July 9, 2021 DATE (FINISH): July 9, 2021

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4910514.329 EASTING: 609567.975

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		270.66		GROUND SURFACE				%		
0				TOPSOIL : 200 mm		SS1A		22	--	--
1	0.20	270.46		FILL : SANDY SILT, trace clay, trace rootlets, brown, moist, loose		SS1B	92	18	1-1-2-1	3
2	0.76	269.90		NATIVE : SM-SILTY SAND, trace to some gravel, trace clay, light brown, moist, loose		SS2	92	7	1-2-3-4	5
3	1.0									
4	1.52	269.14		SM-SILTY SAND TILL, trace to some gravel, trace clay, brown, moist, compact		SS3	83	4	3-10-16-20	26
5	2.0									
6				dense		SS4	83	5	4-16-20-45	36
7										
8	3.0									
9	3.05	267.61		ML-SILT with sand, some clay, brown, moist, dense Gravel : 0%, Sand : 26%, Clay : 15%, Silt : 59%; NP		SS5	79	8	16-20-22-36	42
10	3.81	266.85		SM-SILTY SAND TILL, trace clay and gravel, brown, moist, dense		SS6	92	7	6-15-20-26	35
11	4.0									
12				very dense		SS7	94	4	10-40-50/ 125mm	100
13	5.0									
14	5.34	265.32		SP-SAND, trace silt and gravel, brown, moist, very dense		SS8	100	4	20-40-50/ 0mm	100
15	6.0					SS9	100	8	20-30-50/ 100mm	100
16										
17	7.0									
18	7.62	263.04		SW-SM-SAND with silt, well graded, trace clay and gravel, brown, moist, very dense Gravel : 1%, Sand : 90%, Clay : 3%, Silt : 6%		SS10	75	17	15-55-35-48	90
19	8.0									
20	9.0			dense		SS11	79	19	12-13-34-45	47

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

File: I:\LOG DATABASE\8-CHAR\11-----\1122---\112266--\11226647\11226647.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 8/23/21

REFERENCE No.: 11226647 ENCLOSURE No.: 3

BOREHOLE REPORT

BOREHOLE No.: MW3-21

ELEVATION: 270.66 m

CLIENT: Crown Barrie Developments Inc.

PROJECT: Geotechnical Investigation - Hydrogeological Investigation

LOCATION: 1012 Yonge Street, Barrie, Ontario

DESCRIBED BY: C. Radway CHECKED BY: P. Verma

DATE (START): July 9, 2021 DATE (FINISH): July 9, 2021

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4910514.329 EASTING: 609567.975

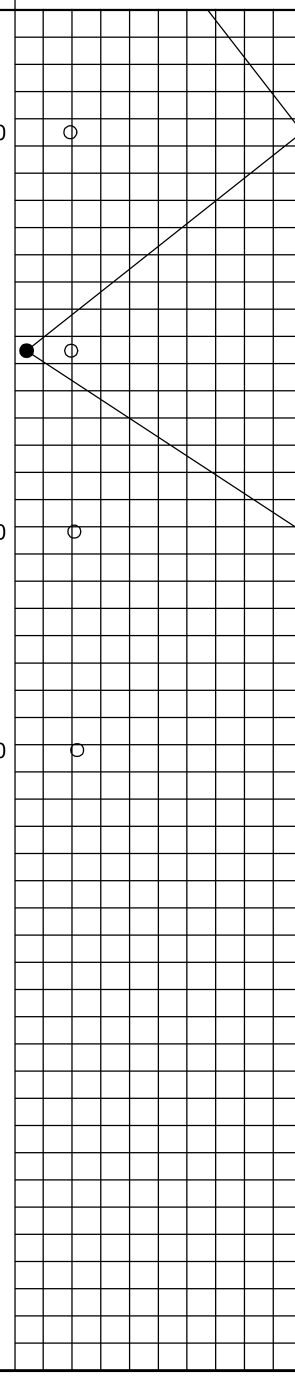
Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content (%)	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
	270.66		GROUND SURFACE						
10.67	259.99		SM-SILTY SAND, trace gravel, brown, wet, very dense	SS	SS12		19	8-25-50/ 150mm	100
12.20	258.46		SP-SM-SAND with silt, poorly graded, trace clay and gravel, brown, wet, loose Gravel : 1%, Sand : 92%, Clay : 2%, Silt : 5%	SS	SS13	75	20	1-2-2-6	4
			very dense	SS	SS14	100	21	20-50/ 75mm	100
				SS	SS15	100	22	22-40-50/ 100mm	100
15.64	255.02		**END OF BOREHOLE :**						

Depth scale: Feet 33–65; Metres 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0

NOTE :

- End of Borehole at 15.64 m bgs
- Ground water level found at 4.12 m bgs
- bgs denotes 'below ground surface'
- NP denotes 'non-plastic'

Shear test (Cu) Sensitivity (S) △ Field □ Lab
○ Water content (%)
Atterberg limits (%) W_p W_l
● "N" Value (blows / 12 in.-30 cm)



REFERENCE No.: 11226647 ENCLOSURE No.: 4

BOREHOLE No.: MW4-21
ELEVATION: 270.91 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Crown Barrie Developments Inc.
PROJECT: Geotechnical Investigation - Hydrogeological Investigation
LOCATION: 1012 Yonge Street, Barrie, Ontario
DESCRIBED BY: C. Radway CHECKED BY: P. Verma
DATE (START): July 7, 2021 DATE (FINISH): July 8, 2021

LEGEND
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4910426.121 EASTING: 609478.918

Depth Feet	Depth Metres	Elevation (m) BGS 270.91	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
				GROUND SURFACE						
0				TOPSOIL : 325 mm		SS1A		18	--	--
1	0.33	270.58		FILL : SANDY SILT, trace clay, trace rootlets, brown, moist, very loose		SS1B	58	14	0-1-1-1	2
2				occasional organic matter, loose						
3	1.0					SS2	75	13	1-2-3-3	5
4										
5	1.52	269.39		NATIVE : SM-SILTY SAND with gravel, trace clay, light brown, moist, compact		SS3	67	8	2-5-8-15	13
6	2.0			Gravel : 22%, Sand : 52%, Clay : 9%, Silt : 17%						
7				dense						
8						SS4	67	9	16-20-20-22	40
9										
10	3.0									
	3.05	267.86		SP-SAND, some silt, trace gravel, brown, moist, dense		SS5	75	2	10-20-30-40	50
11										
12										
	3.81	267.10		SM-SILTY SAND, trace clay, brown, wet, dense		SS6	75	19	20-22-15-15	37
13	4.0									
14										
15	4.57	266.34		SP-SAND, trace silt and gravel, brown, moist to wet, very dense		SS7		3	10-30-36-58/ 150mm	66
16	5.0									
17										
18						SS8	55	3	17-50/ 150mm	100
19										
20	6.0									
	6.10	264.81		ML-SILT with sand, trace clay and gravel, brown, moist to wet, very dense		SS9	100	21	22-29-50/ 125mm	100
21				Gravel : 4%, Sand : 25%, Clay : 8%, Silt : 63%						
22										
23	7.0									
24										
25										
26	8.0					SS10	75	18	22-29-50/ 125mm	100
27										
28										
29	9.0									
30										
31						SS11	75	21	20-30-50/ 150mm	100
32										

Shear test (Cu) △ Field
Sensitivity (S) ☐ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

m
m

0.31 m
6.72 m
Bentonite
7.01 m
#2 Sand
Screen

File: I:\LOG DATABASE\8-CHAR\11-----\1122---\112266--\112266471122664711226647.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 8/23/21

REFERENCE No.: 11226647 ENCLOSURE No.: 4

BOREHOLE No.: MW4-21
ELEVATION: 270.91 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Crown Barrie Developments Inc.
PROJECT: Geotechnical Investigation - Hydrogeological Investigation
LOCATION: 1012 Yonge Street, Barrie, Ontario
DESCRIBED BY: C. Radway CHECKED BY: P. Verma
DATE (START): July 7, 2021 DATE (FINISH): July 8, 2021

LEGEND

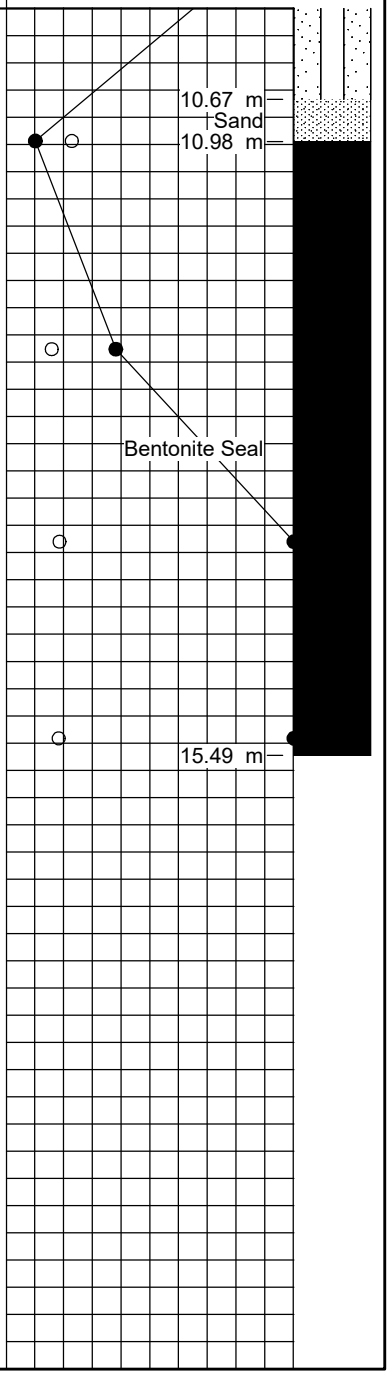
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4910426.121 EASTING: 609478.918

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		270.91		GROUND SURFACE				%		
	11.0			compact		SS12	67	23	2-4-6-12	10
	12.0									
	12.20	258.71		SAND, some silt, trace gravel, brown, wet, dense		SS13	75	16	10-18-20-36	38
	13.0									
	14.0			very dense		SS14	100	18	12-48-50/ 100mm	100
	15.0									
	15.49	255.42				SS15	100	18	35-50/ 100mm	100
	16.0			**END OF BOREHOLE :**						
	17.0			**NOTE :** - End of Borehole at 15.49 m bgs - 50 mm diameter monitoring well installed at 10.67 m bgs - Ground water level found at 3.05 m bgs - Groundwater level found at 6.60 m on Aug 18, 2021 - bgs denotes 'below ground surface'						
	18.0									
	19.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



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REFERENCE No.: 11226647 ENCLOSURE No.: 5

BOREHOLE No.: MW5-21
ELEVATION: 271.09 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Crown Barrie Developments Inc.
PROJECT: Geotechnical Investigation - Hydrogeological Investigation
LOCATION: 1012 Yonge Street, Barrie, Ontario
DESCRIBED BY: C. Radway CHECKED BY: P. Verma
DATE (START): July 6, 2021 DATE (FINISH): July 6, 2021

NORTHING: 4910490.177 EASTING: 609448.749

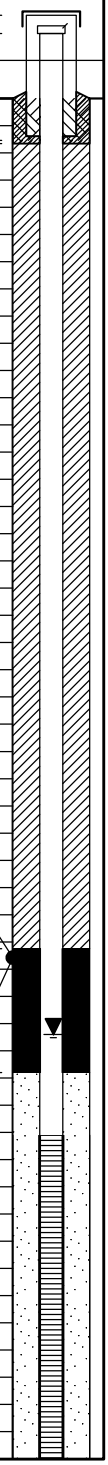
LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS 271.09	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
				GROUND SURFACE						
0				TOPSOIL : 350 mm		SS1A		20	--	--
1	0.35	270.74		FILL :		SS1B	83	17	1-1-1-1	2
2				SANDY SILT, trace gravel, trace rootlets, brown, moist, very loose						
3	1.0			trace clay, loose		SS2	75	34	1-2-3-4	5
4										
5	1.52	269.57		NATIVE :						
6				CL-CLAY with silt, trace sand, brown, moist, firm		SS3	83	30	1-2-4-5	6
7	2.0			Gravel : 0%, Sand : 10%, Clay : 58%, Silt : 32%						
8	2.29	268.80		SILTY SAND TILL, trace gravel, brown, moist, very dense		SS4	83	7	6-24-30-45	54
9										
10	3.0					SS5	92	6	20-38-44-50/ 125mm	82
11										
12										
13	4.0									
14										
15										
16						SS6	83	5	12-18-38-50	56
17	5.0									
18										
19										
20	6.0									
21						SS7	94	16	17-20-50/ 125mm	100
22										
23	7.0									
24										
25	7.62	263.47		SAND, some silt, trace gravel, brown, moist, very dense		SS8	83	18	25-30-35-35	65
26	8.0									
27										
28										
29										
30	9.0			trace silt and clay, wet, dense						
31						SS9	83	12	10-16-25-50/ 125mm	41
32										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



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REFERENCE No.: 11226647 ENCLOSURE No.: 5

BOREHOLE No.: MW5-21
ELEVATION: 271.09 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Crown Barrie Developments Inc.
PROJECT: Geotechnical Investigation - Hydrogeological Investigation
LOCATION: 1012 Yonge Street, Barrie, Ontario
DESCRIBED BY: C. Radway CHECKED BY: P. Verma
DATE (START): July 6, 2021 DATE (FINISH): July 6, 2021

NORTHING: 4910490.177 EASTING: 609448.749

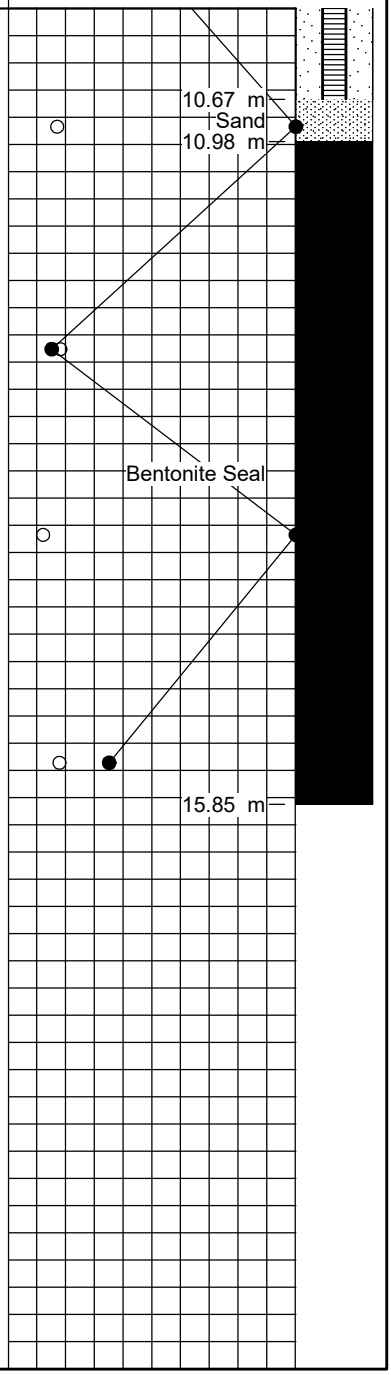
LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		271.09		GROUND SURFACE				%		
	10.67	260.42		SILTY SAND, trace clay, brown, moist, very dense Gravel : 0%, Sand : 91%, Clay : 2%, Silt : 7%		SS10	75	17	15-40-50/ 100mm	100
	12.0			compact		SS11		18	5-7-8-10	15
	14.0			some gravel, very dense		SS12		12	28-50/ 150mm	100
	15.0			dense		SS13		18	10-15-20-21	35
	15.85	255.24		**END OF BOREHOLE :** **NOTE :** - End of Borehole at 15.85 m bgs - 50 mm diameter monitoring well installed at 10.67 m bgs - Ground water level found at 6.40 m bgs - Groundwater level found at 6.88 m on Aug 18, 2021 - bgs denotes 'below ground surface'						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



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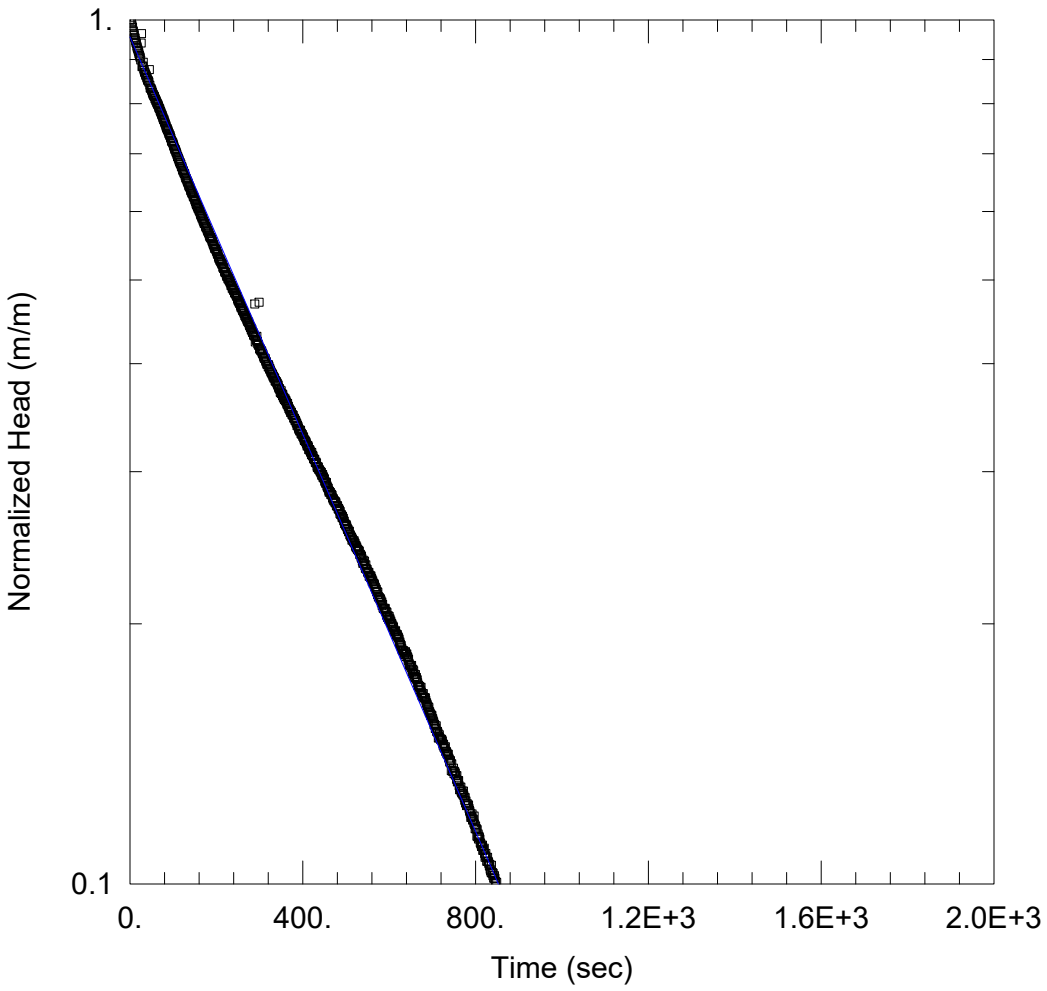
Appendix C

Single Well Response Tests



MW1-21 FALLING HEAD

Data Set: N:\...\MW1-21 FH BR.aqt
Date: 11/08/21 Time: 16:14:57

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW1-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 6.98 m Anisotropy Ratio (Kz/Kr): 1.

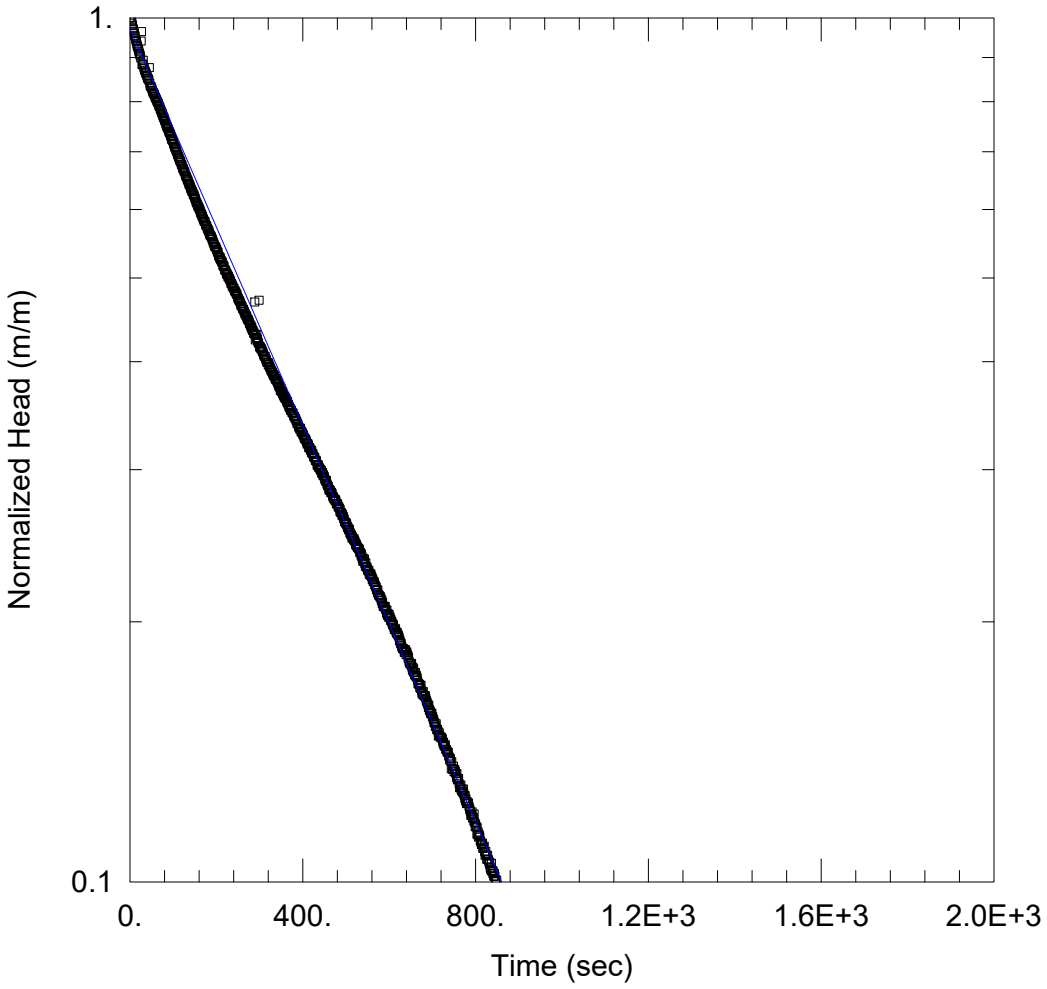
WELL DATA (MW1-21)

Initial Displacement: 0.4481 m
Total Well Penetration Depth: 6.98 m
Casing Radius: 0.025 m
Static Water Column Height: 6.98 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0001148 cm/sec y0 = 0.4282 m



MW1-21 FALLING HEAD

Data Set: N:\...\MW1-21 FH HV.aqt
Date: 11/08/21 Time: 16:15:07

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW1-21
Test Date: July 22, 2021

AQUIFER DATA

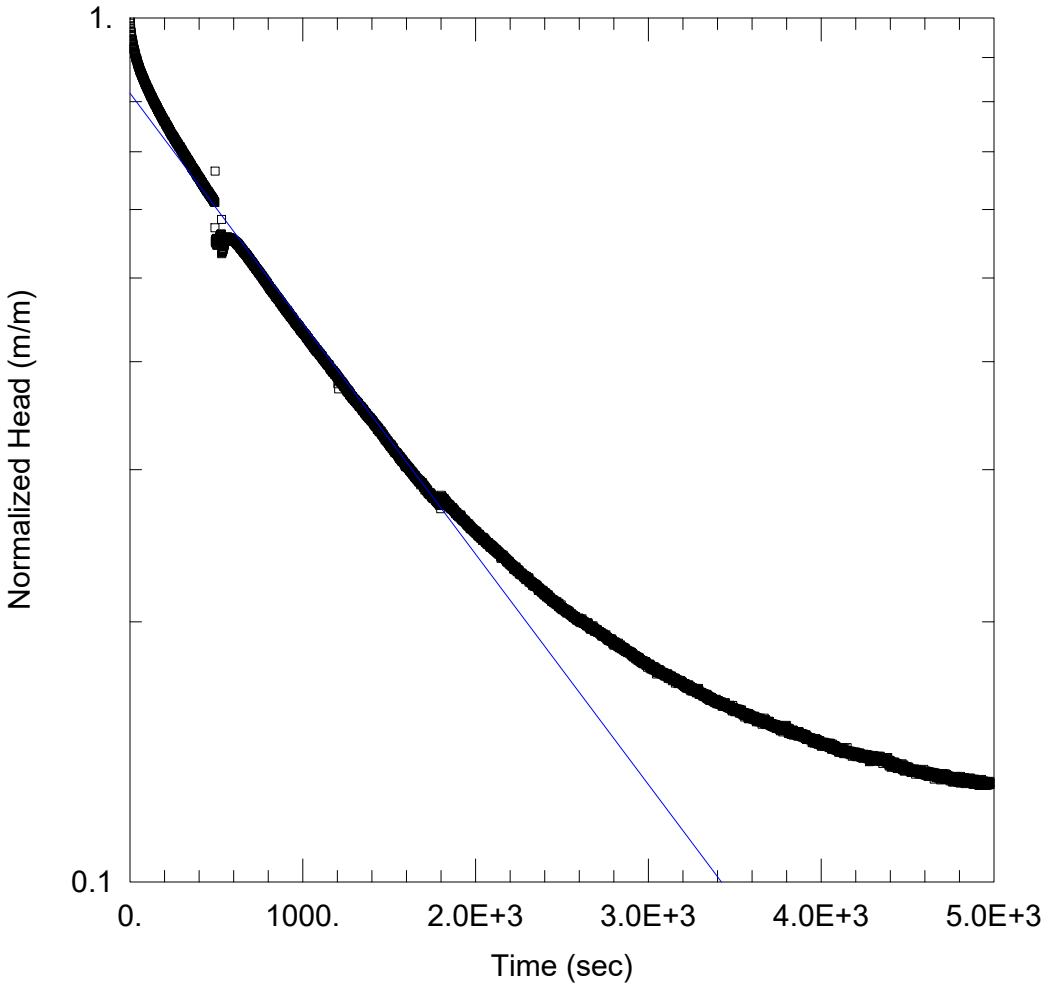
Saturated Thickness: 6.98 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1-21)

Initial Displacement: 0.4481 m
Total Well Penetration Depth: 6.98 m
Casing Radius: 0.025 m
Static Water Column Height: 6.98 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.0001489 cm/sec
y0 = 0.4354 m



MW1-21 RISING HEAD

Data Set: N:\...\MW1-21 RH BR.aqt
Date: 11/08/21 Time: 16:15:23

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW1-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 6.98 m Anisotropy Ratio (Kz/Kr): 1.

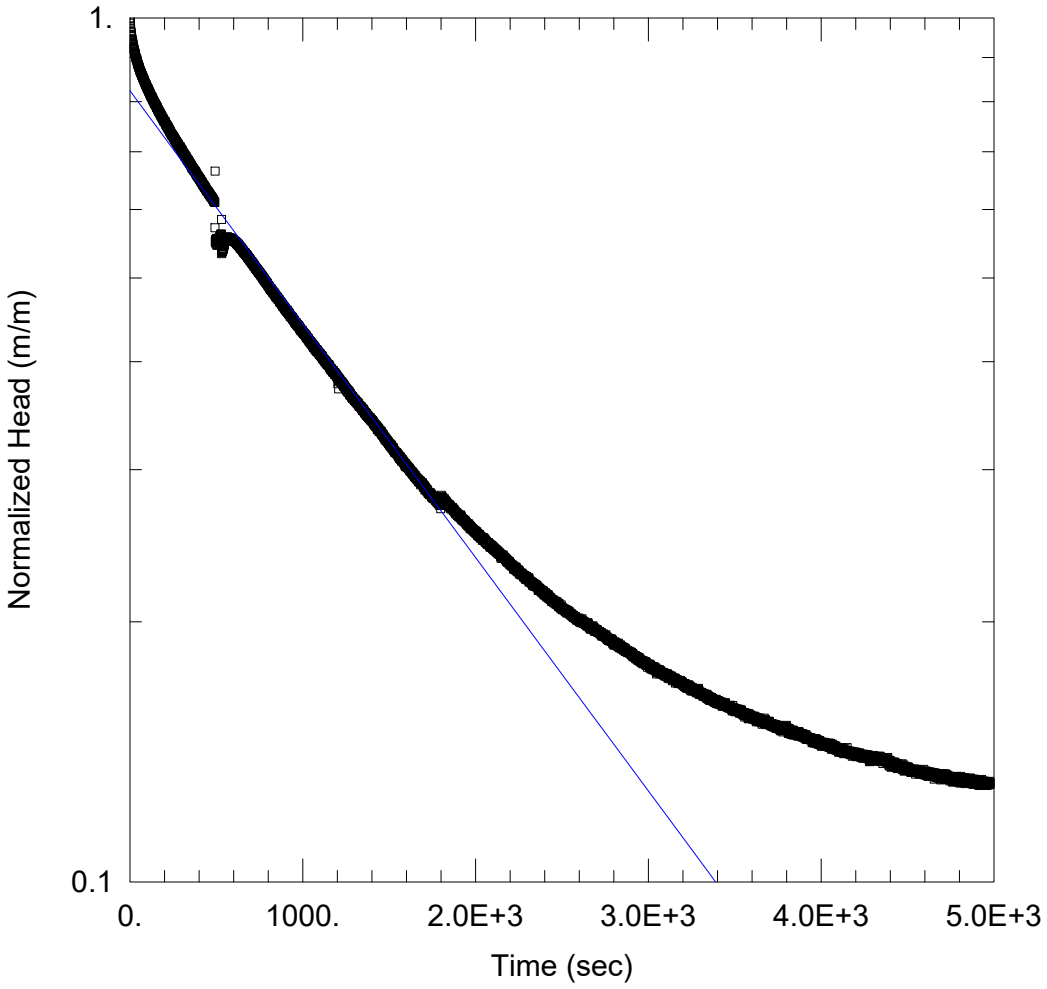
WELL DATA (MW1-21)

Initial Displacement: 0.6424 m
Total Well Penetration Depth: 6.98 m
Casing Radius: 0.025 m
Static Water Column Height: 6.98 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 2.664E-5 cm/sec y0 = 0.5256 m



MW1-21 RISING HEAD

Data Set: N:\...\MW1-21 RH HV.aqt
Date: 11/08/21 Time: 16:15:42

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW1-21
Test Date: July 22, 2021

AQUIFER DATA

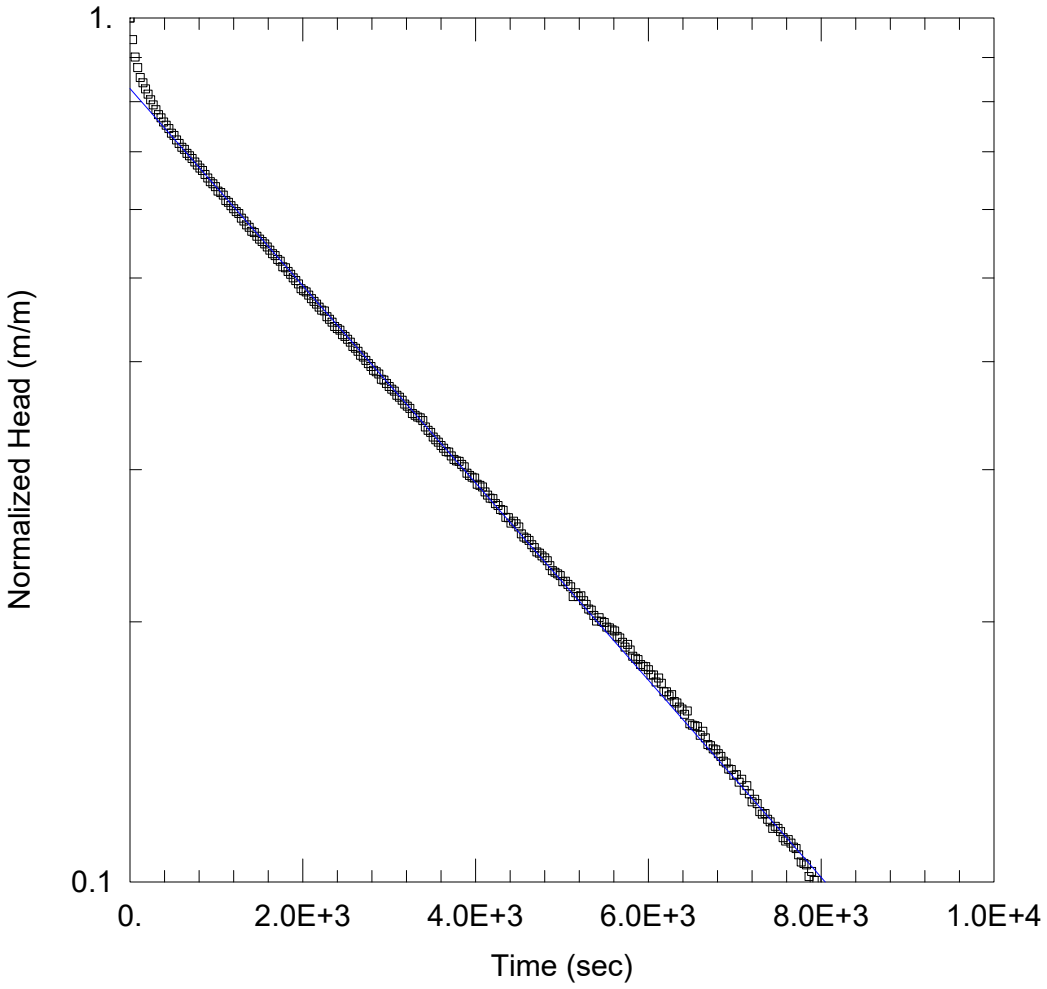
Saturated Thickness: 6.98 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1-21)

Initial Displacement: 0.6424 m
Total Well Penetration Depth: 6.98 m
Casing Radius: 0.025 m
Static Water Column Height: 6.98 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.503E-5 cm/sec
y0 = 0.529 m



MW2-21 FALLING HEAD

Data Set: N:\...\MW2-21 FH BR.aqt
Date: 11/08/21 Time: 16:15:51

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW2-21
Test Date: July 22, 2021

AQUIFER DATA

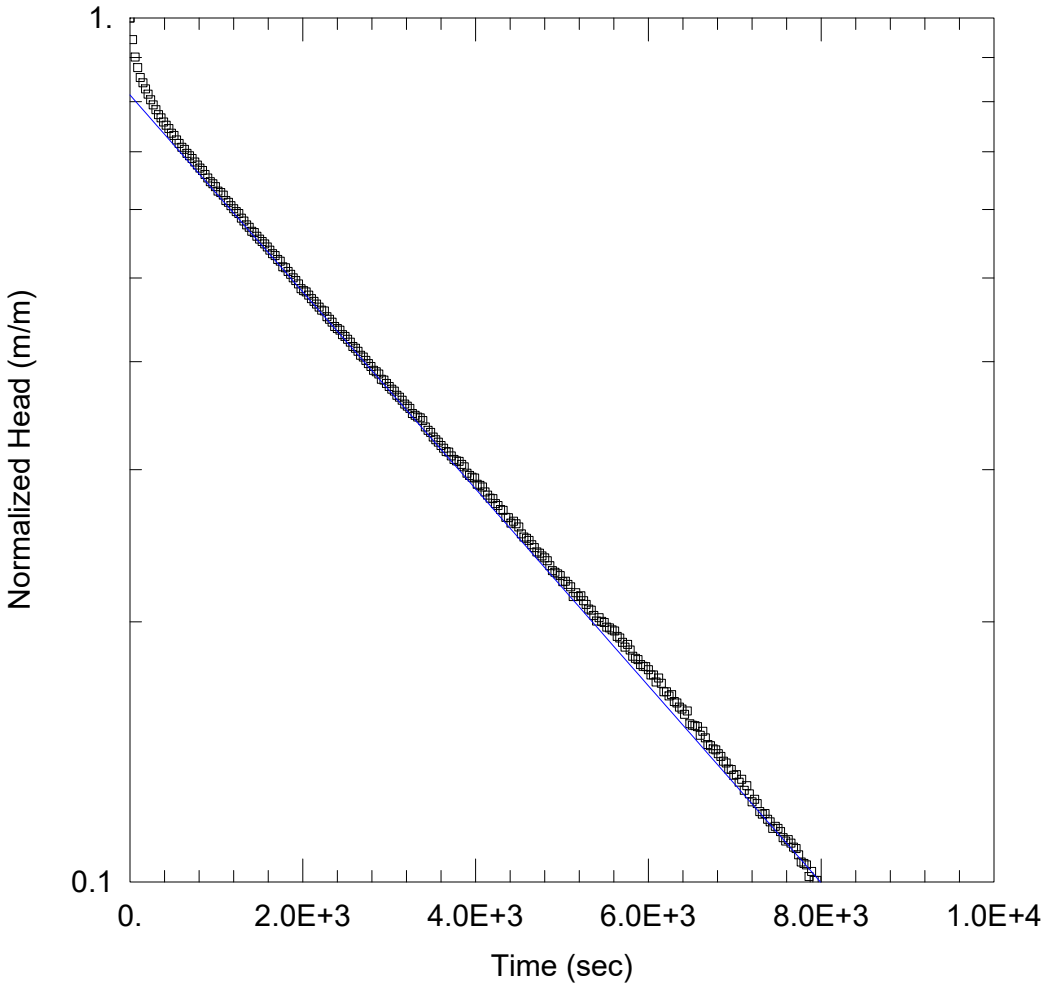
Saturated Thickness: 7.04 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-21)

Initial Displacement: 0.4959 m
Total Well Penetration Depth: 7.04 m
Casing Radius: 0.025 m
Static Water Column Height: 7.04 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.141E-5 cm/sec
y0 = 0.4108 m



MW2-21 FALLING HEAD

Data Set: N:\...\MW2-21 FH HV.aqt
Date: 11/08/21 Time: 16:16:00

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW2-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 7.04 m Anisotropy Ratio (Kz/Kr): 1.

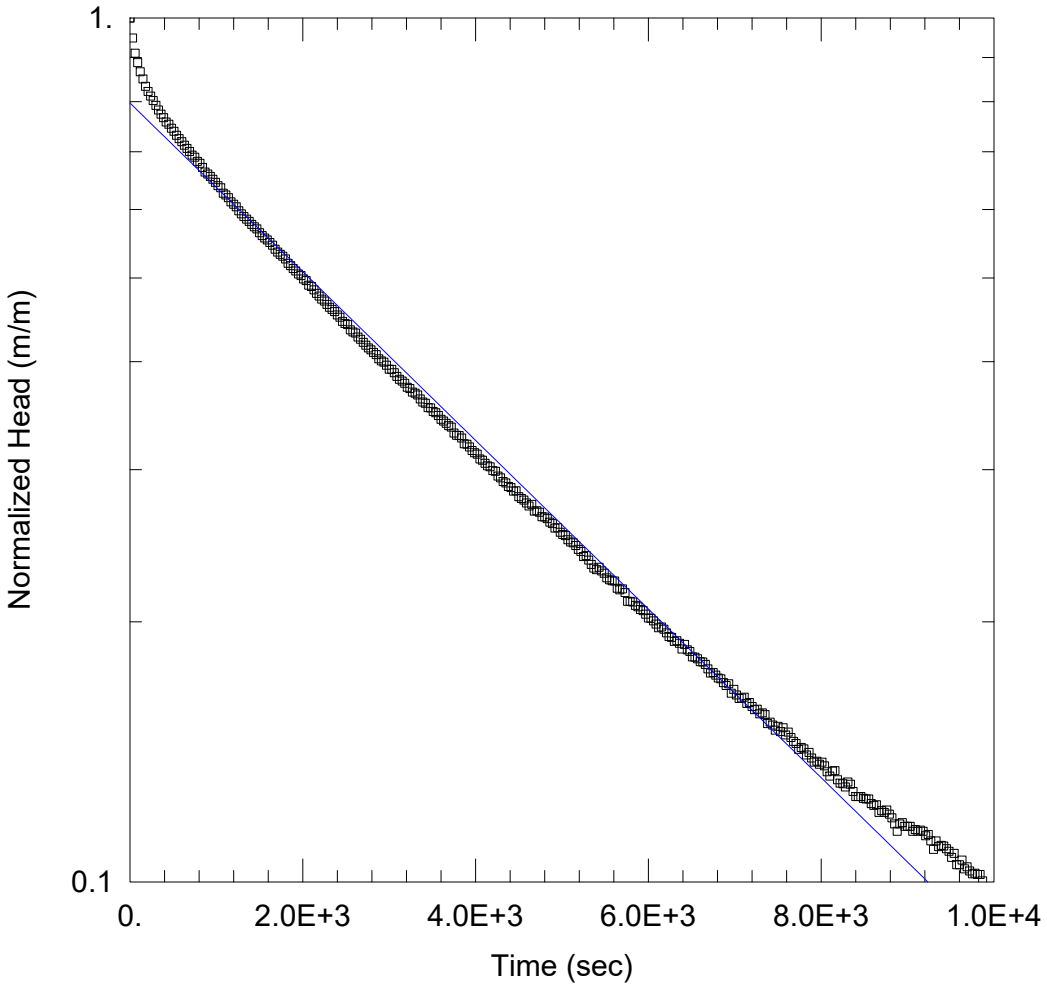
WELL DATA (MW2-21)

Initial Displacement: 0.4959 m
Total Well Penetration Depth: 7.04 m
Casing Radius: 0.025 m
Static Water Column Height: 7.04 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.478E-5 cm/sec y0 = 0.4038 m



MW2-21 RISING HEAD

Data Set: N:\...\MW2-21 RH BR.aqt
Date: 11/08/21 Time: 16:16:09

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW2-21
Test Date: July 22, 2021

AQUIFER DATA

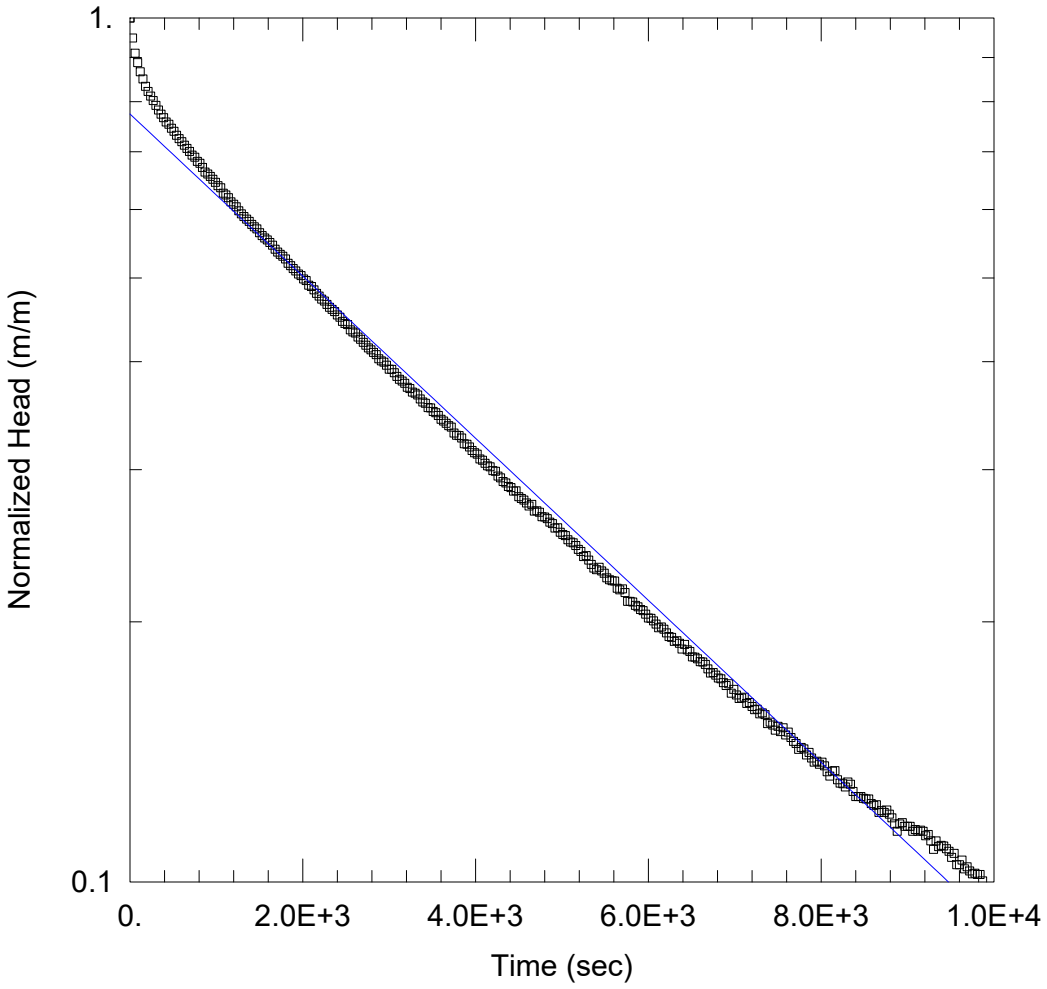
Saturated Thickness: 7.04 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-21)

Initial Displacement: 0.5226 m
Total Well Penetration Depth: 7.04 m
Casing Radius: 0.025 m
Static Water Column Height: 7.04 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 9.761E-6 cm/sec
y0 = 0.4166 m



MW2-21 RISING HEAD

Data Set: N:\...\MW2-21 RH HV.aqt
Date: 11/08/21 Time: 16:16:16

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW2-21
Test Date: July 22, 2021

AQUIFER DATA

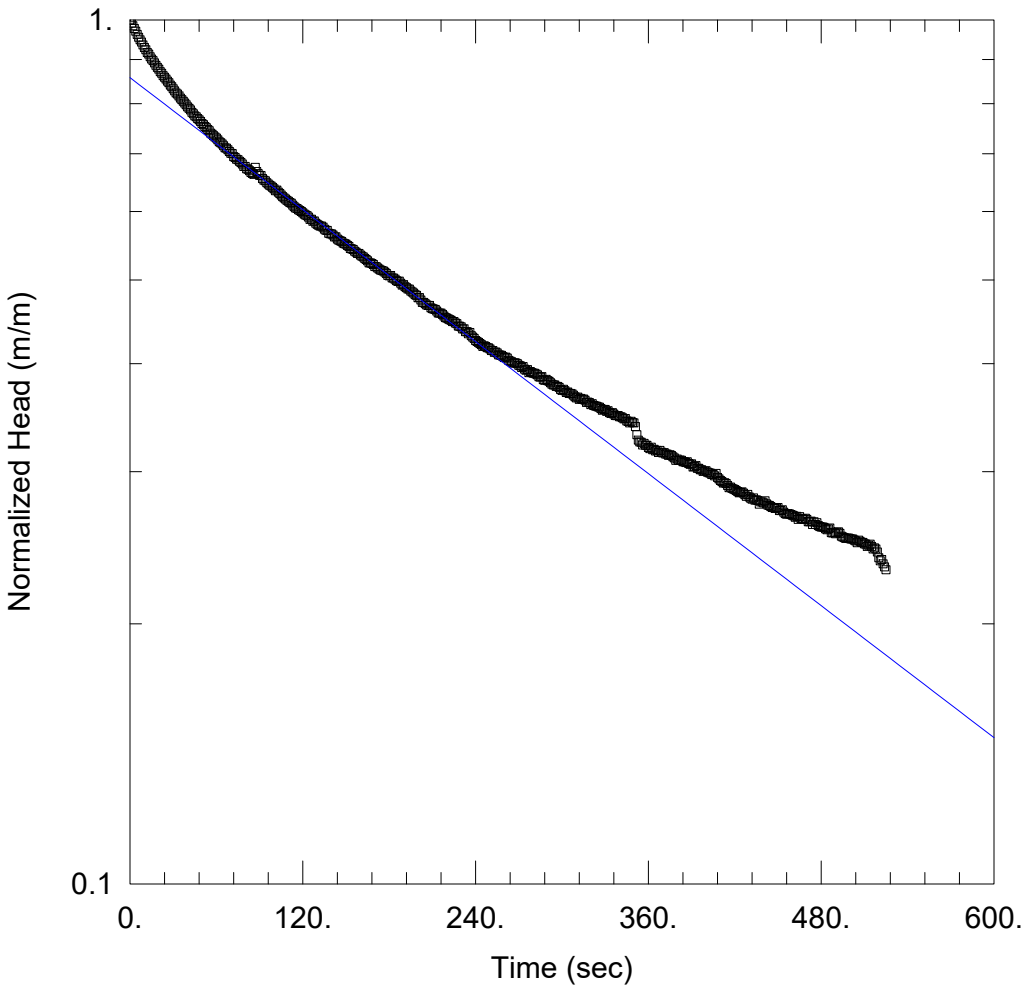
Saturated Thickness: 7.04 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-21)

Initial Displacement: 0.5226 m
Total Well Penetration Depth: 7.04 m
Casing Radius: 0.025 m
Static Water Column Height: 7.04 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.217E-5 cm/sec
y0 = 0.4046 m



MW4-21 FALLING HEAD

Data Set: N:\...\MW4-21 FH BR.aqt
Date: 11/08/21 Time: 16:16:24

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW4-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 3.23 m Anisotropy Ratio (Kz/Kr): 1.

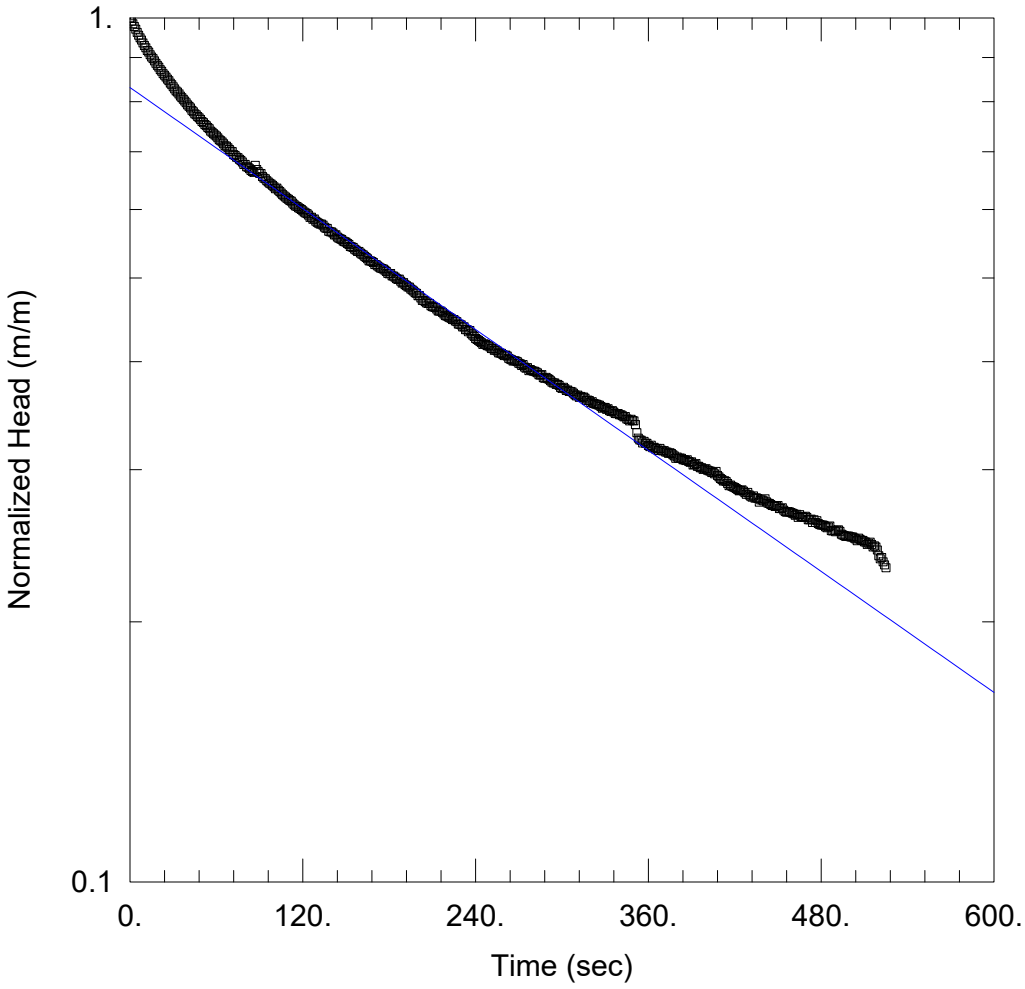
WELL DATA (MW4-21)

Initial Displacement: 0.4129 m
Total Well Penetration Depth: 3.23 m
Casing Radius: 0.025 m
Static Water Column Height: 3.23 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0001124 cm/sec y0 = 0.354 m



MW4-21 FALLING HEAD

Data Set: N:\...\MW4-21 FH HV.aqt
Date: 11/08/21 Time: 16:16:33

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW4-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 3.23 m Anisotropy Ratio (Kz/Kr): 1.

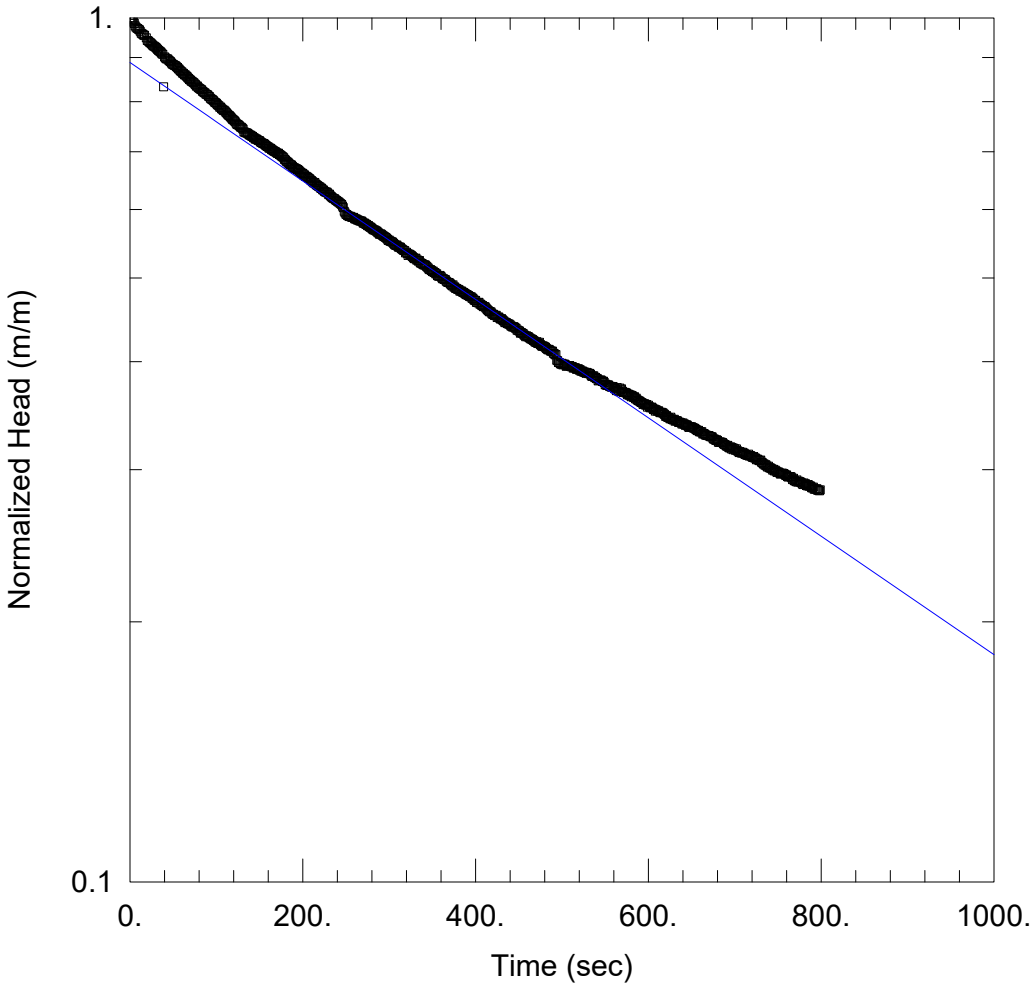
WELL DATA (MW4-21)

Initial Displacement: 0.4129 m
Total Well Penetration Depth: 3.23 m
Casing Radius: 0.025 m
Static Water Column Height: 3.23 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 0.0001513 cm/sec y0 = 0.343 m



MW4-21 RISING HEAD

Data Set: N:\...\MW4-21 RH BR.aqt
Date: 11/08/21 Time: 16:16:41

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW4-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 3.23 m Anisotropy Ratio (Kz/Kr): 1.

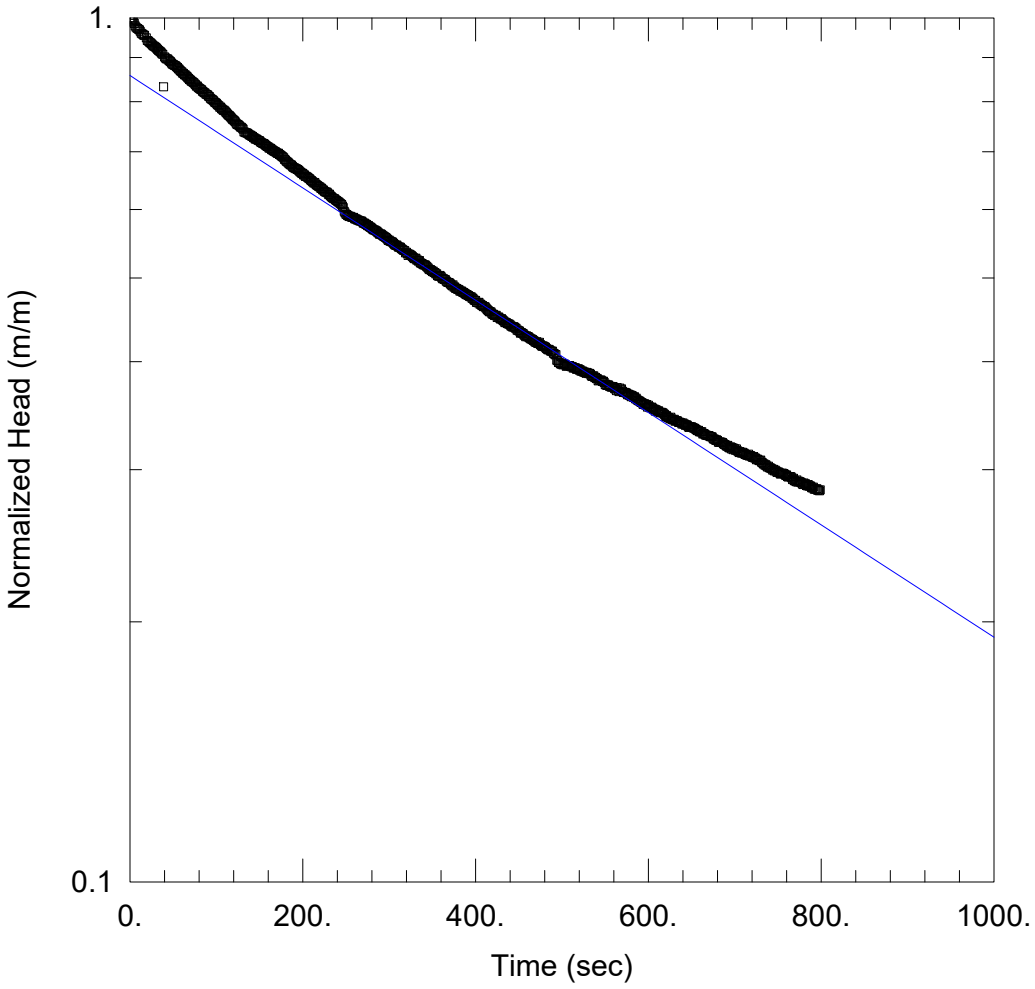
WELL DATA (MW4-21)

Initial Displacement: 0.498 m
Total Well Penetration Depth: 3.23 m
Casing Radius: 0.025 m
Static Water Column Height: 3.23 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 6.051E-5 cm/sec y0 = 0.4422 m



MW4-21 RISING HEAD

Data Set: N:\...\MW4-21 RH HV.aqt
Date: 11/08/21 Time: 16:16:51

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW4-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 3.23 m Anisotropy Ratio (Kz/Kr): 1.

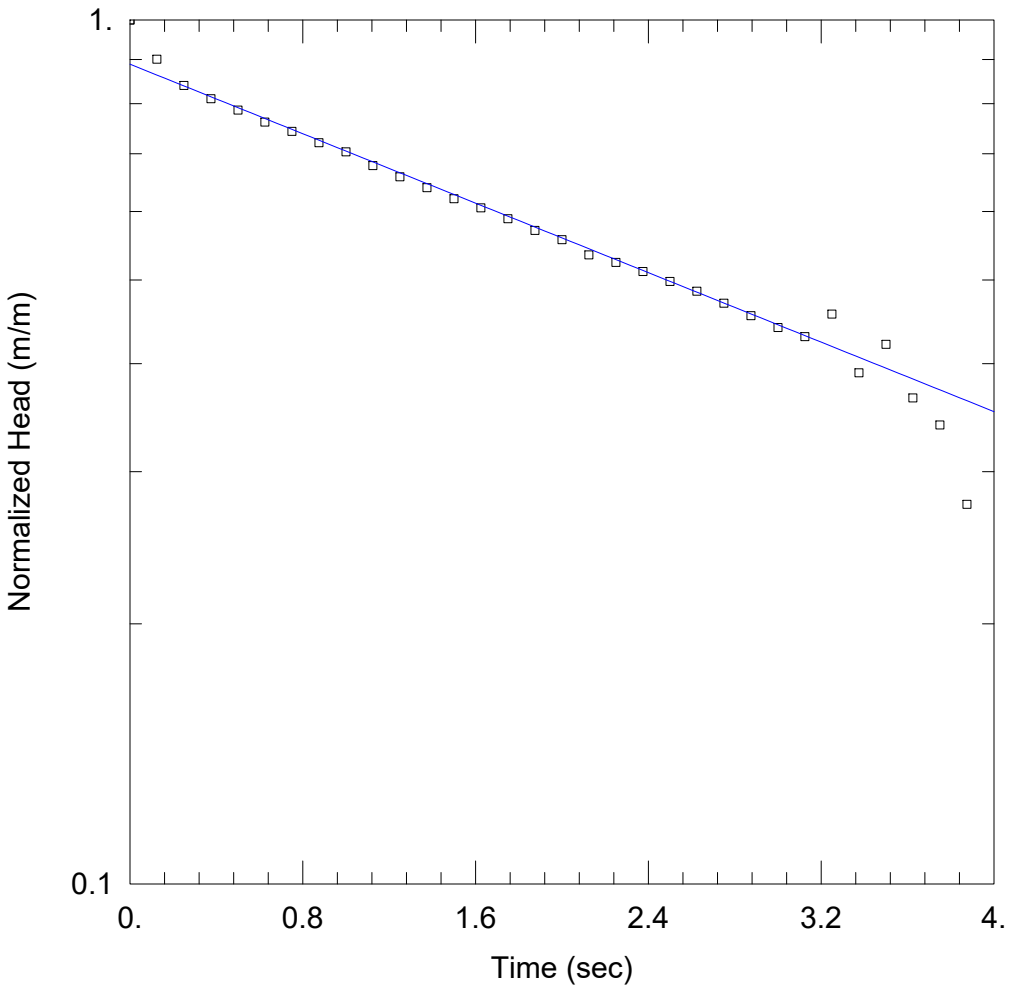
WELL DATA (MW4-21)

Initial Displacement: 0.498 m
Total Well Penetration Depth: 3.23 m
Casing Radius: 0.025 m
Static Water Column Height: 3.23 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 8.431E-5 cm/sec y0 = 0.4271 m



MW5-21 FALLING HEAD

Data Set: N:\...\MW5-21 FH BR.aqt
Date: 11/08/21 Time: 16:16:59

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW5-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 3.45 m Anisotropy Ratio (Kz/Kr): 1.

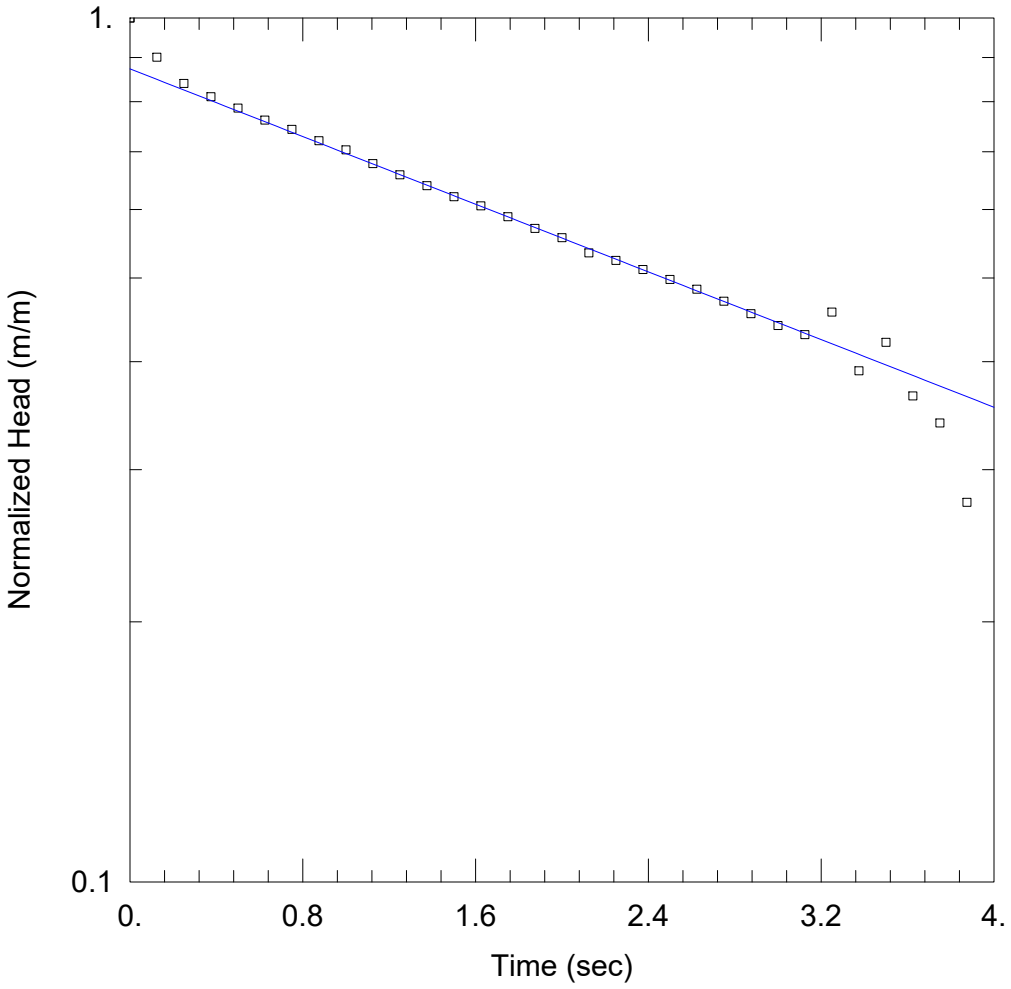
WELL DATA (MW5-21)

Initial Displacement: 0.1498 m
Total Well Penetration Depth: 3.45 m
Casing Radius: 0.025 m
Static Water Column Height: 3.45 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008977 cm/sec y0 = 0.1331 m



MW5-21 FALLING HEAD

Data Set: N:\...\MW5-21 FH HV.aqt
Date: 11/08/21 Time: 16:17:16

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW5-21
Test Date: July 22, 2021

AQUIFER DATA

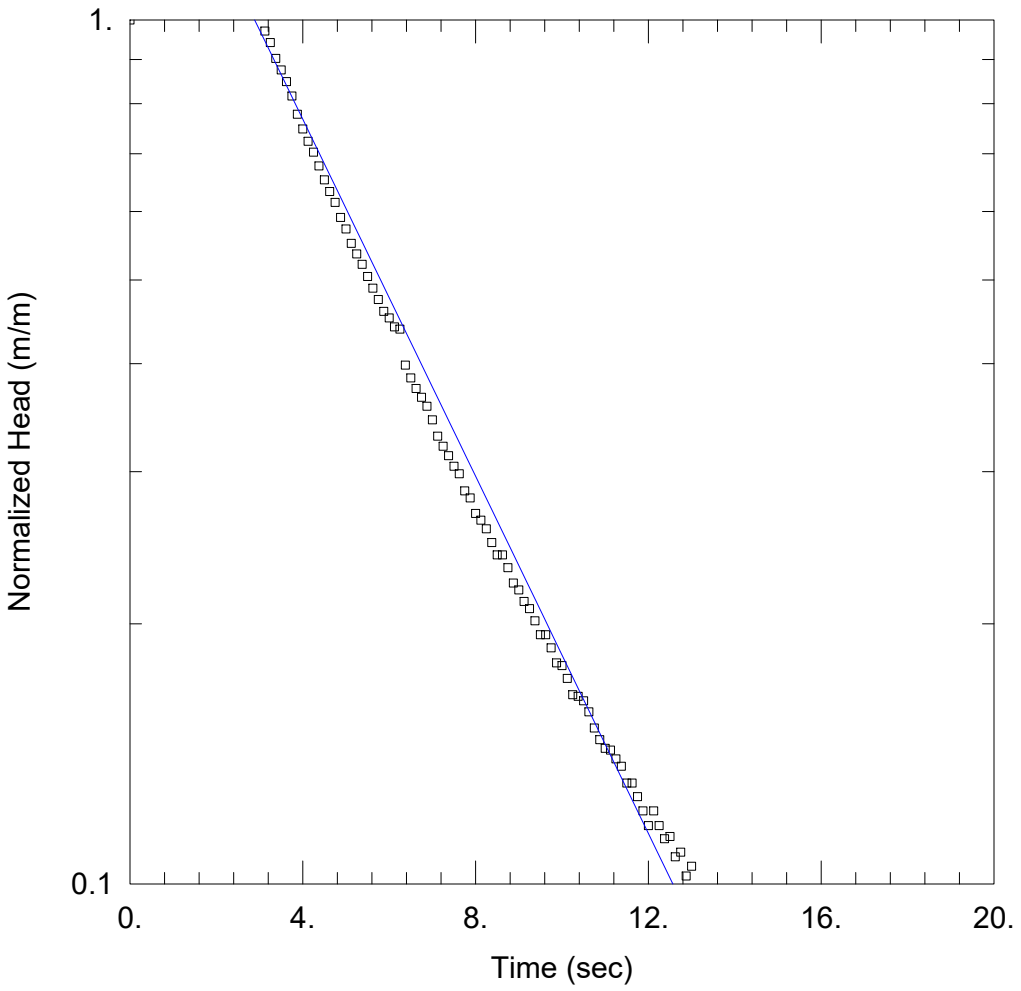
Saturated Thickness: 3.45 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5-21)

Initial Displacement: 0.1498 m
Total Well Penetration Depth: 3.45 m
Casing Radius: 0.025 m
Static Water Column Height: 3.45 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.0111 cm/sec
y0 = 0.1308 m



MW5-21 RISING HEAD

Data Set: N:\...\MW5-21 RH BR.aqt
Date: 11/08/21 Time: 16:17:25

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW5-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 3.45 m Anisotropy Ratio (Kz/Kr): 1.

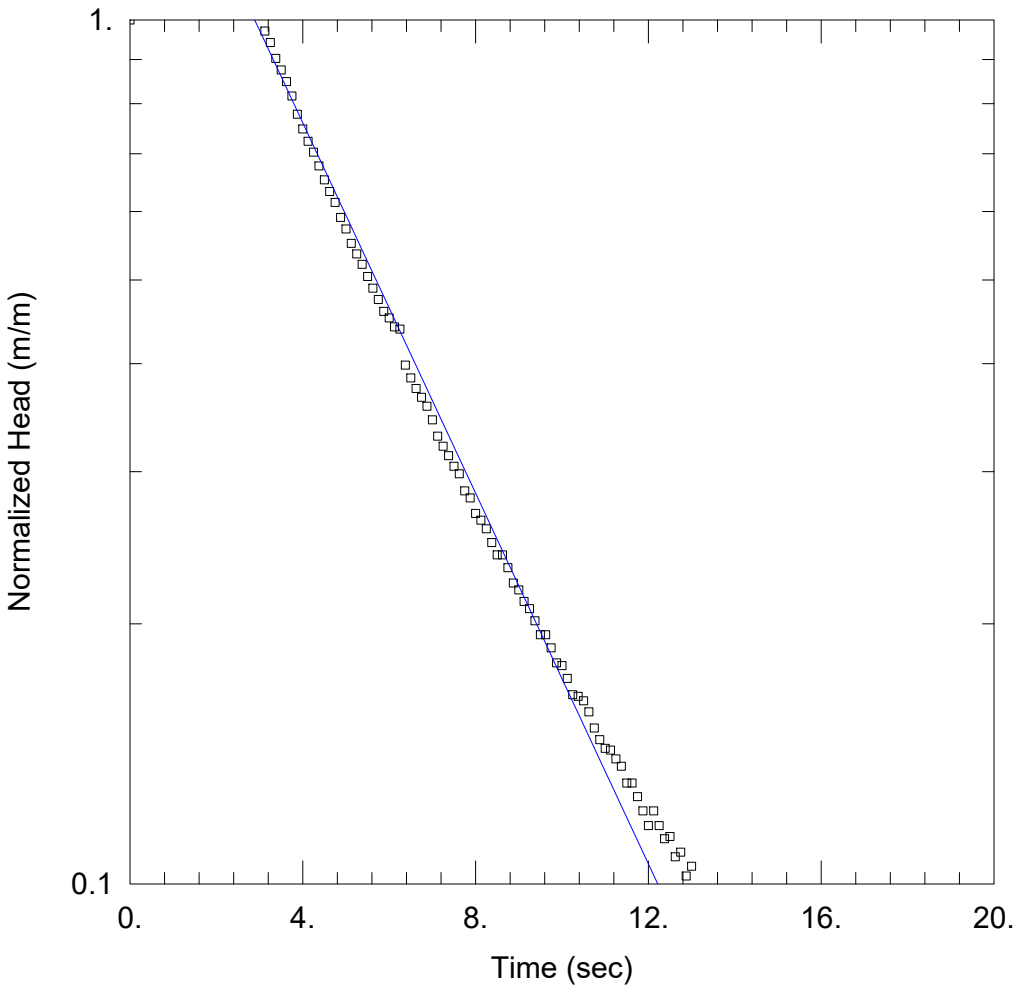
WELL DATA (MW5-21)

Initial Displacement: 0.1498 m
Total Well Penetration Depth: 3.45 m
Casing Radius: 0.025 m
Static Water Column Height: 3.45 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.009224 cm/sec y0 = 0.2976 m



MW5-21 RISING HEAD

Data Set: N:\...\MW5-21 RH HV.aqt
Date: 11/08/21 Time: 16:17:35

PROJECT INFORMATION

Company: GHD Limited
Project: 11226647
Location: 1012 Yonge Street, Barrie, ON
Test Well: MW5-21
Test Date: July 22, 2021

AQUIFER DATA

Saturated Thickness: 3.45 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW5-21)

Initial Displacement: 0.1498 m
Total Well Penetration Depth: 3.45 m
Casing Radius: 0.025 m
Static Water Column Height: 3.45 m
Screen Length: 3.05 m
Well Radius: 0.025 m
Gravel Pack Porosity: 0.3

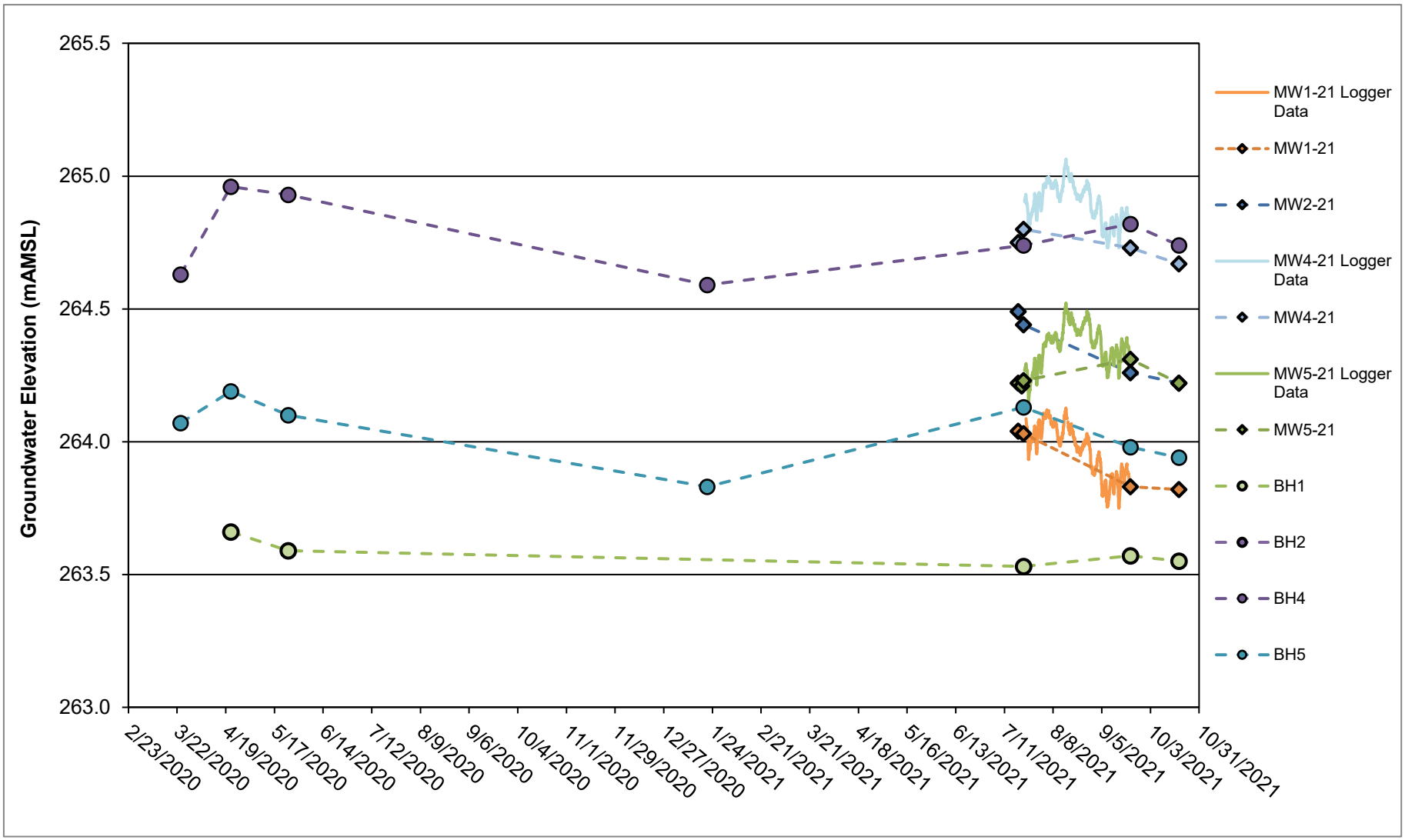
SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 0.01215 cm/sec y0 = 0.3055 m

Appendix D

Hydrographs



APPENDIX D1
GROUNDWATER ELEVATION HYDROGRAPH
HYDROGEOLOGICAL ASSESSMENT
1012 YONGE STREET, BARRIE, ON
CROWN BARRIE DEVELOPMENTS INC

Appendix E

Laboratory Certificates

Your P.O. #: 73524358
Your Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your C.O.C. #: 835837-01-01

Attention: 11226647-PO-73524358

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2021/07/28
Report #: R6740811
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K4167
Received: 2021/07/21, 15:57

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2021/07/23	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	1	N/A	2021/07/26	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	1	N/A	2021/07/23	CAM SOP-00463	SM 23 4500-Cl E m
Colour	1	N/A	2021/07/23	CAM SOP-00412	SM 23 2120C m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2021/07/23	CAM SOP-00446	SM 23 5310 B m
Fluoride	1	2021/07/22	2021/07/23	CAM SOP-00449	SM 23 4500-F C m
Hardness (calculated as CaCO3)	1	N/A	2021/07/26	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	1	N/A	2021/07/23	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2021/07/27	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	1	N/A	2021/07/26		
Total Ammonia-N	1	N/A	2021/07/26	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	1	N/A	2021/07/27	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Organic Nitrogen	1	N/A	2021/07/26	Auto Calc.	
pH	1	2021/07/22	2021/07/23	CAM SOP-00413	SM 4500H+ B m
Field Measured pH (3)	1	N/A	2021/07/22		Field pH Meter
Orthophosphate	1	N/A	2021/07/23	CAM SOP-00461	EPA 365.1 m
Sulphate by Automated Colourimetry	1	N/A	2021/07/23	CAM SOP-00464	EPA 375.4 m
Sulphide	1	N/A	2021/07/22	CAM SOP-00455	SM 23 4500-S G m
Total Dissolved Solids	1	2021/07/26	2021/07/27	CAM SOP-00428	SM 23 2540C m
Field Temperature (3)	1	N/A	2021/07/22		Field Thermometer
Total Kjeldahl Nitrogen in Water	1	2021/07/22	2021/07/23	CAM SOP-00938	OMOE E3516 m
Total Nitrogen (calculated)	1	N/A	2021/07/27	Auto Calc.	
Total Phosphorus (Colourimetric)	1	2021/07/26	2021/07/26	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids	1	2021/07/26	2021/07/27	CAM SOP-00428	SM 23 2540D m
Turbidity	1	N/A	2021/07/23	CAM SOP-00417	SM 23 2130 B m
Un-ionized Ammonia	1	2021/07/21	2021/07/27	Auto Calc.	PWQO

Remarks:

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

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

Your P.O. #: 73524358
Your Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your C.O.C. #: 835837-01-01

Attention: 11226647-PO-73524358

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2021/07/28
Report #: R6740811
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K4167
Received: 2021/07/21, 15:57

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

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas 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 Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas 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 Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) 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.
(3) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas Laboratories.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Julie Clement, Technical Account Manager
Email: Julie.CLEMENT@bureauveritas.com
Phone# (613)868-6079
==========
This report has been generated and distributed using a secure automated process.
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: C1K4167
Report Date: 2021/07/28

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

RESULTS OF ANALYSES OF WATER

BV Labs ID		QDW995			QDW995		
Sampling Date		2021/07/21 13:00			2021/07/21 13:00		
COC Number		835837-01-01			835837-01-01		
	UNITS	GW-11226647-072121 -DB-MW5	RDL	QC Batch	GW-11226647-072121 -DB-MW5 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	290	1.0	7475237			
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.9	1.0	7475237			
Hardness (CaCO3)	mg/L	300	1.0	7475159			
Hydrox. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	7475237			
Ion Balance (% Difference)	%	0.890	N/A	7475067			
Total Nitrogen (N)	mg/L	3.8	0.10	7475246			
Total Organic Nitrogen	mg/L	0.15	0.10	7474932			
Total Un-ionized Ammonia	mg/L	<0.00061	0.00061	7474929			
Field Measurements							
Field Temperature	Celsius	17.12	N/A	ONSITE			
Field Measured pH	pH	7.36		ONSITE			
Inorganics							
Total Ammonia-N	mg/L	<0.050	0.050	7478257			
Colour	TCU	<2	2	7477697			
Total Dissolved Solids	mg/L	330	10	7483659			
Fluoride (F-)	mg/L	0.12	0.10	7479051	<0.10	0.10	7479051
Total Kjeldahl Nitrogen (TKN)	mg/L	0.15	0.10	7478294			
Dissolved Organic Carbon	mg/L	1.3	0.40	7479893			
Orthophosphate (P)	mg/L	<0.050 (1)	0.050	7480337			
pH	pH	7.85		7479106	7.87		7479106
Total Phosphorus	mg/L	0.015	0.004	7482875			
Total Suspended Solids	mg/L	28	1	7481890			
Dissolved Sulphate (SO4)	mg/L	21	1.0	7480369			
Sulphide	mg/L	<0.020	0.020	7477829			
Turbidity	NTU	28	0.1	7478488			
Alkalinity (Total as CaCO3)	mg/L	290	1.0	7479080	290	1.0	7479080
Dissolved Chloride (Cl-)	mg/L	8.1	1.0	7480368			
Nitrite (N)	mg/L	0.022	0.010	7478544			
Nitrate (N)	mg/L	3.64	0.10	7478544			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

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

BV Labs Job #: C1K4167
Report Date: 2021/07/28

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

RESULTS OF ANALYSES OF WATER

BV Labs ID		QDW995			QDW995		
Sampling Date		2021/07/21 13:00			2021/07/21 13:00		
COC Number		835837-01-01			835837-01-01		
	UNITS	**GW-11226647-072121 -DB-MW5**	**RDL**	**QC Batch**	**GW-11226647-072121 -DB-MW5 Lab-Dup**	**RDL**	**QC Batch**
Nitrate + Nitrite (N)	mg/L	3.66	0.10	7478544			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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BV Labs Job #: C1K4167
Report Date: 2021/07/28

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

BV Labs ID		QDW995		
Sampling Date		2021/07/21 13:00		
COC Number		835837-01-01		
	UNITS	GW-11226647-072121 -DB-MW5	RDL	QC Batch
Metals				
Total Aluminum (Al)	ug/L	340	4.9	7484925
Total Antimony (Sb)	ug/L	<0.50	0.50	7484925
Total Arsenic (As)	ug/L	<1.0	1.0	7484925
Total Barium (Ba)	ug/L	50	2.0	7484925
Total Beryllium (Be)	ug/L	<0.40	0.40	7484925
Total Boron (B)	ug/L	26	10	7484925
Total Cadmium (Cd)	ug/L	<0.090	0.090	7484925
Dissolved Calcium (Ca)	ug/L	100000	200	7479621
Total Chromium (Cr)	ug/L	<5.0	5.0	7484925
Total Cobalt (Co)	ug/L	1.2	0.50	7484925
Total Copper (Cu)	ug/L	1.5	0.90	7484925
Total Iron (Fe)	ug/L	430	100	7484925
Total Lead (Pb)	ug/L	<0.50	0.50	7484925
Dissolved Magnesium (Mg)	ug/L	11000	50	7479621
Total Manganese (Mn)	ug/L	140	2.0	7484925
Total Molybdenum (Mo)	ug/L	7.6	0.50	7484925
Total Nickel (Ni)	ug/L	1.9	1.0	7484925
Dissolved Potassium (K)	ug/L	1600	200	7479621
Total Selenium (Se)	ug/L	<2.0	2.0	7484925
Total Silver (Ag)	ug/L	<0.090	0.090	7484925
Dissolved Sodium (Na)	ug/L	14000	100	7479621
Total Sodium (Na)	ug/L	14000	100	7484925
Total Thallium (Tl)	ug/L	<0.050	0.050	7484925
Total Tungsten (W)	ug/L	<1.0	1.0	7484925
Total Uranium (U)	ug/L	0.78	0.10	7484925
Total Vanadium (V)	ug/L	1.1	0.50	7484925
Total Zinc (Zn)	ug/L	<5.0	5.0	7484925
Total Zirconium (Zr)	ug/L	<1.0	1.0	7484925

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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BV Labs Job #: C1K4167
Report Date: 2021/07/28

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

TEST SUMMARY

BV Labs ID: QDW995
Sample ID: GW-11226647-072121-DB-MW5
Matrix: Water

Collected: 2021/07/21
Shipped:
Received: 2021/07/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7479080	N/A	2021/07/23	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	7475237	N/A	2021/07/26	Automated Statchk
Chloride by Automated Colourimetry	KONE	7480368	N/A	2021/07/23	Avneet Kour Sudan
Colour	SPEC	7477697	N/A	2021/07/23	Viorica Rotaru
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7479893	N/A	2021/07/23	Nimarta Singh
Fluoride	ISE	7479051	2021/07/22	2021/07/23	Surinder Rai
Hardness (calculated as CaCO3)		7475159	N/A	2021/07/26	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	7479621	N/A	2021/07/23	Nan Raykha
Total Metals Analysis by ICPMS	ICP/MS	7484925	N/A	2021/07/27	Azita Fazaeli
Ion Balance (% Difference)	CALC	7475067	N/A	2021/07/26	Automated Statchk
Total Ammonia-N	LACH/NH4	7478257	N/A	2021/07/26	Amanpreet Sappal
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	7478544	N/A	2021/07/27	Chandra Nandlal
Organic Nitrogen	CALC	7474932	N/A	2021/07/26	Automated Statchk
pH	AT	7479106	2021/07/22	2021/07/23	Surinder Rai
Field Measured pH	PH	ONSITE	N/A	2021/07/22	Julie Clement
Orthophosphate	KONE	7480337	N/A	2021/07/23	Avneet Kour Sudan
Sulphate by Automated Colourimetry	KONE	7480369	N/A	2021/07/23	Avneet Kour Sudan
Sulphide	ISE/S	7477829	N/A	2021/07/22	Neil Dassanayake
Total Dissolved Solids	BAL	7483659	2021/07/26	2021/07/27	Shivani Desai
Field Measured pH	PH	ONSITE	N/A	2021/07/22	Julie Clement
Total Kjeldahl Nitrogen in Water	SKAL	7478294	2021/07/22	2021/07/23	Massarat Jan
Total Nitrogen (calculated)	CALC	7475246	N/A	2021/07/27	Automated Statchk
Total Phosphorus (Colourimetric)	LACH/P	7482875	2021/07/26	2021/07/26	Shivani Shivani
Low Level Total Suspended Solids	BAL	7481890	2021/07/26	2021/07/27	Sandeep Kaur
Turbidity	AT	7478488	N/A	2021/07/23	Neil Dassanayake
Un-ionized Ammonia	CALC/NH3	7474929	2021/07/27	2021/07/27	Automated Statchk

BV Labs ID: QDW995 Dup
Sample ID: GW-11226647-072121-DB-MW5
Matrix: Water

Collected: 2021/07/21
Shipped:
Received: 2021/07/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7479080	N/A	2021/07/23	Surinder Rai
Fluoride	ISE	7479051	2021/07/22	2021/07/23	Surinder Rai
pH	AT	7479106	2021/07/22	2021/07/23	Surinder Rai

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BV Labs Job #: C1K4167
Report Date: 2021/07/28

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

GENERAL COMMENTS

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

Package 1	10.7°C

Results relate only to the items tested.

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BV Labs Job #: C1K4167
Report Date: 2021/07/28

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7477697	Colour	2021/07/23			99	80 - 120	<2	TCU	1.8 (1)	25		
7477829	Sulphide	2021/07/22	99	80 - 120	100	80 - 120	<0.020	mg/L	7.7 (1)	20		
7478257	Total Ammonia-N	2021/07/26	102	75 - 125	99	80 - 120	<0.050	mg/L	15 (1)	20		
7478294	Total Kjeldahl Nitrogen (TKN)	2021/07/23	97	80 - 120	101	80 - 120	<0.10	mg/L	1.7 (1)	20	101	80 - 120
7478488	Turbidity	2021/07/23			100	85 - 115	<0.1	NTU	NC (1)	20		
7478544	Nitrate (N)	2021/07/27	96	80 - 120	98	80 - 120	<0.10	mg/L	NC (1)	20		
7478544	Nitrite (N)	2021/07/27	107	80 - 120	108	80 - 120	<0.010	mg/L	NC (1)	20		
7479051	Fluoride (F-)	2021/07/23	94 (2)	80 - 120	98	80 - 120	<0.10	mg/L	18 (3)	20		
7479080	Alkalinity (Total as CaCO3)	2021/07/23			97	85 - 115	<1.0	mg/L	0.52 (3)	20		
7479106	pH	2021/07/23			102	98 - 103			0.21 (3)	N/A		
7479621	Dissolved Calcium (Ca)	2021/07/23	NC	80 - 120	93	80 - 120	<200	ug/L	3.3 (1)	20		
7479621	Dissolved Magnesium (Mg)	2021/07/23	95	80 - 120	98	80 - 120	<50	ug/L	0.12 (1)	20		
7479621	Dissolved Potassium (K)	2021/07/23	97	80 - 120	94	80 - 120	<200	ug/L				
7479621	Dissolved Sodium (Na)	2021/07/23	NC	80 - 120	96	80 - 120	<100	ug/L				
7479893	Dissolved Organic Carbon	2021/07/23	97	80 - 120	98	80 - 120	<0.40	mg/L	9.4 (1)	20		
7480337	Orthophosphate (P)	2021/07/23	102	75 - 125	99	80 - 120	<0.010	mg/L	NC (1)	25		
7480368	Dissolved Chloride (Cl-)	2021/07/23	111	80 - 120	104	80 - 120	<1.0	mg/L	1.2 (1)	20		
7480369	Dissolved Sulphate (SO4)	2021/07/23	109	75 - 125	102	80 - 120	<1.0	mg/L	4.3 (1)	20		
7481890	Total Suspended Solids	2021/07/27					<1	mg/L	0 (1)	25	97	85 - 115
7482875	Total Phosphorus	2021/07/26	97	80 - 120	102	80 - 120	<0.004	mg/L	9.9 (1)	20	100	80 - 120
7483659	Total Dissolved Solids	2021/07/27					<10	mg/L	4.8 (1)	25	97	90 - 110
7484925	Total Aluminum (Al)	2021/07/28	95	80 - 120	96	80 - 120	<4.9	ug/L	1.9 (1)	20		
7484925	Total Antimony (Sb)	2021/07/28	102	80 - 120	101	80 - 120	<0.50	ug/L	1.2 (1)	20		
7484925	Total Arsenic (As)	2021/07/28	NC	80 - 120	96	80 - 120	<1.0	ug/L	0.19 (1)	20		
7484925	Total Barium (Ba)	2021/07/28	97	80 - 120	96	80 - 120	<2.0	ug/L	1.0 (1)	20		
7484925	Total Beryllium (Be)	2021/07/28	103	80 - 120	105	80 - 120	<0.40	ug/L	NC (1)	20		
7484925	Total Boron (B)	2021/07/28	94	80 - 120	95	80 - 120	<10	ug/L	1.8 (1)	20		
7484925	Total Cadmium (Cd)	2021/07/28	99	80 - 120	98	80 - 120	<0.090	ug/L	NC (1)	20		
7484925	Total Chromium (Cr)	2021/07/28	93	80 - 120	92	80 - 120	<5.0	ug/L	NC (1)	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7484925	Total Cobalt (Co)	2021/07/28	98	80 - 120	98	80 - 120	<0.50	ug/L	1.4 (1)	20		
7484925	Total Copper (Cu)	2021/07/28	97	80 - 120	98	80 - 120	<0.90	ug/L	12 (1)	20		
7484925	Total Iron (Fe)	2021/07/28	94	80 - 120	96	80 - 120	<100	ug/L	NC (1)	20		
7484925	Total Lead (Pb)	2021/07/28	95	80 - 120	96	80 - 120	<0.50	ug/L	NC (1)	20		
7484925	Total Manganese (Mn)	2021/07/28	96	80 - 120	97	80 - 120	<2.0	ug/L	2.0 (1)	20		
7484925	Total Molybdenum (Mo)	2021/07/28	97	80 - 120	97	80 - 120	<0.50	ug/L	5.1 (1)	20		
7484925	Total Nickel (Ni)	2021/07/28	94	80 - 120	95	80 - 120	<1.0	ug/L	0.64 (1)	20		
7484925	Total Selenium (Se)	2021/07/28	101	80 - 120	102	80 - 120	<2.0	ug/L	NC (1)	20		
7484925	Total Silver (Ag)	2021/07/28	98	80 - 120	97	80 - 120	<0.090	ug/L	NC (1)	20		
7484925	Total Sodium (Na)	2021/07/28	94	80 - 120	95	80 - 120	<100	ug/L	1.3 (1)	20		
7484925	Total Thallium (Tl)	2021/07/28	94	80 - 120	96	80 - 120	<0.050	ug/L	NC (1)	20		
7484925	Total Tungsten (W)	2021/07/28	95	80 - 120	94	80 - 120	<1.0	ug/L	NC (1)	20		
7484925	Total Uranium (U)	2021/07/28	98	80 - 120	95	80 - 120	<0.10	ug/L	6.6 (1)	20		
7484925	Total Vanadium (V)	2021/07/28	94	80 - 120	94	80 - 120	<0.50	ug/L	NC (1)	20		
7484925	Total Zinc (Zn)	2021/07/28	99	80 - 120	100	80 - 120	<5.0	ug/L	NC (1)	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7484925	Total Zirconium (Zr)	2021/07/28	102	80 - 120	101	80 - 120	<1.0	ug/L	NC (1)	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) Matrix Spike Parent ID [QDW995-02]

(3) Duplicate Parent ID [QDW995-02]

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BV Labs Job #: C1K4167
Report Date: 2021/07/28

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Julie Clement, Technical Account Manager

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

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21-Jul-21 15:57
Julie Clement
C1K4167

KSE ENV-1108

Use Only:

INVOICE TO:		REPORT TO:		PROJECT INFORMATION	
Company Name:	#3000 GHD Limited	Company Name:		Quotation #:	C10335
Attention:	(AP-735)- Jennifer Balkwill	Attention:	11226647 Distribution List	P.O. #:	73524358
Address:	455 Phillip St Waterloo ON N2L 3X2	Address:		Project:	11226647
Tel:	(519) 884-0510 Fax: (519) 725-1394	Tel:	Fax:	Project Name:	
Email:	APinvoices-735@ghd.com	Email:		Site #:	
				Sampled By:	D. Berriman

Bottle Order #: 835837
COC #: C#835837-01-01
Project Manager: Julie Clement

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

Regulation 153 (2011)
☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations
☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558. ☐ Storm Sewer Bylaw
☐ MISA Municipality _____
☐ PWQO ☐ Reg 406 Table _____
☐ Other _____

Special Instructions

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

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

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

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Ion Balance (% Difference)	Speciated Alkalinity	Total Ammonia-N	Total Nitrogen (calculated)	Un-ionized Ammonia	Colour	Dissolved Organic Carbon (DOC)	Hardness (calculated as CaCO3)	Organic Nitrogen	Total Kjeldahl Nitrogen in Water	# of Bottles	Comments
1		GW-11226647-0721-21- DB - MW5	21.07.21	13:00	GW		X	X	X	X	X	X	X	X	X	X	10	
2		GW-11226647-___21-____- ____																
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
DB D. Berriman	21.07.21	16:00		21/07/21	15:57	

Laboratory Use Only
Time Sensitive
Temperature (°C) on Recei: 9/11/12
Custody Seal Present: Yes ☒ No
Intact

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

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

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

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

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

Bureau Veritas Laboratories
6740 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 #:	C10335	BV Labs Job #:	Bottle Order #:
Attention:	(AP-735)- Jennifer Balkwill	Attention:	11226647 Distribution List	P.O. #:	73524358		835837
Address:	455 Phillip St Waterloo ON N2L 3X2	Address:		Project:	11226647	COC #:	Project Manager:
Tel:	(519) 884-0510 Fax: (519) 725-1394	Tel:	Fax:	Project Name:		C#835837-01-02	Julie Clement
Email:	APinvoices-735@ghd.com	Email:		Site #:			
				Sampled By:	D. Berriman		

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

Regulation 153 (2011)	Other Regulations	Special Instructions
☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___	☐ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558. ☐ Storm Sewer Bylaw ☐ MISA Municipality ___ ☐ PWQO ☐ Reg 406 Table ___ ☐ Other ___	

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Total Phosphorus (Colourimetric)	Sulphide	Total Dissolved Solids	Turbidity	pH	Nitrate (NO3) and Nitrite (NO2) in Water	Total Metals Analysis by ICPMS (Select parameters)	Dissolved Metals by ICPMS (Select Parameters) FIELD FILTERED	Low Level Total Suspended Solids		# of Bottles	Comments
1		GW-11226647-0721-DB-MW5	21.07.21	13:00	GW		X	X	X	X	X	X	X	X	X		10	DISSOLVED METALS ARE
2		GW-11226647-___21-___-___																FIELD FILTERED AND
3																		~~DISS~~ PRESERVED
4																		
5																		
6																		
7																		
8																		
9																		
10																		

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

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

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

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only				
D. Berriman	21.07.21	16:00			(515)		Time Sensitive	Temperature (°C) on Recei 9/11/12	Custody Seal Present	Yes ✓	No
									Intact		

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

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

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

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

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

Your P.O. #: 73524358
Your Project #: 11226647
Your C.O.C. #: 835835-01-01

Attention: 11226647-PO-73524358

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2021/08/13
Report #: R6764200
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K6179
Received: 2021/07/23, 08:00

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Biochemical Oxygen Demand (BOD)	1	2021/07/25	2021/07/30	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	1	N/A	2021/07/29	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	1	N/A	2021/07/28	CAM SOP-00416	SM 23 5220 D m
Free (WAD) Cyanide	1	N/A	2021/07/26	CAM SOP-00457	OMOE E3015 m
Total Cyanide	1	2021/07/26	2021/07/26	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2021/07/24	2021/07/27	CAM SOP-00449	SM 23 4500-F C m
Dissolved Mercury in Water by CVAA	1	2021/07/27	2021/07/27	CAM SOP-00453	EPA 7470A m
Mercury in Water by CVAA	1	2021/07/28	2021/07/28	CAM SOP-00453	EPA 7470A m
Total Extractable Elements by ICP-MS (1, 3)	1	2021/08/11	2021/08/11	STL SOP-00071	MA.200–Mét. 1.2 R5 m
Elements by ICPMS Low Level (total) (2)	1	2021/08/05	2021/08/06	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Animal and Vegetable Oil and Grease	1	N/A	2021/07/29	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2021/07/28	2021/07/29	CAM SOP-00326	EPA1664B m,SM5520B m
OC Pesticides (Selected) & PCB (4)	1	2021/07/27	2021/07/28	CAM SOP-00307	EPA 8081A/8082B m
PAH Compounds in Water by GC/MS (SIM)	1	2021/07/27	2021/07/28	CAM SOP-00318	EPA 8270D m
pH	1	2021/07/24	2021/07/27	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2021/07/26	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2021/07/30	CAM SOP-00464	EPA 375.4 m
Sulphide	1	N/A	2021/07/26	CAM SOP-00455	SM 23 4500-S G m
Total Kjeldahl Nitrogen in Water	1	2021/07/26	2021/07/27	CAM SOP-00938	OMOE E3516 m
Total PAHs (Barrie Sewer By-law) (5)	1	N/A	2021/07/28	CAM SOP - 00301	
Mineral/Synthetic O & G (TPH Heavy Oil) (6)	1	2021/07/28	2021/07/29	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2021/07/27	2021/07/28	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2021/07/28	CAM SOP-00228	EPA 8260C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas 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 Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are

Your P.O. #: 73524358
Your Project #: 11226647
Your C.O.C. #: 835835-01-01

Attention: 11226647-PO-73524358

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2021/08/13
Report #: R6764200
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K6179
Received: 2021/07/23, 08:00

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.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas 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 Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas 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 Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Montreal via Mississauga
(2) This test was performed by Bureau Veritas Burnaby via Mississauga
(3) Non-accredited test method
(4) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane
(5) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(6) 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.
Julie Clement, Technical Account Manager
Email: Julie.CLEMENT@bureauveritas.com
Phone# (613)868-6079
==========
This report has been generated and distributed using a secure automated process.
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: C1K6179
Report Date: 2021/08/13

GHD Limited
Client Project #: 11226647
Your P.O. #: 73524358
Sampler Initials: DB

RESULTS OF ANALYSES OF WATER

BV Labs ID		QEH889		
Sampling Date		2021/07/22 10:00		
COC Number		835835-01-01		
	UNITS	GW-11226647-072221 -DB-MW5-SEWERUSE	RDL	QC Batch
Calculated Parameters				
Total Animal/Vegetable Oil and Grease	mg/L	<0.50	0.50	7479760
Inorganics				
Total BOD	mg/L	<2	2	7482521
Total Chemical Oxygen Demand (COD)	mg/L	<4.0	4.0	7483884
Fluoride (F-)	mg/L	<0.10	0.10	7482347
Total Kjeldahl Nitrogen (TKN)	mg/L	<0.10	0.10	7484028
pH	pH	7.89		7482349
Phenols-4AAP	mg/L	<0.0010	0.0010	7482748
Total Suspended Solids	mg/L	14	10	7482068
Dissolved Sulphate (SO4)	mg/L	22	1.0	7482344
Sulphide	mg/L	<0.020	0.020	7483603
Total Cyanide (CN)	mg/L	<0.0050	0.0050	7483478
WAD Cyanide (Free)	ug/L	<1	1	7483223
Dissolved Chloride (Cl-)	mg/L	6.7	1.0	7482345
Metals				
Total Aluminum (Al)	ug/L	125	3.0	7508455
Total Antimony (Sb)	ug/L	0.109	0.020	7508455
Total Arsenic (As)	ug/L	0.231	0.020	7508455
Total Barium (Ba)	ug/L	49.8	0.050	7508455
Total Bismuth (Bi)	ug/L	<0.010	0.010	7508455
Total Cadmium (Cd)	ug/L	<0.0050	0.0050	7508455
Total Chromium (Cr)	ug/L	0.25	0.10	7508455
Total Cobalt (Co)	ug/L	0.873	0.010	7508455
Total Copper (Cu)	ug/L	0.71	0.10	7508455
Total Iron (Fe)	ug/L	73.6	5.0	7508455
Total Lead (Pb)	ug/L	0.093	0.020	7508455
Total Manganese (Mn)	ug/L	124	0.10	7508455
Total Molybdenum (Mo)	ug/L	7.38	0.050	7508455
Total Nickel (Ni)	ug/L	1.70	0.10	7508455
Total Phosphorus (P)	ug/L	6.1	5.0	7508455
Total Selenium (Se)	ug/L	0.097	0.040	7508455
Total Silver (Ag)	ug/L	<0.010	0.010	7508455
Total Tin (Sn)	ug/L	0.25	0.20	7508455
Total Vanadium (V)	ug/L	0.33	0.20	7508455

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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BV Labs Job #: C1K6179
Report Date: 2021/08/13

GHD Limited
Client Project #: 11226647
Your P.O. #: 73524358
Sampler Initials: DB

RESULTS OF ANALYSES OF WATER

BV Labs ID		QEH889		
Sampling Date		2021/07/22 10:00		
COC Number		835835-01-01		
	UNITS	**GW-11226647-072221 -DB-MW5-SEWERUSE**	**RDL**	**QC Batch**
Total Zinc (Zn)	ug/L	1.8	1.0	7508455
Total Rhodium (Rh)	ug/L	<0.50	0.50	7517580
Total Gold (Au)	ug/L	<0.10	0.10	7508455
Total Platinum (Pt)	ug/L	<0.10	0.10	7508455
Petroleum Hydrocarbons				
Total Oil & Grease	mg/L	<0.50	0.50	7488820
Total Oil & Grease Mineral/Synthetic	mg/L	<0.50	0.50	7488837

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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BV Labs Job #: C1K6179
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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

BV Labs ID		QEH889		
Sampling Date		2021/07/22 10:00		
COC Number		835835-01-01		
	UNITS	GW-11226647-072221 -DB-MW5-SEWERUSE	RDL	QC Batch
Metals				
Mercury (Hg)	mg/L	<0.00010	0.00010	7487631
Dissolved Mercury (Hg)	ug/L	<0.10	0.10	7485209

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

BV Labs ID		QEH889		
Sampling Date		2021/07/22 10:00		
COC Number		835835-01-01		
	UNITS	GW-11226647-072221 -DB-MW5-SEWERUSE	RDL	QC Batch
Calculated Parameters				
Total PAHs	ug/L	<0.20	0.20	7479762
Polyaromatic Hydrocarbons				
Acenaphthene	ug/L	<0.050	0.050	7486258
Acenaphthylene	ug/L	<0.050	0.050	7486258
Anthracene	ug/L	<0.050	0.050	7486258
Benzo(a)anthracene	ug/L	<0.050	0.050	7486258
Benzo(a)pyrene	ug/L	<0.0090	0.0090	7486258
Benzo(b/j)fluoranthene	ug/L	<0.050	0.050	7486258
Benzo(g,h,i)perylene	ug/L	<0.050	0.050	7486258
Benzo(k)fluoranthene	ug/L	<0.050	0.050	7486258
Chrysene	ug/L	<0.050	0.050	7486258
Dibenzo(a,h)anthracene	ug/L	<0.050	0.050	7486258
Fluoranthene	ug/L	<0.050	0.050	7486258
Fluorene	ug/L	<0.050	0.050	7486258
Indeno(1,2,3-cd)pyrene	ug/L	<0.050	0.050	7486258
1-Methylnaphthalene	ug/L	<0.050	0.050	7486258
2-Methylnaphthalene	ug/L	<0.050	0.050	7486258
Naphthalene	ug/L	<0.050	0.050	7486258
Phenanthrene	ug/L	<0.030	0.030	7486258
Pyrene	ug/L	<0.050	0.050	7486258
Surrogate Recovery (%)				
D10-Anthracene	%	113		7486258
D14-Terphenyl (FS)	%	108		7486258
D8-Acenaphthylene	%	106		7486258

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GHD Limited
Client Project #: 11226647
Your P.O. #: 73524358
Sampler Initials: DB

VOLATILE ORGANICS BY GC/MS (WATER)

BV Labs ID		QEH889		
Sampling Date		2021/07/22 10:00		
COC Number		835835-01-01		
	UNITS	GW-11226647-072221 -DB-MW5-SEWERUSE	RDL	QC Batch
Volatile Organics				
Acetone (2-Propanone)	ug/L	<200	200	7482113
Benzene	ug/L	<4.0	4.0	7482113
Bromodichloromethane	ug/L	<10	10	7482113
Bromoform	ug/L	<20	20	7482113
Bromomethane	ug/L	<10	10	7482113
Carbon Tetrachloride	ug/L	<3.8	3.8	7482113
Chlorobenzene	ug/L	<4.0	4.0	7482113
Chloroethane	ug/L	<20	20	7482113
Chloroform	ug/L	<4.0	4.0	7482113
Chloromethane	ug/L	<100	100	7482113
Dibromochloromethane	ug/L	<10	10	7482113
1,2-Dichlorobenzene	ug/L	<8.0	8.0	7482113
1,3-Dichlorobenzene	ug/L	<8.0	8.0	7482113
1,4-Dichlorobenzene	ug/L	<8.0	8.0	7482113
Dichlorodifluoromethane (FREON 12)	ug/L	<20	20	7482113
1,1-Dichloroethane	ug/L	<4.0	4.0	7482113
1,2-Dichloroethane	ug/L	<9.8	9.8	7482113
1,1-Dichloroethylene	ug/L	<4.0	4.0	7482113
cis-1,2-Dichloroethylene	ug/L	<10	10	7482113
trans-1,2-Dichloroethylene	ug/L	<10	10	7482113
1,2-Dichloropropane	ug/L	<4.0	4.0	7482113
cis-1,3-Dichloropropene	ug/L	<6.0	6.0	7482113
trans-1,3-Dichloropropene	ug/L	<8.0	8.0	7482113
Ethylbenzene	ug/L	<4.0	4.0	7482113
Ethylene Dibromide	ug/L	<3.8	3.8	7482113
Hexane	ug/L	<20	20	7482113
Methylene Chloride(Dichloromethane)	ug/L	<40	40	7482113
Methyl Ethyl Ketone (2-Butanone)	ug/L	<200	200	7482113
Methyl Isobutyl Ketone	ug/L	<100	100	7482113
Methyl t-butyl ether (MTBE)	ug/L	<10	10	7482113
Styrene	ug/L	<8.0	8.0	7482113
1,1,1,2-Tetrachloroethane	ug/L	<10	10	7482113
1,1,2,2-Tetrachloroethane	ug/L	<8.0	8.0	7482113
Tetrachloroethylene	ug/L	<4.0	4.0	7482113

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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GHD Limited
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VOLATILE ORGANICS BY GC/MS (WATER)

BV Labs ID		QEH889		
Sampling Date		2021/07/22 10:00		
COC Number		835835-01-01		
	UNITS	GW-11226647-072221 -DB-MW5-SEWERUSE	RDL	QC Batch
Toluene	ug/L	<4.0	4.0	7482113
1,1,1-Trichloroethane	ug/L	<4.0	4.0	7482113
1,1,2-Trichloroethane	ug/L	<8.0	8.0	7482113
Trichloroethylene	ug/L	<4.0	4.0	7482113
Trichlorofluoromethane (FREON 11)	ug/L	<10	10	7482113
Vinyl Chloride	ug/L	<4.0	4.0	7482113
p+m-Xylene	ug/L	<4.0	4.0	7482113
o-Xylene	ug/L	<4.0	4.0	7482113
Total Xylenes	ug/L	<4.0	4.0	7482113
Total Trihalomethanes	ug/L	<20	20	7482113
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	88		7482113
D4-1,2-Dichloroethane	%	111		7482113
D8-Toluene	%	91		7482113

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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GHD Limited
Client Project #: 11226647
Your P.O. #: 73524358
Sampler Initials: DB

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

BV Labs ID		QEH889		
Sampling Date		2021/07/22 10:00		
COC Number		835835-01-01		
	UNITS	GW-11226647-072221 -DB-MW5-SEWERUSE	RDL	QC Batch
Pesticides & Herbicides				
Hexachlorobenzene	ug/L	<0.005	0.005	7485459
Surrogate Recovery (%)				
2,4,5,6-Tetrachloro-m-xylene	%	59		7485459
Decachlorobiphenyl	%	83		7485459

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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BV Labs Job #: C1K6179
Report Date: 2021/08/13

GHD Limited
Client Project #: 11226647
Your P.O. #: 73524358
Sampler Initials: DB

TEST SUMMARY

BV Labs ID: QEH889
Sample ID: GW-11226647-072221-DB-MW5-SEWERUSE
Matrix: Water

Collected: 2021/07/22
Shipped:
Received: 2021/07/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	7482521	2021/07/25	2021/07/30	Frank Zhang
Chloride by Automated Colourimetry	KONE	7482345	N/A	2021/07/29	Avneet Kour Sudan
Chemical Oxygen Demand	SPEC	7483884	N/A	2021/07/28	Nimarta Singh
Free (WAD) Cyanide	SKAL/CN	7483223	N/A	2021/07/26	Aditiben Patel
Total Cyanide	SKAL/CN	7483478	2021/07/26	2021/07/26	Aditiben Patel
Fluoride	ISE	7482347	2021/07/24	2021/07/27	Surinder Rai
Dissolved Mercury in Water by CVAA	CV/AA	7485209	2021/07/27	2021/07/27	Meghaben Patel
Mercury in Water by CVAA	CV/AA	7487631	2021/07/28	2021/07/28	Gagandeep Rai
Total Extractable Elements by ICP-MS	ICP/MSMS	7517580	2021/08/11	2021/08/11	Jaime Garza
Elements by ICPMS Low Level (total)	ICP/MS	7508455	2021/08/05	2021/08/06	Andrew An
Animal and Vegetable Oil and Grease	BAL	7479760	N/A	2021/07/29	Automated Statchk
Total Oil and Grease	BAL	7488820	2021/07/28	2021/07/29	Jay Tailor
OC Pesticides (Selected) & PCB	GC/ECD	7485459	2021/07/27	2021/07/28	Li Peng
PAH Compounds in Water by GC/MS (SIM)	GC/MS	7486258	2021/07/27	2021/07/28	Mitesh Raj
pH	AT	7482349	2021/07/24	2021/07/27	Surinder Rai
Phenols (4AAP)	TECH/PHEN	7482748	N/A	2021/07/26	Deonarine Ramnarine
Sulphate by Automated Colourimetry	KONE	7482344	N/A	2021/07/30	Avneet Kour Sudan
Sulphide	ISE/S	7483603	N/A	2021/07/26	Neil Dassanayake
Total Kjeldahl Nitrogen in Water	SKAL	7484028	2021/07/26	2021/07/27	Rajni Tyagi
Total PAHs (Barrie Sewer By-law)	CALC	7479762	N/A	2021/07/28	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	7488837	2021/07/28	2021/07/29	Jay Tailor
Total Suspended Solids	BAL	7482068	2021/07/27	2021/07/28	Kristen Chan
Volatile Organic Compounds in Water	GC/MS	7482113	N/A	2021/07/28	Ancheol Jeong

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BV Labs Job #: C1K6179
Report Date: 2021/08/13

GHD Limited
Client Project #: 11226647
Your P.O. #: 73524358
Sampler Initials: DB

GENERAL COMMENTS

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

Package 1	8.3°C

Sample QEH889 [GW-11226647-072221-DB-MW5-SEWERUSE] : 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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BV Labs Job #: C1K6179
Report Date: 2021/08/13

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11226647
Your P.O. #: 73524358
Sampler Initials: DB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7482113	4-Bromofluorobenzene	2021/07/28	100	70 - 130	102	70 - 130	94	%				
7482113	D4-1,2-Dichloroethane	2021/07/28	101	70 - 130	101	70 - 130	113	%				
7482113	D8-Toluene	2021/07/28	110	70 - 130	108	70 - 130	91	%				
7485459	2,4,5,6-Tetrachloro-m-xylene	2021/07/28	79 (3)	50 - 130	59	50 - 130	53	%				
7485459	Decachlorobiphenyl	2021/07/28	91 (3)	50 - 130	109	50 - 130	114	%				
7486258	D10-Anthracene	2021/07/28	98	50 - 130	103	50 - 130	100	%				
7486258	D14-Terphenyl (FS)	2021/07/28	89	50 - 130	96	50 - 130	91	%				
7486258	D8-Acenaphthylene	2021/07/28	94	50 - 130	101	50 - 130	97	%				
7482068	Total Suspended Solids	2021/07/28					<10	mg/L	13 (1)	25	95	85 - 115
7482113	1,1,1,2-Tetrachloroethane	2021/07/28	100	70 - 130	101	70 - 130	<0.50	ug/L	NC (1)	30		
7482113	1,1,1-Trichloroethane	2021/07/28	98	70 - 130	99	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	1,1,2,2-Tetrachloroethane	2021/07/28	98	70 - 130	101	70 - 130	<0.40	ug/L	NC (1)	30		
7482113	1,1,2-Trichloroethane	2021/07/28	104	70 - 130	106	70 - 130	<0.40	ug/L	NC (1)	30		
7482113	1,1-Dichloroethane	2021/07/28	93	70 - 130	95	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	1,1-Dichloroethylene	2021/07/28	98	70 - 130	99	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	1,2-Dichlorobenzene	2021/07/28	100	70 - 130	99	70 - 130	<0.40	ug/L	NC (1)	30		
7482113	1,2-Dichloroethane	2021/07/28	95	70 - 130	98	70 - 130	<0.49	ug/L	NC (1)	30		
7482113	1,2-Dichloropropane	2021/07/28	97	70 - 130	99	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	1,3-Dichlorobenzene	2021/07/28	97	70 - 130	95	70 - 130	<0.40	ug/L	NC (1)	30		
7482113	1,4-Dichlorobenzene	2021/07/28	113	70 - 130	111	70 - 130	<0.40	ug/L	NC (1)	30		
7482113	Acetone (2-Propanone)	2021/07/28	102	60 - 140	105	60 - 140	<10	ug/L	NC (1)	30		
7482113	Benzene	2021/07/28	90	70 - 130	92	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	Bromodichloromethane	2021/07/28	99	70 - 130	102	70 - 130	<0.50	ug/L	NC (1)	30		
7482113	Bromoform	2021/07/28	99	70 - 130	101	70 - 130	<1.0	ug/L	NC (1)	30		
7482113	Bromomethane	2021/07/28	97	60 - 140	95	60 - 140	<0.50	ug/L	NC (1)	30		
7482113	Carbon Tetrachloride	2021/07/28	93	70 - 130	94	70 - 130	<0.19	ug/L	NC (1)	30		
7482113	Chlorobenzene	2021/07/28	100	70 - 130	100	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	Chloroethane	2021/07/28	108	70 - 130	110	70 - 130	<1.0	ug/L				
7482113	Chloroform	2021/07/28	96	70 - 130	97	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	Chloromethane	2021/07/28	134	60 - 140	132	60 - 140	<5.0	ug/L				

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7482113	cis-1,2-Dichloroethylene	2021/07/28	98	70 - 130	99	70 - 130	<0.50	ug/L	NC (1)	30		
7482113	cis-1,3-Dichloropropene	2021/07/28	93	70 - 130	92	70 - 130	<0.30	ug/L	NC (1)	30		
7482113	Dibromochloromethane	2021/07/28	98	70 - 130	99	70 - 130	<0.50	ug/L	NC (1)	30		
7482113	Dichlorodifluoromethane (FREON 12)	2021/07/28	98	60 - 140	105	60 - 140	<1.0	ug/L	NC (1)	30		
7482113	Ethylbenzene	2021/07/28	94	70 - 130	94	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	Ethylene Dibromide	2021/07/28	97	70 - 130	99	70 - 130	<0.19	ug/L	NC (1)	30		
7482113	Hexane	2021/07/28	106	70 - 130	107	70 - 130	<1.0	ug/L	NC (1)	30		
7482113	Methyl Ethyl Ketone (2-Butanone)	2021/07/28	109	60 - 140	115	60 - 140	<10	ug/L	NC (1)	30		
7482113	Methyl Isobutyl Ketone	2021/07/28	111	70 - 130	118	70 - 130	<5.0	ug/L	NC (1)	30		
7482113	Methyl t-butyl ether (MTBE)	2021/07/28	92	70 - 130	95	70 - 130	<0.50	ug/L	NC (1)	30		
7482113	Methylene Chloride(Dichloromethane)	2021/07/28	117	70 - 130	119	70 - 130	<2.0	ug/L	NC (1)	30		
7482113	o-Xylene	2021/07/28	92	70 - 130	98	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	p+m-Xylene	2021/07/28	101	70 - 130	101	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	Styrene	2021/07/28	108	70 - 130	113	70 - 130	<0.40	ug/L	NC (1)	30		
7482113	Tetrachloroethylene	2021/07/28	91	70 - 130	90	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	Toluene	2021/07/28	99	70 - 130	100	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	Total Trihalomethanes	2021/07/28					<1.0	ug/L				
7482113	Total Xylenes	2021/07/28					<0.20	ug/L	NC (1)	30		
7482113	trans-1,2-Dichloroethylene	2021/07/28	98	70 - 130	99	70 - 130	<0.50	ug/L	NC (1)	30		
7482113	trans-1,3-Dichloropropene	2021/07/28	106	70 - 130	99	70 - 130	<0.40	ug/L	NC (1)	30		
7482113	Trichloroethylene	2021/07/28	99	70 - 130	100	70 - 130	<0.20	ug/L	NC (1)	30		
7482113	Trichlorofluoromethane (FREON 11)	2021/07/28	95	70 - 130	96	70 - 130	<0.50	ug/L	NC (1)	30		
7482113	Vinyl Chloride	2021/07/28	98	70 - 130	100	70 - 130	<0.20	ug/L	NC (1)	30		
7482344	Dissolved Sulphate (SO4)	2021/07/30	NC	75 - 125	108	80 - 120	<1.0	mg/L	1.7 (1)	20		
7482345	Dissolved Chloride (Cl-)	2021/07/29	110	80 - 120	102	80 - 120	<1.0	mg/L	9.9 (1)	20		
7482347	Fluoride (F-)	2021/07/27	45 (2)	80 - 120	100	80 - 120	<0.10	mg/L	NC (1)	20		
7482349	pH	2021/07/27			102	98 - 103			0.39 (1)	N/A		
7482521	Total BOD	2021/07/30					<2	mg/L	NC (1)	30	103	80 - 120
7482748	Phenols-4AAP	2021/07/26	102	80 - 120	99	80 - 120	<0.0010	mg/L	NC (1)	20		
7483223	WAD Cyanide (Free)	2021/07/26	98	80 - 120	98	80 - 120	<1	ug/L	NC (1)	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7483478	Total Cyanide (CN)	2021/07/26	83	80 - 120	92	80 - 120	<0.0050	mg/L	NC (1)	20		
7483603	Sulphide	2021/07/26	103	80 - 120	103	80 - 120	<0.020	mg/L	NC (1)	20		
7483884	Total Chemical Oxygen Demand (COD)	2021/07/28	100	80 - 120	100	80 - 120	<4.0	mg/L	8.6 (1)	20		
7484028	Total Kjeldahl Nitrogen (TKN)	2021/07/27	99	80 - 120	98	80 - 120	<0.10	mg/L	16 (1)	20	105	80 - 120
7485209	Dissolved Mercury (Hg)	2021/07/27	90	75 - 125	91	80 - 120	<0.10	ug/L	NC (1)	20		
7485459	Hexachlorobenzene	2021/07/28	79 (3)	50 - 130	80	50 - 130	<0.005	ug/L	NC (1)	30		
7486258	1-Methylnaphthalene	2021/07/28	100	50 - 130	100	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	2-Methylnaphthalene	2021/07/28	99	50 - 130	95	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Acenaphthene	2021/07/28	103	50 - 130	103	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Acenaphthylene	2021/07/28	101	50 - 130	100	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Anthracene	2021/07/28	104	50 - 130	101	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Benzo(a)anthracene	2021/07/28	106	50 - 130	106	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Benzo(a)pyrene	2021/07/28	88	50 - 130	89	50 - 130	<0.0090	ug/L	NC (1)	30		
7486258	Benzo(b/j)fluoranthene	2021/07/28	97	50 - 130	102	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Benzo(g,h,i)perylene	2021/07/28	103	50 - 130	104	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Benzo(k)fluoranthene	2021/07/28	100	50 - 130	96	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Chrysene	2021/07/28	106	50 - 130	106	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Dibenzo(a,h)anthracene	2021/07/28	96	50 - 130	93	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Fluoranthene	2021/07/28	105	50 - 130	104	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Fluorene	2021/07/28	104	50 - 130	103	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Indeno(1,2,3-cd)pyrene	2021/07/28	102	50 - 130	102	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Naphthalene	2021/07/28	98	50 - 130	96	50 - 130	<0.050	ug/L	NC (1)	30		
7486258	Phenanthrene	2021/07/28	107	50 - 130	105	50 - 130	<0.030	ug/L	NC (1)	30		
7486258	Pyrene	2021/07/28	106	50 - 130	102	50 - 130	<0.050	ug/L	NC (1)	30		
7487631	Mercury (Hg)	2021/07/28	89	75 - 125	94	80 - 120	<0.00010	mg/L	NC (1)	20		
7488820	Total Oil & Grease	2021/07/29			98	85 - 115	<0.50	mg/L	0.51 (1)	25		
7488837	Total Oil & Grease Mineral/Synthetic	2021/07/29			95	85 - 115	<0.50	mg/L	2.1 (1)	25		
7508455	Total Aluminum (Al)	2021/08/06	NC	80 - 120	103	80 - 120	<3.0	ug/L	0.59 (1)	20		
7508455	Total Antimony (Sb)	2021/08/06	105	80 - 120	104	80 - 120	<0.020	ug/L	3.8 (1)	20		
7508455	Total Arsenic (As)	2021/08/06	106	80 - 120	103	80 - 120	<0.020	ug/L	0.60 (1)	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7508455	Total Barium (Ba)	2021/08/06	105	80 - 120	103	80 - 120	<0.050	ug/L	1.4 (1)	20		
7508455	Total Bismuth (Bi)	2021/08/06	100	80 - 120	99	80 - 120	<0.010	ug/L	4.1 (1)	20		
7508455	Total Cadmium (Cd)	2021/08/06	104	80 - 120	103	80 - 120	<0.0050	ug/L	5.8 (1)	20		
7508455	Total Chromium (Cr)	2021/08/06	106	80 - 120	102	80 - 120	<0.10	ug/L	0.69 (1)	20		
7508455	Total Cobalt (Co)	2021/08/06	97	80 - 120	101	80 - 120	<0.010	ug/L	0.33 (1)	20		
7508455	Total Copper (Cu)	2021/08/06	94	80 - 120	99	80 - 120	<0.10	ug/L	0.83 (1)	20		
7508455	Total Gold (Au)	2021/08/06	35 (2)	80 - 120	77 (4)	80 - 120	<0.10	ug/L				
7508455	Total Iron (Fe)	2021/08/06	NC	80 - 120	103	80 - 120	<5.0	ug/L	0.76 (1)	20		
7508455	Total Lead (Pb)	2021/08/06	102	80 - 120	100	80 - 120	<0.020	ug/L	1.9 (1)	20		
7508455	Total Manganese (Mn)	2021/08/06	NC	80 - 120	102	80 - 120	<0.10	ug/L	0.98 (1)	20		
7508455	Total Molybdenum (Mo)	2021/08/06	109	80 - 120	104	80 - 120	<0.050	ug/L	2.9 (1)	20		
7508455	Total Nickel (Ni)	2021/08/06	97	80 - 120	102	80 - 120	<0.10	ug/L	1.0 (1)	20		
7508455	Total Phosphorus (P)	2021/08/06	105	80 - 120	103	80 - 120	<5.0	ug/L	3.6 (1)	20		
7508455	Total Platinum (Pt)	2021/08/06	105	80 - 120	104	80 - 120	<0.10	ug/L				
7508455	Total Selenium (Se)	2021/08/06	109	80 - 120	103	80 - 120	<0.040	ug/L	4.9 (1)	20		
7508455	Total Silver (Ag)	2021/08/06	100	80 - 120	100	80 - 120	<0.010	ug/L	NC (1)	20		
7508455	Total Tin (Sn)	2021/08/06	103	80 - 120	105	80 - 120	<0.20	ug/L	NC (1)	20		
7508455	Total Vanadium (V)	2021/08/06	103	80 - 120	103	80 - 120	<0.20	ug/L	3.3 (1)	20		
7508455	Total Zinc (Zn)	2021/08/06	100	80 - 120	103	80 - 120	<1.0	ug/L	1.5 (1)	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7517580	Total Rhodium (Rh)	2021/08/11			117	70 - 130	<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) 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 [QEH889-08]

(4) Blank Spike outside acceptance criteria due to matrix interference.

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BV Labs Job #: C1K6179
Report Date: 2021/08/13

GHD Limited
Client Project #: 11226647
Your P.O. #: 73524358
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

David Huang, BBY Scientific Specialist

CHIMISTE
Shu Yang
2008-014
QUÉBEC

Shu Yang, Analyst 2

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.
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Julie Clement

C1K6179

ICRO

Aurora, Ontario Canada L5S 2L8 Tel:(905) 817-5700 Toll-free:800-563-6266 Fax:(905) 817-5777 www.bvlabs.com

CHAIN OF CUSTODY RECORD

KTN ENV-778

Company Name:	#3000 GHD Limited
Attention:	(AP-735)- Jennifer Balkwill
Address:	455 Phillip St Waterloo ON N2L 3X2
Tel:	(519) 884-0510 Fax: (519) 725-1394
Email:	APinvoices-735@ghd.com

REPORT TO:

Company Name:	
Attention:	11226647 Distribution List
Address:	
Tel:	Fax:
Email:	

PROJECT INFORMATION:

Quotation #:	C10335
P.O. #:	73524358
Project:	11226647
Project Name:	
Site #:	
Sampled By:	D. Berriman

Laboratory Use Only:

BV Labs Job #:	Bottle Order #:
	835835
COC #:	**Project Manager:**
C#835835-01-01	Julie Clement

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

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality ___
☐ PWQO ☐ Reg 406 Table ___
☐ Other ___

Special Instructions

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

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Barrie San. Sewer incl. Rh (2021-002)	Free (WAD) Cyanide	Dissolved Mercury in Water by CVAA	# of Bottles	Comments
1		GW-11226647-0122-21-DB-MW5-Sewer-032	21-07-22	10:00	GW		X	X	X	19	
2											
3											
4											
5											
6											
7											
8											
9											
10											

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☒

(will be applied if Rush TAT is not specified):

Standard TAT = 5-7 Working days for most tests.

Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)

Date Required: ___ Time Required: ___ ☐

Rush Confirmation Number: ___ *(call lab for #)*

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
D. Berriman	21-07-22	20:00		22/07/23	08:00	

Laboratory Use Only

Time Sensitive

Temperature (°C) on Recei: 8/8/9

Custody Seal	Yes	No
Present	✓	
Intact	✓	

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

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

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

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

White: BV Labs Yellow: Client

Your P.O. #: 73524358
Your Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your C.O.C. #: 835836-01-01

Attention: 11226647-PO-73524358

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2021/07/27
Report #: R6738344
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K6265
Received: 2021/07/23, 08:00

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Dissolved Metals by ICPMS	1	N/A	2021/07/27	CAM SOP-00447	EPA 6020B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas 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 Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas 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.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas 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 Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas 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 Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: 73524358
Your Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your C.O.C. #: 835836-01-01

Attention: 11226647-PO-73524358

GHD Limited
455 Phillip St
Waterloo, ON
CANADA N2L 3X2

Report Date: 2021/07/27
Report #: R6738344
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1K6265
Received: 2021/07/23, 08:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Julie Clement, Technical Account Manager
Email: Julie.CLEMENT@bureauveritas.com
Phone# (613)868-6079
==========
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BV Labs Job #: C1K6265
Report Date: 2021/07/27

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

BV Labs ID		QEI366		
Sampling Date		2021/07/22 10:00		
COC Number		835836-01-01		
	UNITS	GW-11226647-072221 -DB-MW5-D-METALS	RDL	QC Batch
Metals				
Dissolved Aluminum (Al)	ug/L	<4.9	4.9	7482346
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	7482346
Dissolved Arsenic (As)	ug/L	<1.0	1.0	7482346
Dissolved Barium (Ba)	ug/L	46	2.0	7482346
Dissolved Beryllium (Be)	ug/L	<0.40	0.40	7482346
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	7482346
Dissolved Boron (B)	ug/L	11	10	7482346
Dissolved Cadmium (Cd)	ug/L	<0.090	0.090	7482346
Dissolved Calcium (Ca)	ug/L	100000	200	7482346
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	7482346
Dissolved Cobalt (Co)	ug/L	0.76	0.50	7482346
Dissolved Copper (Cu)	ug/L	<0.90	0.90	7482346
Dissolved Iron (Fe)	ug/L	<100	100	7482346
Dissolved Lead (Pb)	ug/L	<0.50	0.50	7482346
Dissolved Lithium (Li)	ug/L	<5.0	5.0	7482346
Dissolved Magnesium (Mg)	ug/L	11000	50	7482346
Dissolved Manganese (Mn)	ug/L	120	2.0	7482346
Dissolved Molybdenum (Mo)	ug/L	7.0	0.50	7482346
Dissolved Nickel (Ni)	ug/L	1.6	1.0	7482346
Dissolved Phosphorus (P)	ug/L	<100	100	7482346
Dissolved Potassium (K)	ug/L	1600	200	7482346
Dissolved Selenium (Se)	ug/L	<2.0	2.0	7482346
Dissolved Silicon (Si)	ug/L	6800	50	7482346
Dissolved Silver (Ag)	ug/L	<0.090	0.090	7482346
Dissolved Sodium (Na)	ug/L	13000	100	7482346
Dissolved Strontium (Sr)	ug/L	220	1.0	7482346
Dissolved Tellurium (Te)	ug/L	<1.0	1.0	7482346
Dissolved Thallium (Tl)	ug/L	<0.050	0.050	7482346
Dissolved Tin (Sn)	ug/L	<1.0	1.0	7482346
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	7482346
Dissolved Tungsten (W)	ug/L	<1.0	1.0	7482346
Dissolved Uranium (U)	ug/L	0.80	0.10	7482346

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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

BV Labs Job #: C1K6265
Report Date: 2021/07/27

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

BV Labs ID		QEI366		
Sampling Date		2021/07/22 10:00		
COC Number		835836-01-01		
	UNITS	GW-11226647-072221 -DB-MW5-D-METALS	RDL	QC Batch
Dissolved Vanadium (V)	ug/L	<0.50	0.50	7482346
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	7482346
Dissolved Zirconium (Zr)	ug/L	<1.0	1.0	7482346

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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BV Labs Job #: C1K6265
Report Date: 2021/07/27

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

TEST SUMMARY

BV Labs ID: QEI366
Sample ID: GW-11226647-072221-DB-MW5-D-METALS
Matrix: Water

Collected: 2021/07/22
Shipped:
Received: 2021/07/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	7482346	N/A	2021/07/27	Arefa Dabhad

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

BV Labs Job #: C1K6265
Report Date: 2021/07/27

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

GENERAL COMMENTS

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

Package 1	4.3°C

Results relate only to the items tested.

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BV Labs Job #: C1K6265
Report Date: 2021/07/27

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7482346	Dissolved Aluminum (Al)	2021/07/27	99	80 - 120	102	80 - 120	<4.9	ug/L	NC (1)	20
7482346	Dissolved Antimony (Sb)	2021/07/27	101	80 - 120	104	80 - 120	<0.50	ug/L	NC (1)	20
7482346	Dissolved Arsenic (As)	2021/07/27	100	80 - 120	100	80 - 120	<1.0	ug/L	3.9 (1)	20
7482346	Dissolved Barium (Ba)	2021/07/27	99	80 - 120	102	80 - 120	<2.0	ug/L	0.57 (1)	20
7482346	Dissolved Beryllium (Be)	2021/07/27	95	80 - 120	94	80 - 120	<0.40	ug/L	NC (1)	20
7482346	Dissolved Bismuth (Bi)	2021/07/27	92	80 - 120	99	80 - 120	<1.0	ug/L		
7482346	Dissolved Boron (B)	2021/07/27	90	80 - 120	89	80 - 120	<10	ug/L	3.0 (1)	20
7482346	Dissolved Cadmium (Cd)	2021/07/27	100	80 - 120	102	80 - 120	<0.090	ug/L	NC (1)	20
7482346	Dissolved Calcium (Ca)	2021/07/27	NC	80 - 120	100	80 - 120	<200	ug/L	3.2 (1)	20
7482346	Dissolved Chromium (Cr)	2021/07/27	101	80 - 120	97	80 - 120	<5.0	ug/L	NC (1)	20
7482346	Dissolved Cobalt (Co)	2021/07/27	100	80 - 120	99	80 - 120	<0.50	ug/L	NC (1)	20
7482346	Dissolved Copper (Cu)	2021/07/27	105	80 - 120	105	80 - 120	<0.90	ug/L	NC (1)	20
7482346	Dissolved Iron (Fe)	2021/07/27	101	80 - 120	99	80 - 120	<100	ug/L	5.1 (1)	20
7482346	Dissolved Lead (Pb)	2021/07/27	95	80 - 120	103	80 - 120	<0.50	ug/L	NC (1)	20
7482346	Dissolved Lithium (Li)	2021/07/27	97	80 - 120	100	80 - 120	<5.0	ug/L		
7482346	Dissolved Magnesium (Mg)	2021/07/27	NC	80 - 120	101	80 - 120	<50	ug/L	1.4 (1)	20
7482346	Dissolved Manganese (Mn)	2021/07/27	98	80 - 120	99	80 - 120	<2.0	ug/L	2.9 (1)	20
7482346	Dissolved Molybdenum (Mo)	2021/07/27	107	80 - 120	107	80 - 120	<0.50	ug/L	3.5 (1)	20
7482346	Dissolved Nickel (Ni)	2021/07/27	95	80 - 120	96	80 - 120	<1.0	ug/L	NC (1)	20
7482346	Dissolved Phosphorus (P)	2021/07/27	100	80 - 120	110	80 - 120	<100	ug/L	NC (1)	20
7482346	Dissolved Potassium (K)	2021/07/27	103	80 - 120	102	80 - 120	<200	ug/L	2.8 (1)	20
7482346	Dissolved Selenium (Se)	2021/07/27	101	80 - 120	104	80 - 120	<2.0	ug/L	NC (1)	20
7482346	Dissolved Silicon (Si)	2021/07/27	99	80 - 120	103	80 - 120	<50	ug/L	2.6 (1)	20
7482346	Dissolved Silver (Ag)	2021/07/27	96	80 - 120	98	80 - 120	<0.090	ug/L	NC (1)	20
7482346	Dissolved Sodium (Na)	2021/07/27	99	80 - 120	99	80 - 120	<100	ug/L	0.29 (1)	20
7482346	Dissolved Strontium (Sr)	2021/07/27	NC	80 - 120	96	80 - 120	<1.0	ug/L	3.7 (1)	20
7482346	Dissolved Tellurium (Te)	2021/07/27	99	80 - 120	102	80 - 120	<1.0	ug/L		
7482346	Dissolved Thallium (Tl)	2021/07/27	91	80 - 120	98	80 - 120	<0.050	ug/L	NC (1)	20
7482346	Dissolved Tin (Sn)	2021/07/27	102	80 - 120	104	80 - 120	<1.0	ug/L		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7482346	Dissolved Titanium (Ti)	2021/07/27	97	80 - 120	101	80 - 120	<5.0	ug/L	NC (1)	20
7482346	Dissolved Tungsten (W)	2021/07/27	103	80 - 120	105	80 - 120	<1.0	ug/L		
7482346	Dissolved Uranium (U)	2021/07/27	99	80 - 120	102	80 - 120	<0.10	ug/L	13 (1)	20
7482346	Dissolved Vanadium (V)	2021/07/27	96	80 - 120	95	80 - 120	<0.50	ug/L	NC (1)	20
7482346	Dissolved Zinc (Zn)	2021/07/27	98	80 - 120	99	80 - 120	<5.0	ug/L	NC (1)	20
7482346	Dissolved Zirconium (Zr)	2021/07/27	102	80 - 120	104	80 - 120	<1.0	ug/L		

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

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

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

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

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

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

(1) Duplicate Parent ID

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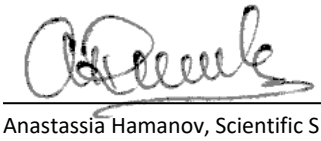
BV Labs Job #: C1K6265
Report Date: 2021/07/27

GHD Limited
Client Project #: 11226647-04
Site Location: CROWN DEVELOPMENTS, 1012 YONGE ST, BARRIE
Your P.O. #: 73524358
Sampler Initials: DB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Anastassia Hamanov, 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.

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6740 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:
Company Name: #3000 GHD Limited
Attention: (AP-735)- Jennifer Balkwill
Address: 455 Phillip St, Waterloo ON N2L 3X2
Tel: (519) 884-0510 Fax: (519) 725-1394
Email: APinvoices-735@ghd.com

REPORT TO:
Company Name:
Attention: 11226647 Distribution List
Address:
Tel: Fax:
Email:

PROJECT INFORMATION:
Quotation #: C10335
P.O. #: 73524358
Project: 11226647
Project Name:
Site #:
Sampled By: D. Bassman

Laboratory Use Only:
BV Labs Job #:
Bottle Order #: 835836
COC #: C#835836-01-01
Project Manager: Julie Clement

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

Regulation 153 (2011)
☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations
☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality ___
☐ PWQO ☐ Reg 406 Table ___
☐ Other ___

Special Instructions

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

Field Filtered (please circle): Metals / Hg / Cr VI

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Dissolved Metals by ICPMS	# of Bottles	Comments
1		GW-11226647-0721-DS-MW5-D-Metals	21-07-22	10:00	GW	X	1	
2		~~GW-11226647-___-21-___~~						
3								
4								
5								
6								
7								
8								
9								
10								

23-Jul-21 08:00
Julie Clement
C1K6265

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

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

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

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
D. Bassman	21/07/22	20:00	J Zhang	21/07/23	08:00	

Laboratory Use Only
Time Sensitive
Temperature (°C) on Recei: 4 / 4 / 5

Custody Seal	Yes	No
Present	✓	
Intact	✓	

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

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

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

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

White: BV Labs Yellow: Client

Bureau Veritas Canada (2019) Inc.

Appendix F

MECP Well Records

UTM 17 Z 609358 E

5 R 4910959 N

Elev. 5 R 0880

Basin Con 12 ~~XI~~

Lot 15

57 No 1412

NOV 23 1959

The Ontario Water Resources Commission Act, 1957

WATER WELL RECORD

County or District Simcoe Township, Village, Town or City ~~Innisfil~~ INNISFIL

[redacted] completed Oct 2 ~~6~~ 1959 (day month year)

[redacted] RR 1 Barrie (Stroud Corner)

Casing and Screen Record

Inside diameter of casing 2"

Total length of casing 45

Type of screen Clayton Works

Length of screen 5 feet

Depth to top of screen 40 feet.

Diameter of finished hole 2"

Pumping Test

Static level 35

Test-pumping rate ~~300~~ 5 G.P.M.

Pumping level 40

Duration of test pumping 2 Hr

Water clear or cloudy at end of test Clear

Recommended pumping rate ~~200~~ 4 G.P.M.

with pumping level of ~~40~~ 37

Well Log

Overburden and Bedrock Record	From ft.	To ft.
COARSE SAND	0	50

Water Record

Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
~~35~~ 45'-50	15	fresh

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

Is well on upland, in valley, or on hillside? valley

Drilling Firm

Address

Licence Number 254

Name of Driller Alex Cameron

Address RR Midhurst

Date Oct 2

Alex Cameron

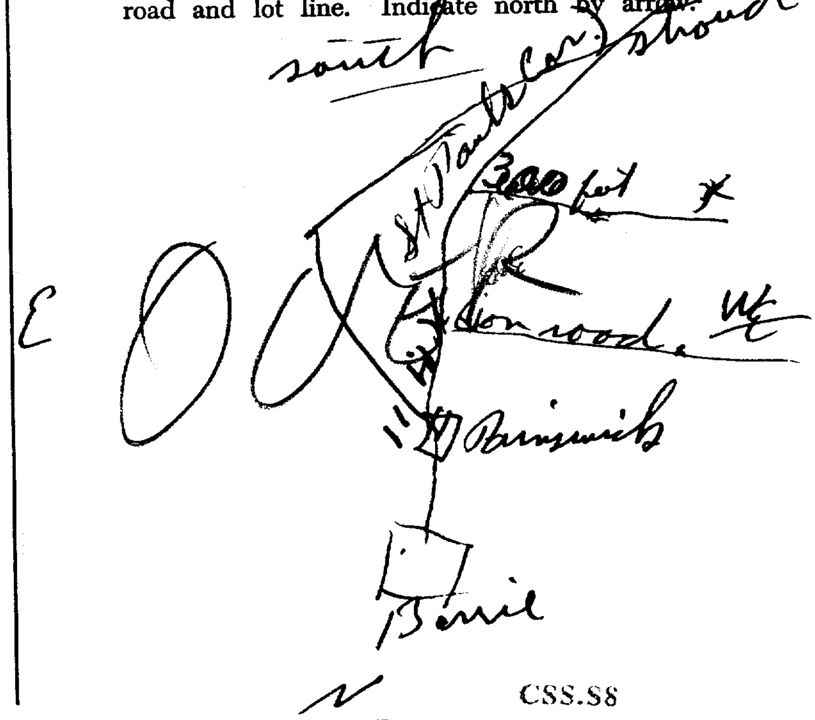
(Signature of Licensed Drilling Contractor)

Form 5
15M-58-4149

Location of Well

R.C.

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



CSS.S8

UTM 17 z 609474 E

5 R 4910915 N

Con XI
Elev. 5 R 0880
Lot 15
Basin 22

57 № 413

The Ontario Water Resources Commission Act, 1957

WATER WELL RECORD

County or District Simcoe Township, Village, Town or City ~~Innisfil~~ INNISFIL

[redacted] completed Oct 7 1959 (day month year)

[redacted] ess RR 5 Barrie (St Pauls Corner)

Casing and Screen Record		Pumping Test	
Inside diameter of casing	2"	Static level	35'
Total length of casing	45'	Test-pumping rate	300 GPHr G.P.M.
Type of screen	Clayton of Toronto	Pumping level	40
Length of screen	5 feet	Duration of test pumping	1½ Hr
Depth to top of screen	40 feet	Water clear or cloudy at end of test	clear
Diameter of finished hole	2"	Recommended pumping rate	250 G.P.M.
		with pumping level of	~~40~~ 37'

Well Log: Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
COARSE sand	~~0~~	~~50~~	~~35'~~	~~15'~~	fresh
	0	50	45-50	15'	

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

Is well on upland, in valley, or on hillside? Valley

Drilling Firm

Address

Licence Number 254

Name of Driller Alex Cameron

Address RR 1 Midhurst Ont.

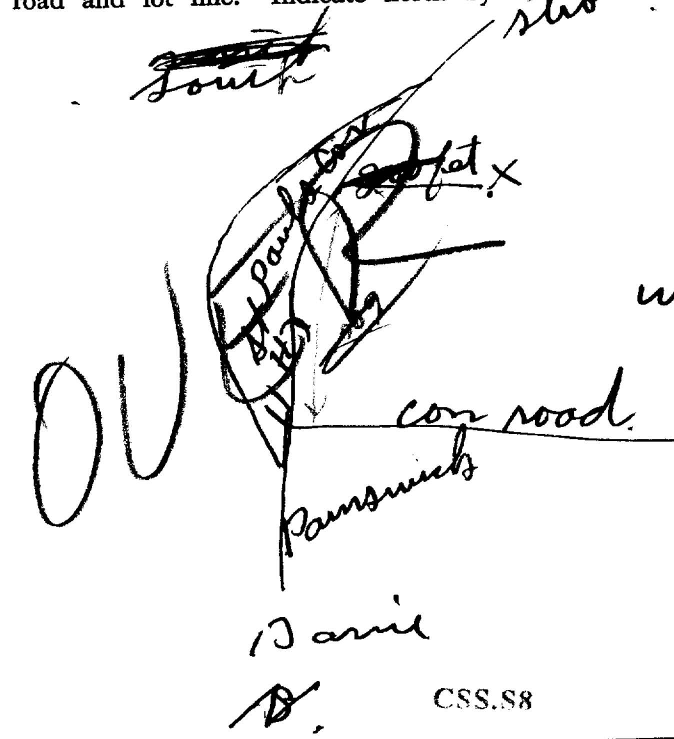
Date Oct 7

Alex Cameron
(Signature of Licensed Drilling Contractor)

Location of Well

R.C.

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



Form 5
15M-58-4149

CSS.S8

UTM 17 Z 609558 E
Cos R 4910234 N
Elev. R 0880
Basin 21 (written over: Lot 5)

The Ontario Water Resources Commission Act

57 № 1415

WATER WELL RECORD

County or District: Simcoe
Township, Village, Town or City: Innisfil
Con. 11 Lot 15 Date completed 29 (day) 8 (month) 65 (year)

[redacted]ess RR#1. Stroud.

Casing and Screen Record	
Inside diameter of casing	6¼
Total length of casing	42 ft
Type of screen	Johnson S.S. Slot 10.
Length of screen	3 ft
Depth to top of screen	52 ft
Diameter of finished hole	6¼

Pumping Test	
Static level	30 ft
Test-pumping rate	3 G.P.M.
Pumping level	52 ft
Duration of test pumping	2½ hrs
Water clear or cloudy at end of test	Clear
Recommended pumping rate	3 G.P.M.
with pump setting of	52 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)
Dug Well	0	33		
Sand with little Brown clay	33	43		
Sand. Medium	43	55	43-55	fresh
fine Sand	55	58		

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

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm: Henry Hammers Well Drilling Contractor

Address: RR#3. Barrie Ont.

Licence Number: 1662

Name of Driller or Borer: John Van Der Meulen.

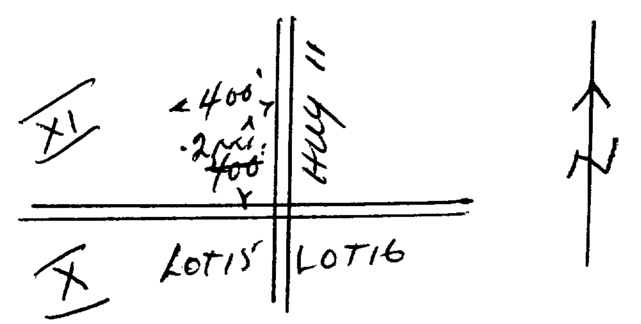
Address: 19 Cumberland St. Barrie

Date: August 30/65.

Henry Hammers
(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.



Form 7 15M-60-4138

OWRC COPY

CSS.S8

DC HB

WATER RESOURCES DIVISION № 57 1419 B

FEB 22 1967

ONTARIO WATER RESOURCES COMMISSION

UTM 17 Z 609561 E

R 4910670 N

Elev. R 0880

Basin 22

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Simcoe — Township, Village, Town or City Innisfil

Con. 11 — Lot 15 — Date completed 17 (day) Jan (month) 67 (year)

[redacted]ess RR #1 Stroud

Casing and Screen Record

Inside diameter of casing 30

Total length of casing 50

Type of screen Tile Well

Length of screen

Depth to top of screen

Diameter of finished hole 30

Pumping Test

Static level 35'

Test-pumping rate 2 G.P.M.

Pumping level

Duration of test pumping

Water clear or cloudy at end of test Clear

Recommended pumping rate 2 G.P.M.

with pump setting of 48 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)
Brown Clay	0	35		
	5			Fresh
Sand	35	50	35'	

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

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Roth Well Digging

Address RR4 Cookstown

Licence Number 61

Name of Driller or Borer B Roth

Address Same

Date Jan 16/67 B Roth

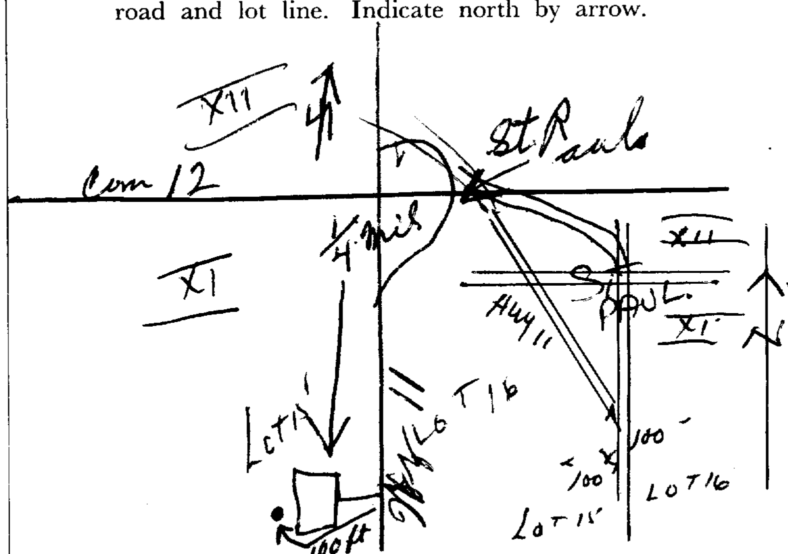
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

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



CSS.88

UTM 17 Z 6 0 9 6 0 9 E

Con 8 R 4 9 1 0 9 3 N

Elev 8 R 0 8 6 5

Lot 16

Basin 2 Simcoe

57 № 1420 B

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District: Simcoe

Township, Village, Town or City: Innisfil

Con: 11 Lot: 15 16

Date completed: 26 (day) - 11 (month) - 1965 (year)

[redacted]ess: R.R.#4 ~~Barrie Ont~~ Stroud Ont

Casing and Screen Record

Inside diameter of casing: 6 1/4

Total length of casing: 38 ft.

Type of screen: Johnson S.S. Slot. 6

Length of screen: 3 ft.

Depth to top of screen: 43 ft.

Diameter of finished hole: 6 1/4

Pumping Test

Static level: 24 ft.

Test-pumping rate: 4 G.P.M.

Pumping level: 43

Duration of test pumping: 2 hrs.

Water clear or cloudy at end of test: clear

Recommended pumping rate: 4 G.P.M.

with pump setting of: 43 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)
Dug well	0	28		
Sand with brown clay	28	35		
Brown Sand (Med.)	35	46	43	fresh
fine Sand	46	49		

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

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm: Henry Hammers Well Drilling Contractor

Address: RR #3 Barrie Ont.

Licence Number: 1662

Name of Driller or Borer: John Van Der Meulen

Address: 119 Cumberland St. Barrie

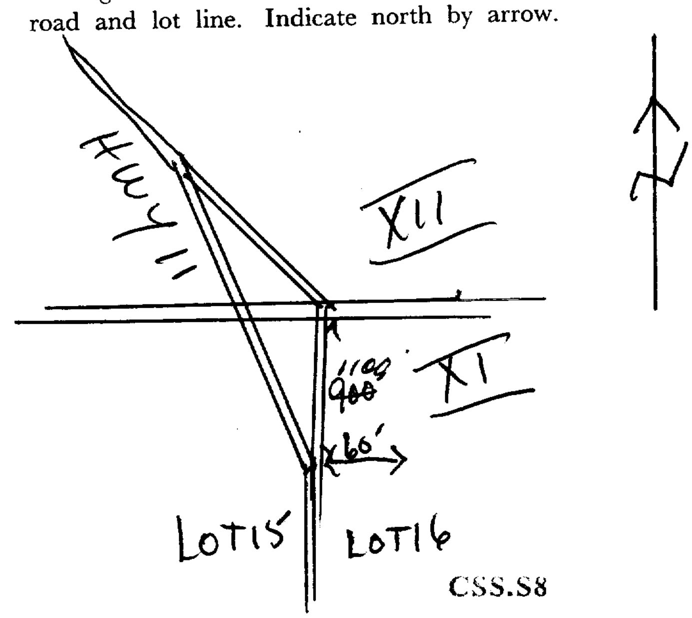
Date: Nov 26/65

Henry Hammers

(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.



CSS.S8

Form 7 15M-60-4138

OWRC COPY

EXHIBIT "G"

WATER RESOURCES DIVISION

57 No. 1421

ONTARIO WATER RESOURCES COMMISSION

UTM 17 Z 6 0 9 6 8 0 E

5 R 4 9 1 0 8 0 1 N

Elev. 5 R 0 8 7 0

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 1 2 | County ~~or District~~ SIM COE .... Township, Village, Town or City INNISFIL TWP.

Con. 11 .... Lot 16 .... Date completed 1 (day) Oct. (month) 1965 (year)

[redacted]ess .... Stroud

Casing and Screen Record	
Inside diameter of casing	30"
Total length of casing	40 ft.
Type of screen	
Length of screen	
Depth to top of screen	
Diameter of finished hole	30"

Pumping Test	
Static level	26 FT.
Test-pumping rate	6 G.P.M.
Pumping level	
Duration of test pumping	
Water clear or cloudy at end of test	CLEAR
Recommended pumping rate	5 G.P.M.
with pump setting of	38 feet below ground surface

Well Log: Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
BROWN CLAY	0	12 FT.		
			26 FT.	FRESH
COURSE SAND	12	40 FT.		

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

Is well on upland, in valley, or on hillside? UPLAND

Drilling or Boring Firm ONTARIO WELL DIGGING COMPANY

Address R.R. # NEWMARKET, ONT.

Licence Number 1236

Name of Driller or Borer

Address

Date

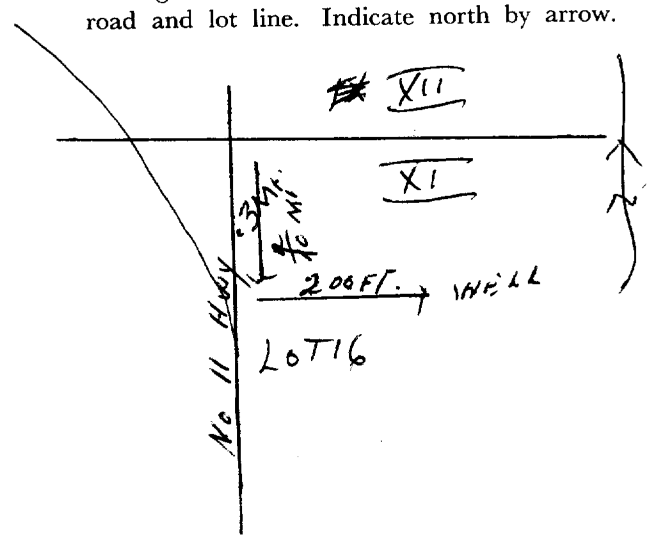
S. Moore
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

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



CSS.S8

17 6096010 CENXI B115 CODED 5705828 3 9

H 4910440

SB5 0875

22

J.B.

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Simcoe Township, Village, Town or City Innisfil

Con. 11 Lot ~~34~~ 15 Date completed Sept 23 (day month) 68 (year)

[redacted]ress RR#1 Stroud Ont.

Casing and Screen Record	
Inside diameter of casing	30 in
Total length of casing	36
Type of screen	well tile
Length of screen	—
Depth to top of screen	—
Diameter of finished hole	36"

Pumping Test		
Static level	26 ~~70~~	
RECOVERY ~~Test pumping~~ rate	5	G.P.M.
Pumping level	—	
Duration of test pumping		
Water clear or cloudy at end of test	Clear	
Recommended pumping rate	2	G.P.M.
with pump setting of	32	feet below ground surface

Well Log: Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
				fresh
Brown Stony Clay	0	20	25 ft.	
Sand	20	36		

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

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Roth Well Digging

Address RR#5 Barrie Ont.

Licence Number 128

Name of Driller or Borer B Roth

Address Same

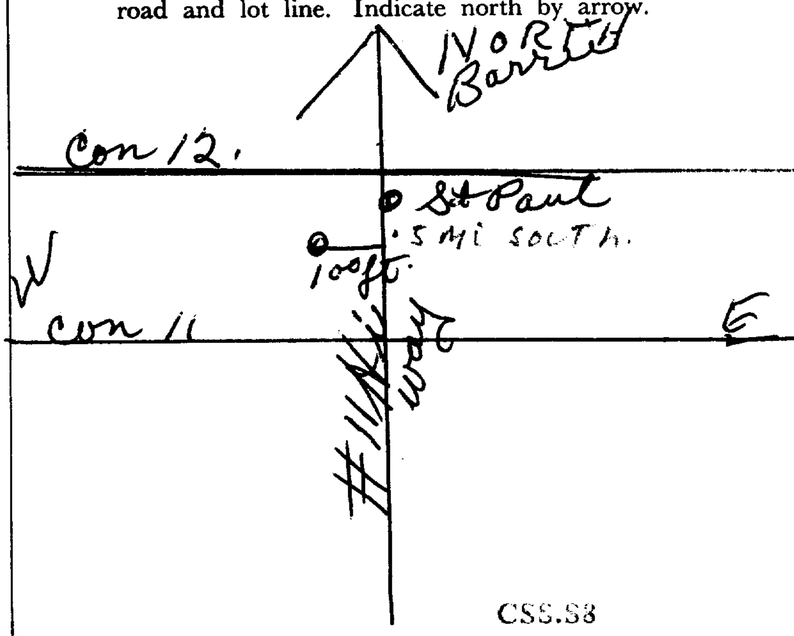
Date Oct 8/68

B Roth

(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.



CSS.S3

Form 7

OWRC COPY

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

3105E

Ontario

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

11 | 5711629 | MUNICIP. 57005 | CON. CON 11

COUNTY OR DISTRICT: SIMCOE | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: INNISFIL | CON., BLOCK, TRACT, SURVEY, ETC.: 11 BP | LOT: 016 BP

[redacted] Young ST ST PAUL ONT | DATE COMPLETED: DAY 09 MO. 10 YR. 74

G 1070.0 | RC 5 | ELEVATION 0875 | 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	DEPTH - FEET TO
		TOPSOIL		0	2
BROWN		CLAY		2	16
"	SAND	"		16	23
GREY	SAND			23	58

31 | 0002 02 | 0016605 | 00236805 | 0058228

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0027	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
15-18	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
20-23	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
25-28	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
30-33	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	55 0055
17-18	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			20-23
24-25	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.): 010 | DIAMETER: 05.000 INCHES | LENGTH: 03 FEET

MATERIAL AND TYPE: JOHNSON S.S. | DEPTH TO TOP OF SCREEN: FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER | PUMPING RATE: 0007 GPM | DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
023 FEET	044 FEET	1 ☒ PUMPING 2 ☐ RECOVERY	044 FEET	044 FEET	044 FEET	044 FEET

IF FLOWING GIVE RATE: GPM | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

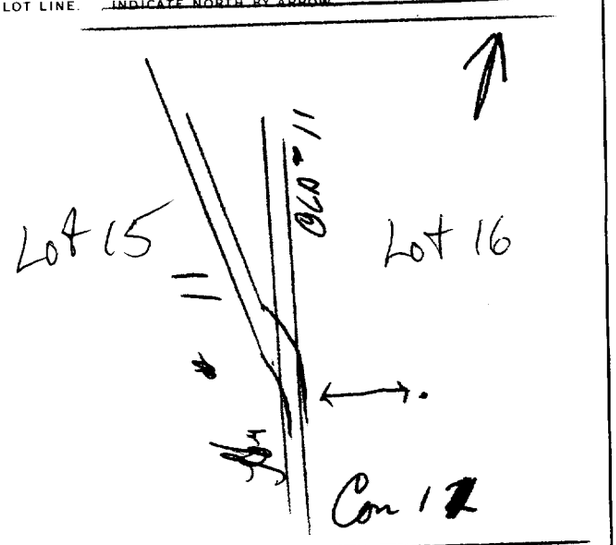
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 050 FEET | RECOMMENDED PUMPING RATE: 0007 GPM

50-53 ———•——— GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

Con 12 0910

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



DRILLERS REMARKS:

FINAL STATUS OF WELL: 1

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

WATER USE: 01

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

METHOD OF DRILLING: 1

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: MACLEAN WATER WELLS | LICENCE NUMBER: 3203

ADDRESS: RR 1 BARRIE

NAME OF DRILLER OR BORER: BARRIE ONT | LICENCE NUMBER: —

SIGNATURE OF CONTRACTOR: [signature] | SUBMISSION DATE: DAY 5 MO. 11 YR. 74

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 3203 | DATE RECEIVED: 291174

DATE OF INSPECTION: May 13 76 | INSPECTOR: J.B

REMARKS: CSS.58 | P BP | WI

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 07-091

31 D/5 E

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

(11) 5716067 MUNICIP 57005 CON 11

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	[redacted]SFIL	CON 11	005

[redacted] 9 STROUD

DATE COMPLETED: DAY 29 MO 04 YR 79

(21) [redacted] 10200 | RC 5 | ELEVATION 0875 | RC 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
DUGWELL				0	30
PREVIOUS DRILLED WELL				30	60
BROWN	SAND	CLAY		60	64
GREY	SAND		LAYERED WITH CLAY	64	83
GREY	CLAY			83	92

(31) 0030 23 | 0060 24 | 0064 62805 | 0083 2805 74 | 0092 205

32

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0060	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
06	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	188	4	0060
05	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	188	4	0080
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 004 | DIAMETER 05000 INCHES | LENGTH 03 FEET

MATERIAL AND TYPE: STAINLESS STEEL | DEPTH TO TOP OF SCREEN 0080 FEET

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
		RUBBER PACKER
~~78~~	~~80~~	2' LEADER CAST PLUG
		~~SANITARY~~ SEAL

(71) PUMPING TEST

PUMPING TEST METHOD: ☐ PUMP ☒ BAILER | PUMPING RATE 0002 ½ GPM | DURATION OF PUMPING 06 HOURS 10 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
030 FEET	075 FEET	075 FEET	075 FEET	075 FEET	075 FEET

WATER LEVELS DURING: ☒ PUMPING ☐ RECOVERY

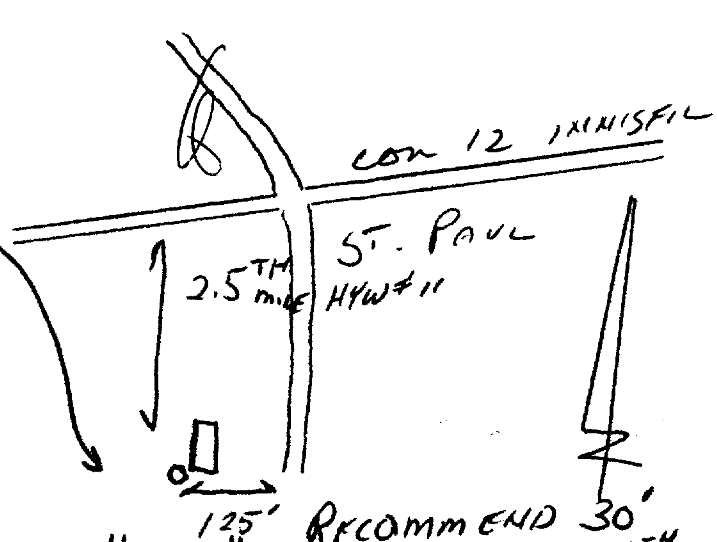
IF FLOWING, GIVE RATE ____ GPM | PUMP INTAKE SET AT ____ FEET | WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING 080 FEET | RECOMMENDED PUMPING RATE 0005 GPM

"NOTE"

LOCATION OF WELL

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



"NOTE" RECOMMEND 30' SINGLE LINE BENEATH INJECTOR

DRILLERS REMARKS

FINAL STATUS OF WELL: 1	☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED
WATER USE: 01	☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED
METHOD OF DRILLING: 1	☒ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: KNELSEN WATER WELLS | LICENCE NUMBER 3203

ADDRESS: RR#1 BARRIE ONT

NAME OF DRILLER OR BORER: WAYNE KNELSEN | LICENCE NUMBER 3213

SIGNATURE OF CONTRACTOR: [signature] | SUBMISSION DATE DAY 29 MO. 4 YR. 79

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 3203 | DATE RECEIVED 250679

DATE OF INSPECTION | INSPECTOR

REMARKS: PLOTTED ~~1604~~ (8) CSS.98

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506-4-77

Ministry of the Environment
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

31052

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

(11) 5718243 MUNICIP 57005 CON. CON 11

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
SIMCOE	INNISFIL	11	PT 16

[redacted] 103 177 BAYVIEW DR., BARRIE, ONT.

DATE COMPLETED: DAY 03 MO 11 YR 82

[redacted] 9106600 RC. 5 ELEVATION 0875 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	DEPTH - FEET TO
36"	OPEN HOLE			0	23
BROWN	SILT			23	58
GREY	SAND		MEDIUM	58	65

31: 0023 23 | 0058606 | 0065209

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0058 ~~58-65~~	☒ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
05	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	.188	0	0062
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
010	05000 INCHES	03 FEET

MATERIAL AND TYPE: JOHNSON SUPER
DEPTH TO TOP OF SCREEN: 0062 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
60	62	K-PACKER & LEAD PIPE

71 PUMPING TEST

PUMPING TEST METHOD: ☐ PUMP ☒ BAILER
PUMPING RATE: 0006 GPM
DURATION OF PUMPING: 02 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
021 FEET	045 FEET	021 FEET	021 FEET	021 FEET	021 FEET

WATER LEVELS DURING: ☐ PUMPING ☒ RECOVERY

IF FLOWING GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 045 FEET
RECOMMENDED PUMPING RATE: 0006 GPM

FINAL STATUS OF WELL: 1

☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED

WATER USE: 01

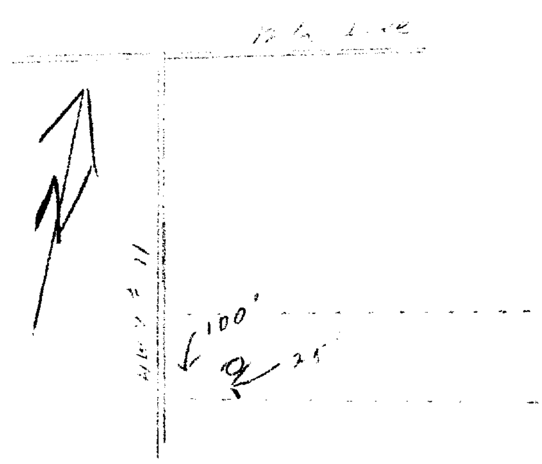
☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

METHOD OF DRILLING: 1

☒ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

LOCATION OF WELL

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



DRILLERS REMARKS: 26008

CONTRACTOR

NAME OF WELL CONTRACTOR: MARCHILDON DRILLING LIMITED — LICENCE NUMBER 3660
ADDRESS: R.R. # 2, SHANTY BAY, ONTARIO
NAME OF DRILLER OR BORER: PETER MARCHILDON — LICENCE NUMBER 3660
SIGNATURE OF CONTRACTOR: Peter Marchildon
SUBMISSION DATE: DAY 4 MO. 11 YR. 82

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 3660 DATE RECEIVED: 12 11 82
DATE OF INSPECTION: INSPECTOR:
REMARKS: CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77 FORM 7

31D/5

Ministry of the Environment
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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

(11) 5718813 MUNICIP 57005 CON. CØN 11

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted] ISFIL		- A XI	016 16

[redacted] R#3 Thornton Ont

DATE COMPLETED 08-53 DAY 23 MO. August YR. 83

10600 5 ELEVATION 0875 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	3
Brown	clay + Sand			3	40
yellow	Sand + clay		Gravel	40	60
Grey	Sand		very Fine	60	75

FEB 16 1987

RP 51R12124 pt 3.

(31) 0003 01 | 0040 60528 | 0060 528 0511 | 0075 20890

32

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0060 / 75	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
06 / 6¼ / 5	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	+ / 60	0060 / 71
05	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0071
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 004 DIAMETER 06000 INCHES LENGTH 04 FEET

MATERIAL AND TYPE Stainless DEPTH TO TOP OF SCREEN 0071 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

(71) PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE 0006 GPM
DURATION OF PUMPING 01 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
027 FEET	070 FEET	065 FEET	070 FEET	070 FEET	070 FEET

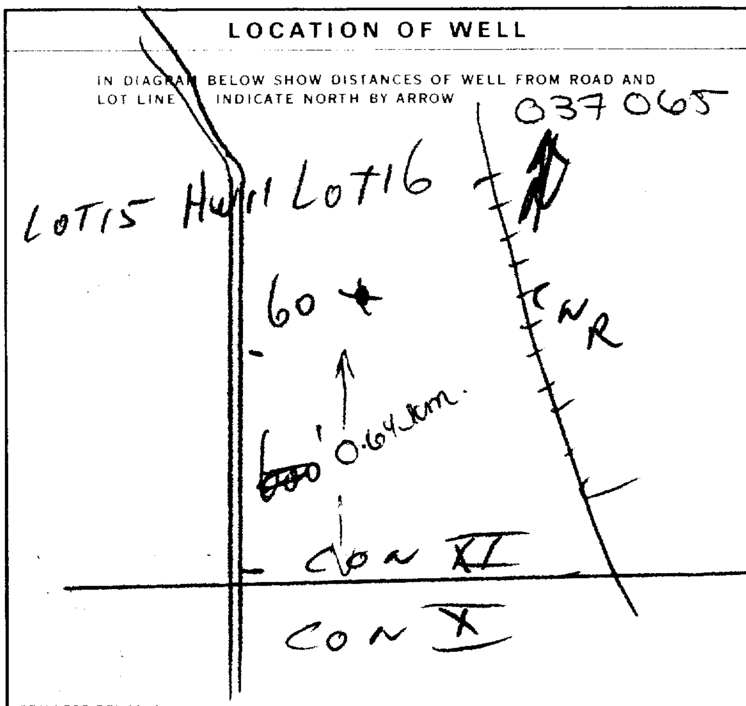
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING GIVE RATE ___ GPM
PUMP INTAKE SET AT ___ FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING 070 FEET
RECOMMENDED PUMPING RATE 0006 GPM

LOCATION OF WELL

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



DRILLERS REMARKS

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

WATER USE 01
1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 2
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: Henry Hammers LICENCE NUMBER: 2514
ADDRESS: RR# 3 Barrie Ont
NAME OF DRILLER OR BORER: Same. LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: Henry Hammers
SUBMISSION DATE DAY ___ MO. ___ YR. ___

OFFICE USE ONLY

DATA SOURCE 1 CONTRACTOR 2514 DATE RECEIVED 200184
DATE OF INSPECTION INSPECTOR
REMARKS located only 11/85 PK

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506-4-77 FORM 7

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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

11 | 5733085 | Municipality 57005 | Con. CON 11

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
[redacted]	Innisfil	11	16
	Address: 3221 St. Pauls Road		Date completed: 15 day, oct month, 97 year

Northing | RC | Elevation | RC | Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	To
Black	Topsoil			0	1
Brown	Sand			1	4
Gray	Sand			4	10
Brown	Sand		W.B.S.	10	15
Brown	Clay		Silty	15	44
Brown	Sand		W.B.S.	44	50

31
32

41 WATER RECORD

Water found at – feet	Kind of water
44	☑ Fresh

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	To
6 1/4	☑ Steel	.188	0	44

SCREEN

Sizes of opening (Slot No.): 6 | Diameter: 6 inches | Length: 6 feet
Material and type: Stainless | Depth at top of screen: 44 feet

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at – feet From	To	Material and type (Cement grout, bentonite, etc.)
0	44	Bentonite

71 PUMPING TEST

Pumping test method: ☑ Pump ☐ Bailer | Pumping rate: 4 GPM | Duration of pumping: 1 Hours ... Mins

Water levels during: ☐ Pumping ☑ Recovery

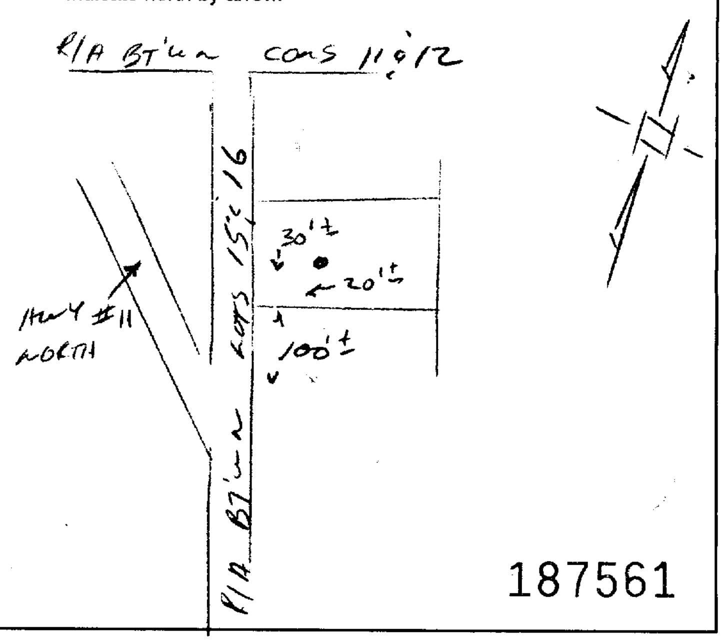
Static level	Water level end of pumping	15 minutes	30 minutes	45 minutes	60 minutes
17 feet	48 feet	19 feet	17 feet	feet	feet

If flowing give rate: GPM | Pump intake set at: 48 feet | Water at end of test: ☑ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep | Recommended pump setting: 45 feet | Recommended pump rate: 4 GPM

LOCATION OF WELL

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



187561

FINAL STATUS OF WELL

☑ Water supply
☐ Observation well
☐ Test hole
☐ Recharge well
☐ Abandoned, insufficient supply
☐ Abandoned, poor quality
☐ Abandoned (Other)
☐ Dewatering
☐ Unfinished
☐ Replacement well

WATER USE

☑ Domestic
☐ Stock
☐ Irrigation
☐ Industrial
☐ Commercial
☐ Municipal
☐ Public supply
☐ Cooling & air conditioning
☐ Not used
☐ Other ....

METHOD OF CONSTRUCTION

☐ Cable tool
☑ Rotary (conventional)
☐ Rotary (reverse)
☐ Rotary (air)
☐ Air percussion
☐ Boring
☐ Diamond
☐ Jetting
☐ Driving
☐ Digging
☐ Other ....

Name of Well Contractor: Drury Well Drilling | Well Contractor's Licence No.: 1851
Address: RR # 1 Barrie
Name of Well Technician: Robert Drury | Well Technician's Licence No.: T-0672
Signature of Technician/Contractor: [signature] | Submission date: 25 day oct mo 97 yr

MINISTRY USE ONLY
Data source | Contractor 1851 | Date received OCT 31 1997
Date of inspection | Inspector
Remarks

CSS S8

0506 (07/94) Front Form 9

2 - MINISTER OF ENVIRONMENT & ENERGY COPY

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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

11 — 5733825 — Municipality 57005 — Con. CON 04

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
SIMCOE	INNISFIL	4				6

Address: 8326 YONGE ST LOT 2MO
Date completed: 03 (day) 07 (month) 98 (year)

21 — T/M — 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	Depth – feet To
	CLAY	GRAVEL		0	15
	SAND	CLAY		15	35
	CLAY			35	60
	SAND			60	65

31 — 32

41 WATER RECORD

Water found at – feet	Kind of water
60 65	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	Depth – feet To
6¼	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	0	65
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter	Length
6	6 inches	4 feet

Material and type: 6 Steel
Depth at top of screen: 61 feet

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at – feet From	Depth set at – feet To	Material and type (Cement grout, bentonite, etc.)
		Bensecal

71 PUMPING TEST

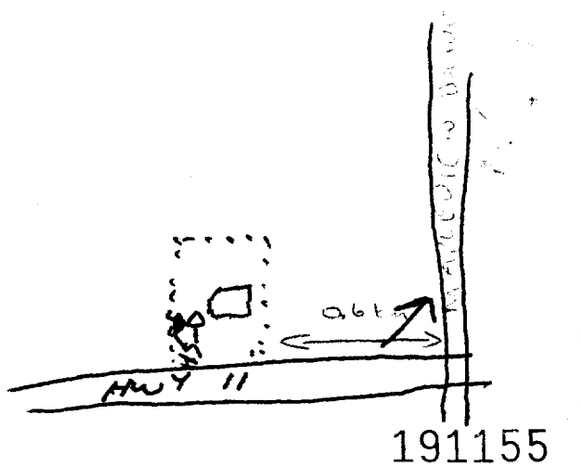
Pumping test method: 1 ☑ Pump 2 ☐ Bailer
Pumping rate: 5 GPM
Duration of pumping: 1 Hours 30 Mins

Static level	Water level end of pumping	Water levels during: 1 ☑ Pumping 2 ☐ Recovery	15 minutes	30 minutes	45 minutes	60 minutes
25 feet	60 feet		60 feet	60 feet	60 feet	60 feet

If flowing give rate: GPM
Pump intake set at: feet
Water at end of test: ☐ Clear ☐ Cloudy
Recommended pump type: ☐ Shallow ☐ Deep
Recommended pump setting: 60 feet
Recommended pump rate: 5 GPM

LOCATION OF WELL

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



191155

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 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE

1 ☐ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not used
10 ☐ Other

METHOD OF CONSTRUCTION

1 ☑ Cable tool
2 ☐ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☐ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
MIKE GILCHRIST	6071
Address: R.R. #1 ORO STATION ON L0L 2E0	
Name of Well Technician: TED WESTRA	Well Technician's Licence No.: 0340
Signature of Technician/Contractor	Submission date: day mo yr

MINISTRY USE ONLY

Data source — Contracctor: 7061 — Date received: NOV 27 1998
Date of inspection — Inspector
Remarks

CSS. ES9

0506 (07/94) Front Form 9

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Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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

11 (1 2) **5733826** Municipality 57005 (10 14) Con. CON (15 22 23 24) 04

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot (25-27)
SIMCOE	INNISFIL	4				4

Address: [redacted] 8322 YONGE ST LOL-2NO

Date completed: 07 (day) 07 (month) 98 (year)

21 (1 2) T/M (10) Northing (12 17) RC (18 24) Elevation (25 26) RC (30) Basin Code (31 47) ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	Depth – feet To
	CLAY	GRAVEL		0	15
	SAND	CLAY		15	35
	CLAY			35	45
	SAND	CLAY		45	65
	SAND			65	71

31 (10 14 15 21 32 43 54 65 75 80)

32

41 WATER RECORD

Water found at – feet	Kind of water			
65 (10-13) / 71	1 ☑ Fresh	3 ☐ Sulphur	4 ☐ Minerals	6 ☐ Gas
(15-18)	1 ☐ Fresh	2 ☐ Salty	3 ☐ Sulphur	4 ☐ Minerals	6 ☐ Gas
(20-23)	1 ☐ Fresh	2 ☐ Salty	3 ☐ Sulphur	4 ☐ Minerals	6 ☐ Gas
(25-28)	1 ☐ Fresh	2 ☐ Salty	3 ☐ Sulphur	4 ☐ Minerals	6 ☐ Gas
(30-33)	1 ☐ Fresh	2 ☐ Salty	3 ☐ Sulphur	4 ☐ Minerals	6 ☐ Gas

(14) (19) (24) (29) (34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	Depth – feet To
6¼ (10-11)	1 ☑ Steel (12) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	0	67 (13-16)
(17-18)	1 ☐ Steel (19) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(20-23)
(24-25)	1 ☐ Steel (26) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(27-30)

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38)	Length (39-40)
6	6 inches	4 feet

Material and type: 8 Steel

Depth at top of screen (41-44): 67 feet (30)

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at – feet From	Depth set at – feet To	Material and type (Cement grout, bentonite, etc.)
(10-13)	(14-17)	Bonseal.
(18-21)	(22-25)	
(26-29)	(30-33)	(80)

71 PUMPING TEST

Pumping test method (10): 1 ☑ Pump 2 ☐ Bailer

Pumping rate (11-14): 6 GPM

Duration of pumping (15-16 / 17-18): 1 Hours 30 Mins

25 Water levels during: 1 ☐ Pumping 2 ☐ Recovery

Static level (19-21)	Water level end of pumping (22-24)	15 minutes (26-28)	30 minutes (29-31)	45 minutes (32-34)	60 minutes (35-37)
25 feet	65 feet	65 feet	65 feet	65 feet	65 feet

If flowing give rate (38-41): GPM

Pump intake set at: feet

Water at end of test (42): ☐ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☐ Deep

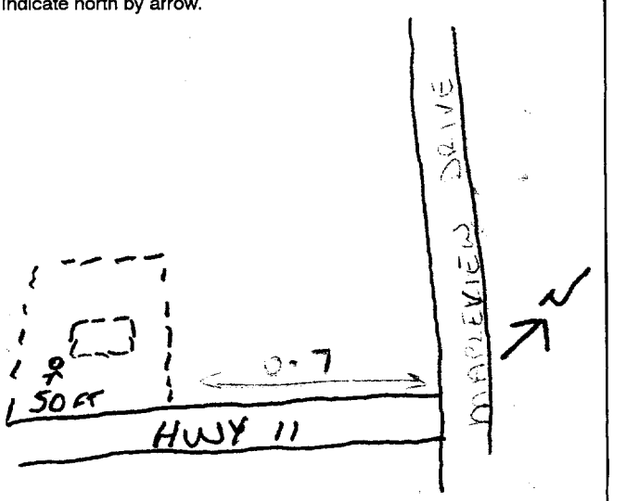
Recommended pump setting (43-45): 65 feet

Recommended pump rate (46-49): 6 GPM

(50-53)

LOCATION OF WELL

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



191156

FINAL STATUS OF WELL (54)

1 ☑ Water supply
2 ☐ Observation well
3 ☐ Test hole
4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply
6 ☐ Abandoned, poor quality
7 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE (55-56)

1 ☑ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not used
10 ☐ Other

METHOD OF CONSTRUCTION (57)

1 ☐ Cable tool
2 ☐ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☐ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
[redacted] CAN-DRILL	6071
Address: R.R. #1 OLD STATION ON. L0L 2E0	
Name of Well Technician: TED WESTRA	Well Technician's Licence No.: 0340
Signature of Technician/Contractor	Submission date: day mo yr

MINISTRY USE ONLY

Data source (58)	Contracctor (59-62)	Date received (63-68) (80)
	7061	NOV 27 1998
Date of inspection	Inspector	
Remarks		

CSS. ES9

0506 (07/94) Front Form 9

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Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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

11 | 5734439 | Municipality 57005 | Con. CON XI

County or District: Simcoe
Township/Borough/City/Town/Village: Innisfil
Con block tract survey, etc.: XI
Lot: 15
Address: 8334 Yonge St., Innisfil
Date completed: 2 day 3 month 99 year
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	Depth – feet To
dark	top soil			0	1
yellow	sand			1	4
"	silt			4	18
"	sand			18	27
"	sand	silt, clay		27	52
"	sand			52	64
"	clay			64	–

41 WATER RECORD

Water found at – feet	Kind of water
52 64	1 [X] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 6 [ ] Gas
	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 6 [ ] Gas
	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 6 [ ] Gas
	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 6 [ ] Gas
	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 6 [ ] Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	Depth – feet To
64	1 [X] Steel 2 [ ] Galvanized 3 [ ] Concrete 4 [ ] Open hole 5 [ ] Plastic	.188	+1½	60
	1 [ ] Steel 2 [ ] Galvanized 3 [ ] Concrete 4 [ ] Open hole 5 [ ] Plastic			
	1 [ ] Steel 2 [ ] Galvanized 3 [ ] Concrete 4 [ ] Open hole 5 [ ] Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter	Length
6	6 inches	4 feet

Material and type: stainless steel
Depth at top of screen: 60 feet

61 PLUGGING & SEALING RECORD

[ ] Annular space [ ] Abandonment

Depth set at – feet From	Depth set at – feet To	Material and type (Cement grout, bentonite, etc.)
0	2	sand
2	10	Portland

71 PUMPING TEST

Pumping test method: 1 [ ] Pump 2 [X] Bailer
Pumping rate: 9 GPM
Duration of pumping: 1 Hours 0 Mins

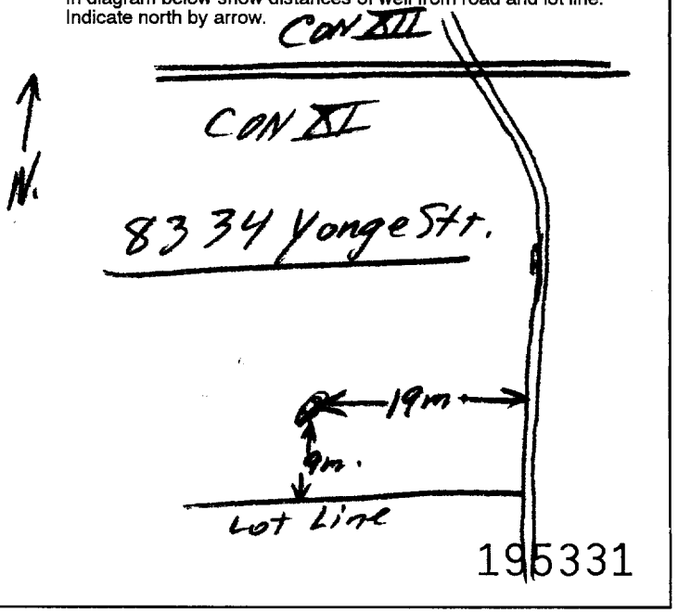
25 Water levels during: 1 [X] Pumping 2 [ ] Recovery

Static level	Water level end of pumping	15 minutes	30 minutes	45 minutes	60 minutes
26 feet	58 feet	58 feet	58 feet	58 feet	58 feet

If flowing give rate: GPM
Pump intake set at: 55 feet
Water at end of test: [X] Clear [ ] Cloudy
Recommended pump type: [ ] Shallow [X] Deep
Recommended pump setting: 45 feet
Recommended pump rate: 5 GPM

LOCATION OF WELL

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



195331

FINAL STATUS OF WELL

54
1 [X] Water supply
2 [ ] Observation well
3 [ ] Test hole
4 [ ] Recharge well
5 [ ] Abandoned, insufficient supply
6 [ ] Abandoned, poor quality
7 [ ] Abandoned (Other)
8 [ ] Dewatering
9 [ ] Unfinished
10 [ ] Replacement well

WATER USE

55-56
1 [X] Domestic
2 [ ] Stock
3 [ ] Irrigation
4 [ ] Industrial
5 [ ] Commercial
6 [ ] Municipal
7 [ ] Public supply
8 [ ] Cooling & air conditioning
9 [ ] Not used
10 [ ] Other

METHOD OF CONSTRUCTION

57
1 [X] Cable tool
2 [ ] Rotary (conventional)
3 [ ] Rotary (reverse)
4 [ ] Rotary (air)
5 [ ] Air percussion
6 [ ] Boring
7 [ ] Diamond
8 [ ] Jetting
9 [ ] Driving
10 [ ] Digging
11 [ ] Other

Name of Well Contractor: A. Hammers Well Drilling Inc.
Well Contractor's Licence No.: 2513
Address: 737 Essa Rd, Barrie, Ont.
Name of Well Technician: A. Hammers
Well Technician's Licence No.: T-0229
Signature of Technician/Contractor: A. Hammers
Submission date: day 27 mo 08 yr 99

MINISTRY USE ONLY
Data source 58
Contractor 59-62: 2513
Date received 63-68: AUG 31 1999
Date of inspection
Inspector
Remarks

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Ontario **Ministry of the Environment**

The Ontario Water Resources Act
WATER WELL RECORD

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

11 — 5736948 — Municipality 57005 — Con. CON XI

County or District	Township/Borough/City/Town/Village	Con. block tract survey etc.	Lot
Simcoe	Innisfil	XI	16

Address: 8329 Yonge St. Innisfil

Date completed: day 4 month 6 year 02

Northing — RC — Elevation — RC — Basin Code — UTM

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
dark	top soil			0	1
brown	silt	sand		1	17
yellow	sand			17	60
grey	sand		very fine	60	67

41 WATER RECORD

Water found at - feet	Kind of water
60 to 67	1 ☒ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6¼	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	+1½	62
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter	Length
4	6 inches	5 feet

Material and type: stainless steel — Depth at top of screen: 62 feet

61 PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	4	sand
4	10	Holeplug

71 PUMPING TEST

Pumping test method: 2 ☒ Bailer — Pumping rate: ½ GPM — Duration of pumping: 1 Hours 0 Mins

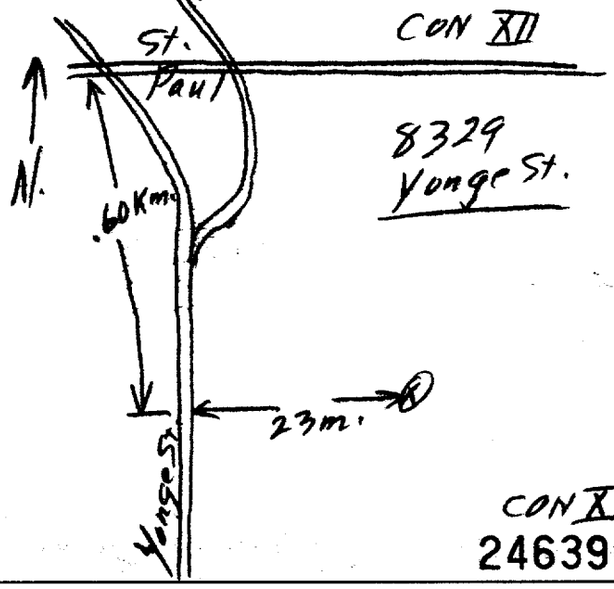
Static level	Water level end of pumping	Water levels during ☒ Pumping ☐ Recovery			
22½ feet	59 feet	15 minutes: 59 feet	30 minutes: 59 feet	45 minutes: 59 feet	60 minutes: 59 feet

If flowing give rate: GPM — Pump intake set at: feet — Water at end of test: ☒ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☒ Deep — Recommended pump setting: 52 feet — Recommended pump rate: 5 GPM

LOCATION OF WELL

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



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 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE

1 ☒ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

1 ☒ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☐ Rotary (air) 5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
A. Hammers Well Drilling Inc.	2513
Address: 737 Essa Rd, Barrie, On.	
Name of Well Technician: A. Hammers	Well Technician's Licence No.: T-229
Signature of Technician/Contractor: A. Hammers	Submission date: day 21 mo 6 yr 02

MINISTRY USE ONLY

Data source	Contractor: 2513	Date received: JUN 26 2002
Date of inspection	Inspector	
Remarks		

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0506 (07/00) Front Form 9

Ontario Ministry of the Environment

Well [illegible] number below)
A000103
A000103

Well Record
Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

[redacted]

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Simcoe	Innisfil	15	XI

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
8384	St. PAUL	

GPS Reading — NAD: 83 · Zone: 17 · Easting: 225608 · Northing: 5126660 · Unit Make/Model: Garmin 201 · Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Metres To
brown	sand	silt, stones	hard	0	4.26
yellow	sand			4.26	18.89
blue	sand	silt, traces clay		18.89	25.90
grey	sand	silt	cemented	25.90	28.04

Hole Diameter

Depth From	Metres To	Diameter Centimetres
0	6	20

Water Record

Water found at Metres	Kind of Water
26 m	☒ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☒ Clear and sediment free ☐ Other, specify

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To
Casing				
15.87	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	+40cm. 0.45m.	26.21
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen — Outside diam		Slot No.		
14.44	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	6	26.21	28.04
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method: submersible
Pump intake set at - (metres): 25.60
Pumping rate - (litres/min): 9.10
Duration of pumping: 1 hrs + 0 min
Final water level end of pumping: 16.78 metres
Recommended pump type: ☐ Shallow ☒ Deep
Recommended pump depth: 25.0 metres
Recommended pump rate: 20.45 (litres/min)
If flowing give rate - (litres/min):
If pumping discontinued, give reason.

Draw Down Time min	Water Level Metres	Recovery Time min	Water Level Metres
Static Level	11.12		
1	11.78	1	16.55
2	12.13	2	16.22
3	12.54	3	15.81
4	12.92	4	15.61
5	13.20	5	15.36
10	14.75	10	14.24
15	15.79	15	13.35
20	16.55	20	12.85
25	17.06	25	12.19
30	17.37	30	11.73
40	16.86	40	11.49
50	16.78	50	11.42
60	16.78	60	11.37

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6	Bentonite slurry EZ Seal + Holeplug	

Method of Construction

☒ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

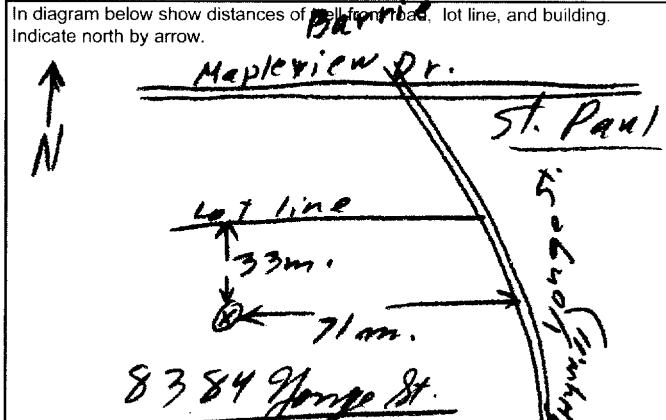
☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: Al Hammers Well Drilling Inc.
Well Contractor's Licence No.: 2513
Business Address (street name, number, city etc.): 737 Essa Rd, Barrie, On.
Name of Well Technician (last name, first name): A. Hammers
Well Technician's Licence No.: T-229
Signature of Technician/Contractor: x A Hammers
Date Submitted: YYYY 2004 MM 05 DD 04

Location of Well

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



Audit No. Z 00199
Date Well Completed: YYYY 2004 MM 4 DD 7
Was the well owner's information package delivered? ☒ Yes ☐ No
Date Delivered: YYYY 2004 MM 4 DD 2

Ministry Use Only

Data Source:
Contractor: 2513
Date Received: MAY 11 2004
Date of Inspection: YYYY MM DD
Remarks: CSS.ES5
Well Record Number: 5738721

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☒ Well Owner's Copy ☐ *Cette formule est disponible en français*

Ontario Ministry of the Environment

We A 000104 nt number below)

A 000104

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

[redacted]

Address of Well Location (County/District/Municipality): Simcoe

Township: Innisfil

Lot: 15

Concession: XI

RR#/Street Number/Name: 8384

City/Town/Village: St. Paul

Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone 17 | Easting 325608 | Northing 5126660 | Unit Make/Model Garmin 201 | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
	Abandoned well				

Hole Diameter

Depth From	Depth To	Diameter Centimetres

Water Record

Water found at ___ Metres — Kind of Water

- ___ m ☐ Fresh ☐ Sulphur
- ☐ Gas ☐ Salty ☐ Minerals
- ☐ Other:
- ___ m ☐ Fresh ☐ Sulphur
- ☐ Gas ☐ Salty ☐ Minerals
- ☐ Other:
- ___ m ☐ Fresh ☐ Sulphur
- ☐ Gas ☐ Salty ☐ Minerals
- ☐ Other:

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify

Chlorinated ☐ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
16.81	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	~~486~~ 0.48	1.52	Total Depth 22.86
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☐ Annular space ☒ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	22.86	Holeplug + EZ Seal → 6m depth + filter sand (intermittent layers)	

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☐ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☒ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: A. Hammers Well Drilling Inc. | Well Contractor's Licence No.: 2513

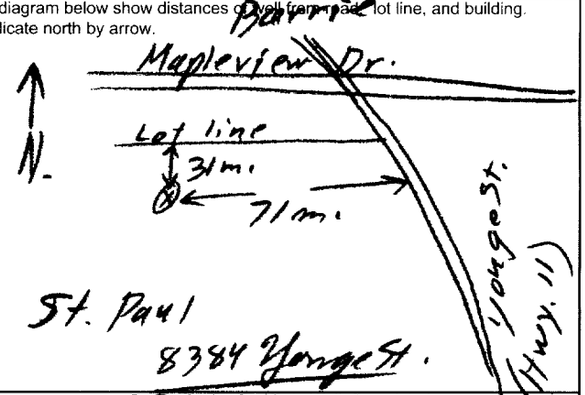
Business Address (street name, number, city etc.): 737 Essa Rd, Barrie, On.

Name of Well Technician (last name, first name): A. Hammers | Well Technician's Licence No.: T-229

Signature of Technician/Contractor: A. Hammers | Date Submitted YYYY MM DD: 2004 05 04

Location of Well

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



Audit No. Z 00200

Date Well Completed YYYY MM DD: 2004 4 13

Was the well owner's information package delivered? ☒ Yes ☐ No

Date Delivered YYYY MM DD: 2004 4 2

Ministry Use Only

Data Source

Contractor: 2513

Date Received: MAY 11 2004 YYYY MM DD

Date of Inspection YYYY MM DD

Remarks: CSSES5

Well Record Number: 5738722

Imp measurements.

Ontario | Ministry of the Environment

Well Tag No. (place sticker and/or print number below): A 048085 — A048085.

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

[redacted]

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
Simcoe	Innisfil.	15 #	11

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
8365 Yonge St South	Stroud.	8365

GPS Reading: NAD 83 | Zone 17 | Easting 609665 | Northing 4911082 | Unit Make/Model: meridian | Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify ______

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres From	Depth Metres To
Black	Sand.	Gravel.	Topsoil	0	1
Grey	Clay	Sand	Loose	1	49
Grey	Sand		Porous	49	59

Hole Diameter

Depth Metres From	Depth Metres To	Diameter Centimetres
0	51	6¼
51	59	5

Water Record

Water found at Metres	Kind of Water
55 m	☑ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was: ☑ Clear and sediment free ☐ Other, specify ______

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth Metres From	Depth Metres To
Casing				
6¼"	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.188	+2'	51'
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam: 5"	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☑ Galvanized	Slot No. 6	51.	59.
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method: Pump.

Pump intake set at - (metres): 57

Pumping rate - (litres/min): 4

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping: 50' 8¾ metres

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump depth: 57 metres

Recommended pump rate (litres/min): 4 gpm

If flowing give rate - (litres/min):

If pumping discontinued, give reason:

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	25' 2"		50' 8¾
1	29' 3½	1	46' 10½
2	33' 7¼	2	42' 7½
3	37' 4¾	3	38' 9½
4	41' 3½	4	34' 4¾
5	44' 10¼	5	31' 10¾
10	49' 2½	10	27' 9½
15	50' 1½	15	25' 10½
20	50' 7¼	20	25' 3¼
25	50' 8½	25	25' 2
30	50' 8¾	30	"
40	"	40	"
50	"	50	"
60	"	60	"

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	20	Bentonite	3.5 ft

Method of Construction

☑ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging ☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other ☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other ☐ Stock ☐ Commercial ☐ Not used ☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other) ☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering ☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: Mike Hammers Well Drill | Well Contractor's Licence No.: 2514

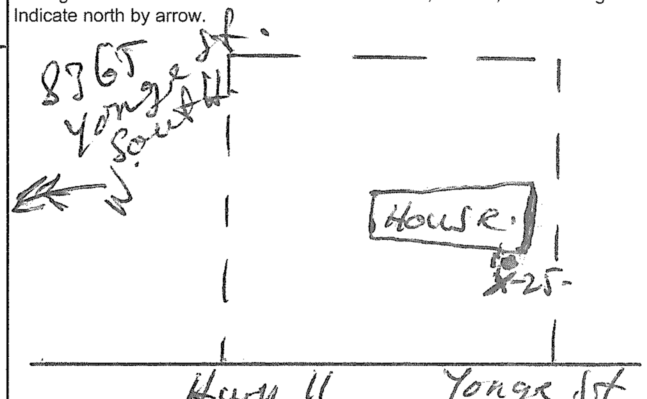
Business Address (street name, number, city etc.): 2091 Dwyer Rd Midhurst On L0L1X0.

Name of Well Technician (last name, first name): Mike Hammers. | Well Technician's Licence No.: T-0527

Signature of Technician/Contractor: X [signature] | Date Submitted YYYY MM DD

Location of Well

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



Audit No. Z 54565

Date Well Completed (YYYY MM DD): 2008 01 21

Was the well owner's information package delivered? ☑ Yes ☐ No

Date Delivered (YYYY MM DD): 2008 01 18

Ministry Use Only

Data Source	Contractor
Date Received: FEB 26 2008	Date of Inspection YYYY MM DD
Remarks	Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐ *Cette formule est disponible en français*

Ontario — Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)*

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	SUMMIT BROOKE Const.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code) / Fax
1235 Journey's End Circle	New Market	On.	L3Y8T7	9058983556 / Fax

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
8392 Yonge St.	Innisfil	15	XI

County/District/Municipality	City/Town/Village	Province	Postal Code
Simcoe	St. Paul	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	609400	4911050	—	—

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Abandon 6¼" ID drilled well 62ft. deep drilled in March 1982 by driller No. 2514 Well No. - 57-18447				
			sand	62	48
	Casing removed to 6ft.		Bentonite holeplug	48	22
			sand	22	13
			Bentonite holeplug	13	6
			Sand	6	0

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☒ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, *specify* ☐ Other, specify

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* ____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

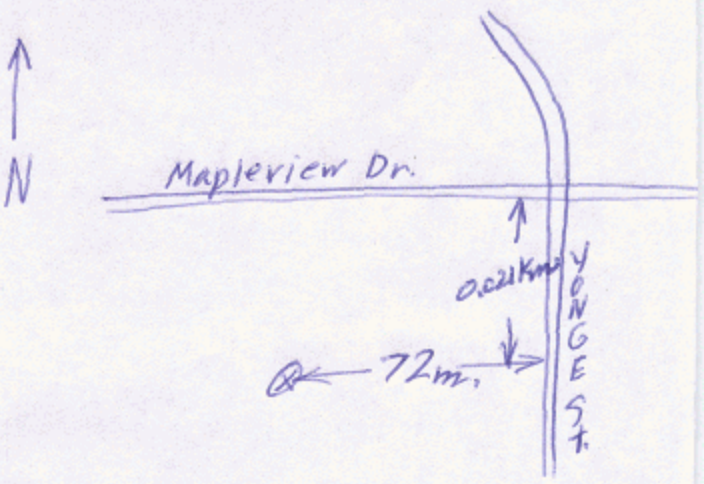
Well production *(l/min / GPM)*

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Al Hammers Well Drilling Inc.	2513

Business Address (Street Number/Name)	Municipality
737 Essa Rd.	Barrie

Province	Postal Code	Business E-mail Address
On.	L4N9G1	—

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
7057216648	Hammers Albert

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T229	G. Hammers	2011/02/04

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☒ No	Owner not available	2011/02/04

Ministry Use Only

Audit No. Z103439

SEP 13 2011

Received

0506E (12/2007)

Ministry's Copy

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A 000103

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Summit Brooke Const.	—	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
1235 Journey's End Circle	NewMarket	On.	L3Y8T7	9058983556 FAX

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
8384 Yonge St.	Innisfil	15	XI

County/District/Municipality	City/Town/Village	Province	Postal Code
Simcoe	St. Paul	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	609486	4911210	—	—

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Abandon previously Drilled well April 2004	by driller no. 2513	No. A000103 (6¼" X 92ft.)		
	Casing cut down 6ft.		sand	92	73
			Bentonite holeplug	73	37
			sand	37	23
			Bentonite holeplug	23	6
			sand	6	0

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☒ Not used ☐ Dewatering ☐ Domestic ☐ Municipal ☐ Test Hole ☐ Monitoring ☐ Livestock ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, *specify* ☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

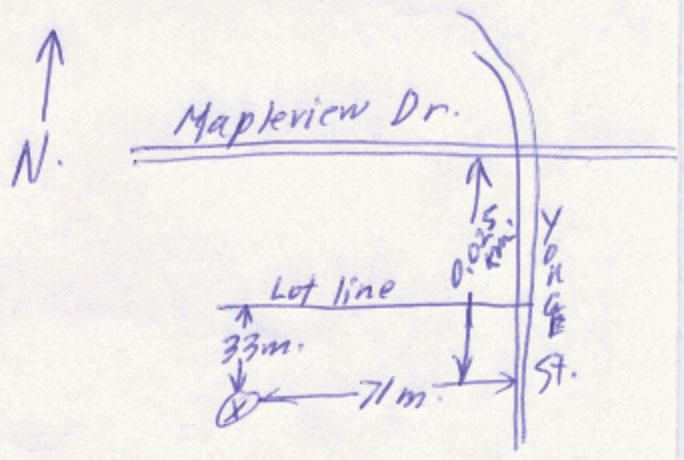
Well production *(l/min / GPM)*

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Al Hammers Well Drilling Inc.	2513

Business Address (Street Number/Name)	Municipality
737 Essa Rd.	Barrie

Province	Postal Code	Business E-mail Address
On.	L4N9G1	—

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
7057216648	Hammers Albert

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T229	A. Hammers	20110908

Well owner's information package delivered ☐ Yes ☒ No

Date Package Delivered: Owner not Available

Date Work Completed: 20110204

Ministry Use Only

Audit No. Z103440

SEP 13 2011

Received

0506E (12/2007)

Ministry's Copy

Ontario — Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)*

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Summit Brooke Const.	—	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code) / Fax
1235 Journey's End Circle	NewMarket	On.	L3Y8T7	905 898 3556

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
8384 Yonge St.	Innisfil	15	XI

County/District/Municipality	City/Town/Village	Province	Postal Code
Simcoe	St. Paul	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	609486	4911208	—	—

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Abandon	dug well below 7' deep pit			
	Hole 36" X 22 ft. deep. Totally dry hole.				
			Bentonite hole plug	22	20
			sand	20	4
			Bentonite hole plug	4	0
			Pit abandoned after		

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, *specify* ____

Well Use

☐ Public ☐ Commercial ☒ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, *specify* ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, *specify* ____ ☐ Other, *specify* ____

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh	Untested	Other, specify
	☐	☐	☐	____
	☐	☐	☐	____
	☐	☐	☐	____

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, *specify* ____

If pumping discontinued, give reason: ____

Pump intake set at *(m/ft)* ____

Pumping rate *(l/min / GPM)* ____

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)* ____

If flowing give rate *(l/min / GPM)* ____

Recommended pump depth *(m/ft)* ____

Recommended pump rate *(l/min / GPM)* ____

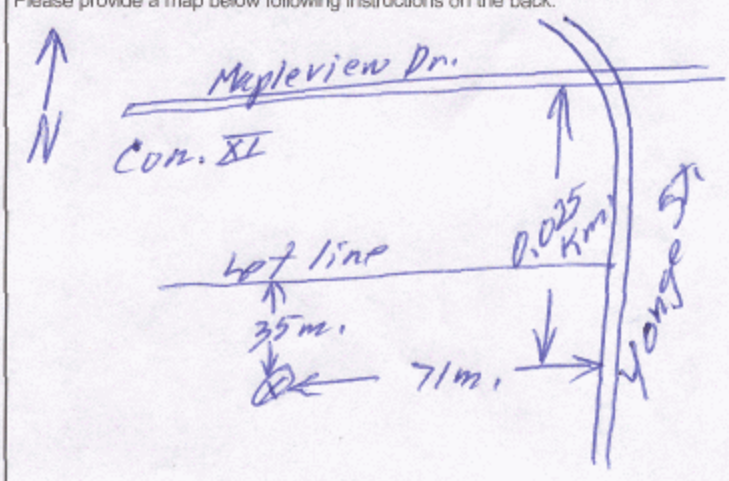
Well production *(l/min / GPM)* ____

Disinfected? ☐ Yes ☒ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: ____

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Al Hammers Well Drilling Inc.	2513

Business Address (Street Number/Name)	Municipality
737 Essa Rd.	Barrie

Province	Postal Code	Business E-mail Address
On.	L4N9G1	—

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
705 721 6648	Hammers Albert

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T229	A. Hammers	2011 09 08

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2011 02 04	2011 02 04

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SEP 13 2011

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Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A 063855

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
#938 YONGE ST	INNISFIL	15	11

County/District/Municipality	City/Town/Village	Province	Postal Code
SIMCOE		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	609682	4911066		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BL	CLAY			0	18'
GREY	CLAY	SAND		18'	53'
GREY	SAND		DIRTY	53'	63'
BROWN	SAND	& B		63'	68'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	QUIK-GROUT	7 FT³

Method of Construction

☒ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼"	STEEL	.188	+2	63'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5½"	STEEL	#6	63'	68'

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft): 65'

Pumping rate (l/min / GPM): 4 60~

Duration of pumping: 1 hrs + 30 min

Final water level end of pumping (m/ft): 56'

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 60'

Recommended pump rate (l/min / GPM): 4 60~

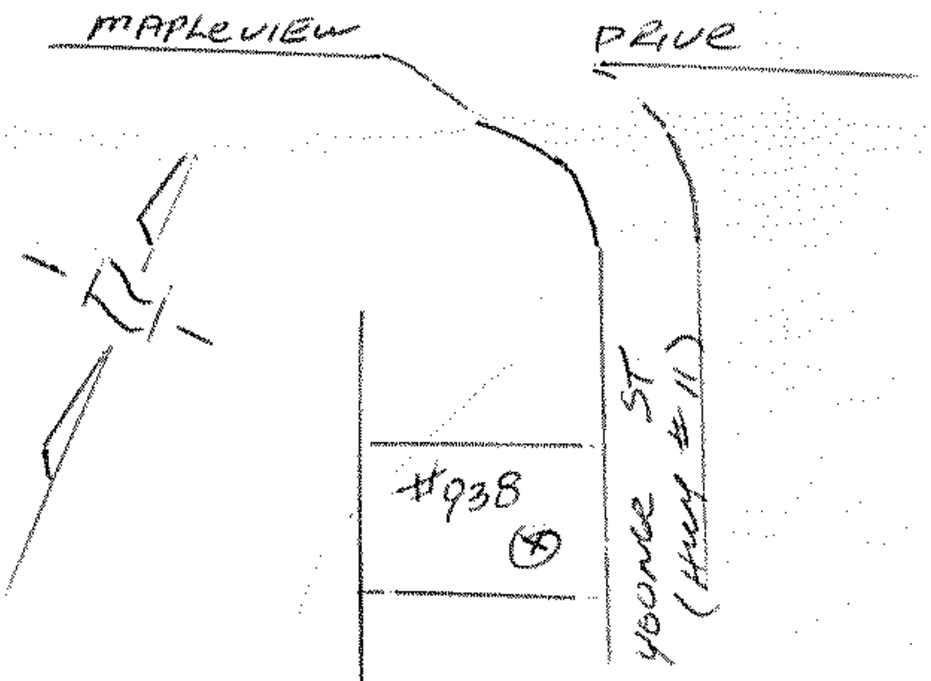
Well production (l/min / GPM): 4 60~

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	29'		
1	35	1	50-8
2	36	2	48-3
3	37-10	3	46-6
4	38-6	4	45
5	39	5	43-6
10	41-3	10	38
15	45	15	34-8
20	49	20	32-9
25	52-3	25	31-7
30	53-6	30	30-6
40		40	30
50	54-9	50	30
60	55-10	60	30

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Water Details

Water found at Depth	Kind of Water	
63' (m/ft) ☐ Gas	☒ Fresh ☒ Untested ☐ Other, *specify*	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
DRURY WELL DRILLING LTD	1851

Business Address (Street Number/Name)	Municipality
RR#1 BARRIE	BARRIE

Province	Postal Code	Business E-mail Address
	L4M4X8	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
705 721 1073	NORM JACQUES

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
7171		20160401

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☒ No		20160401

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Audit No. Z 164616

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MW 10

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Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A269561

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
GreatGulf	Rain Song Land Developmenting		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
3751 Victoria Park Ave	Toronto	ON	M1W3Z4	9499913140

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Maple view Dr E / Yonge St			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Barrie	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	609514	4911058		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Sand			0	25'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	1'	Stick up	.6
1'	19'	Bentonite	
19'	25'	well sand	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☑ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
2"	PVC	3/16"	0	20'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
2 3/8"	PVC	10	20'	25'

Status of Well

☐ Water Supply
☐ Replacement Well
☑ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	25'	6"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

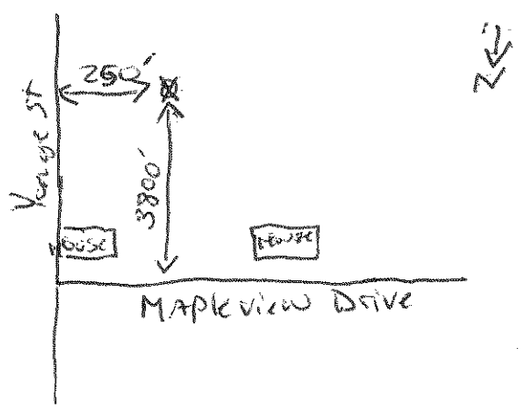
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Pontil Drilling Services	7614

Business Address (Street Number/Name)	Municipality
6 Albert St	Mount Albert

Province	Postal Code	Business E-mail Address
ON	L0G1M0	info@pontildrilling.com

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
2893388388	MacDonald Kevin

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
4103		2019/12/06

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: ____

Date Work Completed: 2019/09/28

Ministry Use Only

Audit No. Z324850

DEC 16 2019

Received

MECP Water Well Record - Formation Report

Well ID: **5701273**
Concession (Lot): CON 10(015)
UTM Zone (Easting, Northing) [RC]: 17 (609732.4,4909940) [5]
Depth to bedrock (m):
Elevation (masl): 275.604827

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 10/27/1962 12:00 AM
Primary Use: Livestock
Secondary Use: Domestic
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
		PREVIOUSLY DUG	0	11.2776
	BROWN	*CLAY MEDIUM SAND GRAVEL*	11.2776	16.4592
		MEDIUM SAND	16.4592	18.288

Well ID: **5701415**
Concession (Lot): CON 11(015)
UTM Zone (Easting, Northing) [RC]: 17 (609572.4,4910457) [5]
Depth to bedrock (m):
Elevation (masl): 272.965759

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 8/30/1965 12:00 AM
Primary Use: Livestock
Secondary Use: Domestic
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
		PREVIOUSLY DUG	0	10.0584
		MEDIUM SAND CLAY	10.0584	13.1064
		MEDIUM SAND	13.1064	16.764
		FINE SAND	16.764	17.6784

Well ID: **5701419**
Concession (Lot): CON 11(015)
UTM Zone (Easting, Northing) [RC]: 17 (609575.4,4910893) [5]
Depth to bedrock (m):
Elevation (masl): 273.088378

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 1/17/1967 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
	BROWN	*CLAY*	0	10.668
		MEDIUM SAND	10.668	15.24

Well ID: **5701421**
Concession (Lot): CON 11(016)
UTM Zone (Easting, Northing) [RC]: 17 (609694.4,4911024) [5]
Depth to bedrock (m):
Elevation (masl): 269.680999

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 10/1/1965 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
	BROWN	*CLAY*	0	3.6576
		COARSE SAND	3.6576	12.192

Well ID: **5705828**
Concession (Lot): CON 11(015)
UTM Zone (Easting, Northing) [RC]: 17 (609614.4,4910663) [4]
Depth to bedrock (m):
Elevation (masl): 273.875061

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 9/23/1968 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
	BROWN	*CLAY STONES*	0	6.096
		MEDIUM SAND	6.096	10.9728

Well ID: **5711629**
Concession (Lot): CON 11(016)
UTM Zone (Easting, Northing) [RC]: 17 (609714.4,4910923) [5]
Depth to bedrock (m):
Elevation (masl): 271.084106

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 10/9/1974 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
		TOPSOIL	0	0.6096
	BROWN	*CLAY*	0.6096	4.8768
	BROWN	*SAND CLAY*	4.8768	7.0104
	GREY	*SAND*	7.0104	17.6784

Well ID: **5716067**
Concession (Lot): CON 11(015)
UTM Zone (Easting, Northing) [RC]: 17 (609564.4,4910423) [5]
Depth to bedrock (m):
Elevation (masl): 272.5065

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 4/29/1979 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
		PREVIOUSLY DUG	0	9.144
		PREV. DRILLED	9.144	18.288
	BROWN	*SAND CLAY*	18.288	19.5072

	GREY	*SAND CLAY LAYERED*	19.5072	25.2984
	GREY	*CLAY*	25.2984	28.0416

Well ID: **5718243**
Concession (Lot): CON 11(016)
UTM Zone (Easting, Northing) [RC]: 17 (609714.4,4910823) [5]
Depth to bedrock (m):
Elevation (masl): 271.757446

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 11/3/1982 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
		PREVIOUSLY DUG	0	7.0104
	BROWN	*SILT*	7.0104	17.6784
	GREY	*MEDIUM SAND*	17.6784	19.812

Well ID: **5718813**
Concession (Lot): CON 11(016)
UTM Zone (Easting, Northing) [RC]: 17 (609714.4,4910823) [5]
Depth to bedrock (m):
Elevation (masl): 271.757446

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 8/23/1983 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
		FILL	0	0.9144
	BROWN	*CLAY SAND*	0.9144	12.192
	YELLOW	*SAND CLAY GRAVEL*	12.192	18.288
	GREY	*FINE SAND VERY*	18.288	22.86

Well ID: **5733085**
Concession (Lot): CON 11(016)
UTM Zone (Easting, Northing) [RC]: 17 (609971.4,4910979) [9]
Depth to bedrock (m):
Elevation (masl): 261.464569

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 10/15/1997 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
	BLACK	*TOPSOIL*	0	0.3048
	BROWN	*SAND*	0.3048	1.2192
	GREY	*SAND*	1.2192	3.048
	BROWN	*SAND WATER-BEARING*	3.048	4.572
	BROWN	*CLAY SILTY*	4.572	13.4112

	BROWN	*SAND WATER-BEARING*	13.4112	15.24

Well ID: **5734439**
Concession (Lot): CON 11(015)
UTM Zone (Easting, Northing) [RC]: 17 (609379.4,4910783) [9]
Depth to bedrock (m):
Elevation (masl): 273.914062

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 3/2/1999 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
		TOPSOIL	0	0.3048
	YELLOW	*SAND*	0.3048	1.2192
	YELLOW	*SILT*	1.2192	5.4864
	YELLOW	*SAND*	5.4864	8.2296
	YELLOW	*SAND SILT CLAY*	8.2296	15.8496
	YELLOW	*SAND*	15.8496	19.5072
	YELLOW	*CLAY*	19.5072	19.5072

Well ID: **5736948**
Concession (Lot): CON 11(016)
UTM Zone (Easting, Northing) [RC]: 17 (609686,4910964) [3]
Depth to bedrock (m):
Elevation (masl): 270.120941

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 6/17/2002 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
	BLACK	*TOPSOIL*	0	0.3048
	BROWN	*SILT SAND*	0.3048	5.1816
	YELLOW	*SAND*	5.1816	18.288
	GREY	*SAND VERY*	18.288	20.4216

Well ID: **5738721**
Concession (Lot): CON 11(015)
UTM Zone (Easting, Northing) [RC]: 17 (609376.3,4910783) [8]
Depth to bedrock (m):
Elevation (masl): 273.911346

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 4/7/2004 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
	BROWN	*SAND SILT STONES*	0	4.26
	YELLOW	*SAND*	4.26	18.889999

	BLUE	*SAND SILT CLAY*	18.889999	25.9
	GREY	*SAND SILT CEMENTED*	25.9	28.040001

Well ID: **7102395**
Concession (Lot): CON 11(015)
UTM Zone (Easting, Northing) [RC]: 17 (609665,4911082) [3]
Depth to bedrock (m):
Elevation (masl): 269.090179

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 1/28/2008 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
	BLACK	*SAND GRAVEL TOPSOIL*	0	0.3048
	GREY	*CLAY SAND LOOSE*	0.3048	14.9352
	GREY	*SAND POROUS*	14.9352	17.9832

Well ID: **7239318**
Concession (Lot): ()
UTM Zone (Easting, Northing) [RC]: 17 (609712,4910766) [4]
Depth to bedrock (m):
Elevation (masl): 271.439147

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 4/9/2014 12:00 AM
Primary Use: Test Hole
Secondary Use: <null>
Final Status: Monitoring and Test Hole

Layer	Colour	Description	Top - Bottom Depth (m)	
	BROWN	*CLAY SILT*	0	4.572
	BROWN	*COARSE SAND*	4.572	8.382

Well ID: **7261373**
Concession (Lot): CON 11(016)
UTM Zone (Easting, Northing) [RC]: 17 (609682,4911066) [4]
Depth to bedrock (m):
Elevation (masl): 268.614288

COUNTY / Township: 57 / INNISFIL TOWNSHIP
Completion Date: 4/1/2016 12:00 AM
Primary Use: Domestic
Secondary Use: <null>
Final Status: Water Supply

Layer	Colour	Description	Top - Bottom Depth (m)	
	BROWN	*CLAY*	0	5.4864
	GREY	*CLAY SAND*	5.4864	16.1544
	GREY	*SAND DIRTY*	16.1544	19.2024
	BROWN	*SAND*	19.2024	20.7264

Appendix G

Construction Water Taking Estimates

ESTIMATED WATER TAKINGS AND AREA OF INFLUENCE (STEADY STATE)
HYDROGEOLOGICAL ASSESSMENT
CROWN BARRIE DEVELOPMENTS INC
1012 YONGE STREET, BARRIE, ON

Flow to a Trench for a *Unconfined Aquifer*

Information

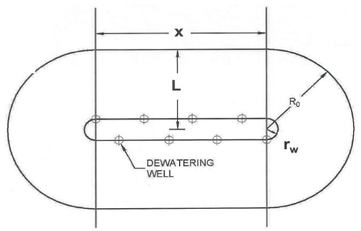
Steady State flow to a trench for an unconfined aquifer.
Use this equation when a/b > 1.5.
Equation 4.0

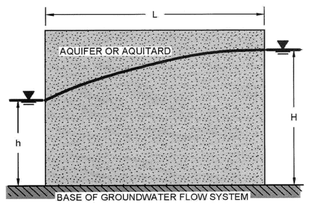
$$Q = \frac{\pi K\left(H^2 - h^2\right)}{\ln R_0 / r_w} + 2\left[\frac{xK\left(H^2 - h^2\right)}{2L}\right]$$

Equation 4.1

$$r_w = \frac{a+b}{\pi}$$

Ro is determined by the Siechardt Equation: Ro = 3000(H-hw)K^0.5 when K is in m/s





Enter Parameters

Shaft or Trench Eq'n Check: **2.8** This number **must be greater than 1.5**; if not, then use a Shaft equation.

K=	**4.30E-03**	cm/s	Input Hydraulic Conductivity in cm/s
=>	3.7152	m/day	Hydraulic Conductivity converted to m/day
H=	**3.35**	m	Input height of groundwater pressure
h=	**0**	m	Input dewatering height
x=	**315**	m	Input length of trench
a=	**315**	m	Input length of excavation
b=	**112**	m	Input width of excavation
r_w=	**135.99**	m	Input/calculate radius of trench
π=	3.141592654		Pi

Note: L and Ro are the same distance
*Note: Height measurements are relative to base of active groundwater

Calculating L and Ro using: $R_o = 1.5(Tt/S)^{0.5}$

T=	12.44592	m²/day	Input transmissivity in m²/day
t=	30	days	Input pumping duration in days
S=	0.3		Input storage coefficient
L=Ro=	52.92	m	Line source distance; distance of influence

Alternative equation by Bear (Bear, J., 1979. **Hydraulics of Groundwater**, McGraw-Hill, New York, 569p) $R_o = 1.5(Tt/S)^{0.5}$ where **T** is transmissivity in **m²/day**, **t** is pumping duration in **days.** $\mathbf{R_o}$ will be in **metres.**

*Note: The above Ro is for comparison. It is not the Ro used to calculate Q below.

Enter additional K values (optional)

K=	**4.30E-03**	**cm/s**	**K=**	**3.7152**	**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

Calculated flow rate using Equation 4.0

Results for Ro (radius of influence)				Flow Results in m³/day			Flow Results in L/min			Flow Results in gal/min		
L=	**Ro=**	**201.89**	**m**	**Q=**	**396.53**	**m³/day**	**Q=**	**275.35**	**L/min**	**Q=**	**60.57**	**gal/min**
L2=	Ro2=	136.99	m	Q2=	4.16	m³/day	Q2=	2.89	L/min	Q2=	0.64	gal/min
L3=	Ro3=	139.17	m	Q3=	13.41	m³/day	Q3=	9.31	L/min	Q3=	2.05	gal/min
L4=	Ro4=	146.04	m	Q4=	44.81	m³/day	Q4=	31.12	L/min	Q4=	6.85	gal/min
L5=	Ro5=	31.78	m	Q5=	75.15	m³/day	Q5=	52.18	L/min	Q5=	11.48	gal/min
L6=	Ro6=	236.49	m	Q6=	679.67	m³/day	Q6=	471.96	L/min	Q6=	103.82	gal/min
L7=	Ro7=	453.80	m	Q7=	3,200.81	m³/day	Q7=	2,222.64	L/min	Q7=	488.91	gal/min
L8=	Ro8=	1140.99	m	Q8=	16,997.72	m³/day	Q8=	11,803.22	L/min	Q8=	2,596.34	gal/min
L9=	Ro9=	3314.08	m	Q9=	104,606.35	m³/day	Q9=	72,638.65	L/min	Q9=	15,978.25	gal/min
L10=	R10=	10185.99	m	Q10=	735,735.58	m³/day	Q10=	510,894.79	L/min	Q10=	112,381.02	gal/min