



**REPORT**

# Hydrogeological Investigation

*Proposed Mixed-Use Development  
Fergus, Ontario*

Submitted to:

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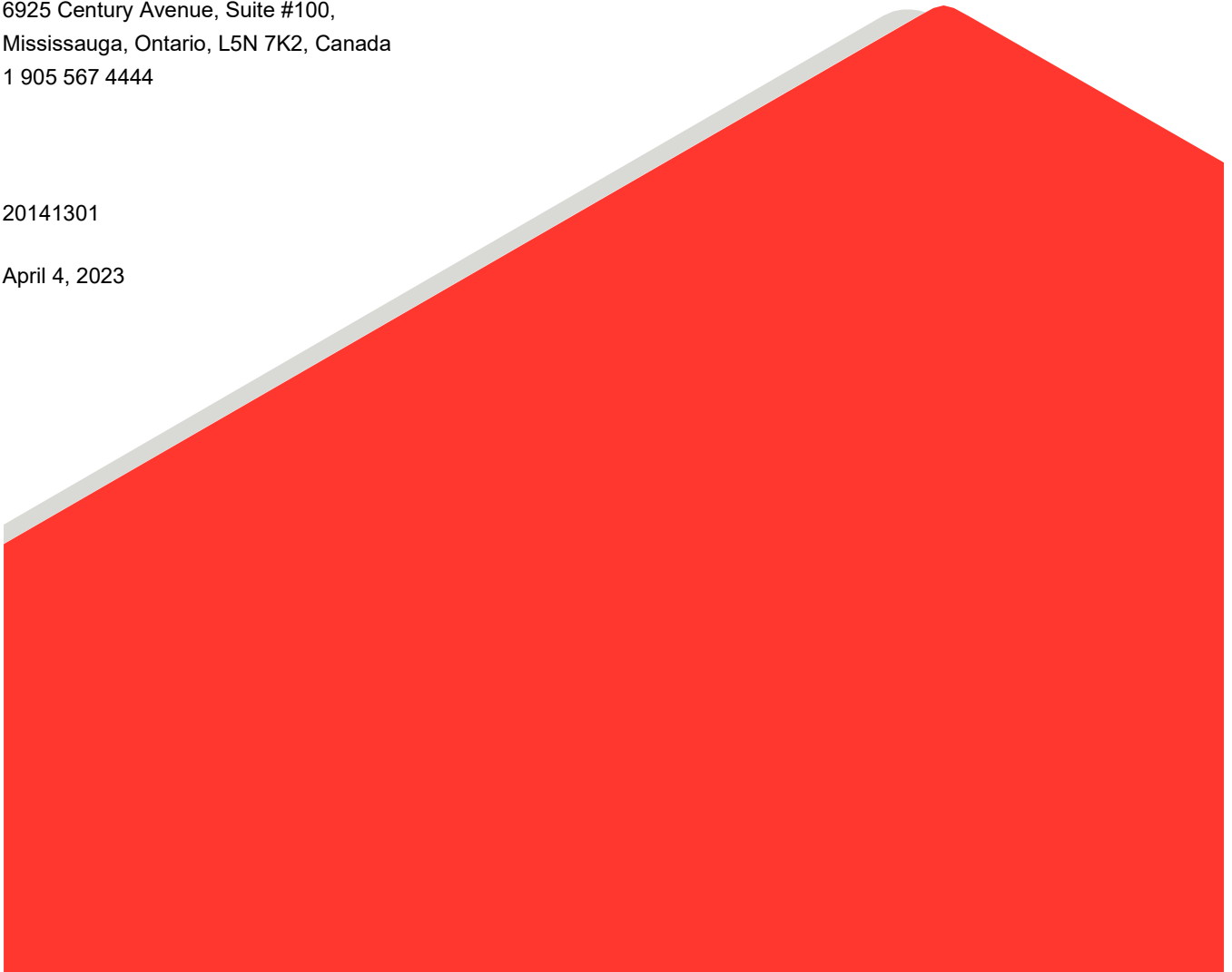
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## 1.0 INTRODUCTION

WSP Canada Inc. (WSP), previously Golder Associates Ltd. (Golder), has been retained by Tatham Engineering Ltd. (Tatham) to conduct a hydrogeological investigation for a proposed mixed-use development to be located in the South Fergus Secondary Plan area within the Township of Centre Wellington, Ontario (the site). The location of the site is shown on the Key Plan, Figure 1. The purpose of this hydrogeological investigation was to characterize the existing hydrogeological conditions at the site.

This report provides the results of the hydrogeological investigation and should be read in conjunction with the *“Important Information and Limitations of This Report”* (Appendix A). The reader’s attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report. The factual data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation, or if the project is not initiated within eighteen months of the date of the report, WSP should be given an opportunity to confirm that the recommendations in this report are still valid.

## 2.0 BACKGROUND

### 2.1 Site and Project Description

The site is located in Fergus, Ontario and is bounded by Guelph Street to the west, Scotland Street to the east, 2<sup>nd</sup> Line to the south and McQueen Boulevard to the north. As shown on the Site Plan, Figure 2, the site is divided by Tower Street South (Highway 6) and consists of properties located both east and west of Tower Street South. The site consists of approximately 147.5 hectares (ha) of undeveloped land and is currently a mixture of treed areas, agricultural fields and residential homes. A storm water management (SWM) facility is located immediately east of Tower Street South and north of the site.

As shown on the Preferred Land Use Plan prepared by MHBC Planning Ltd. (dated May 26, 2022; see Appendix B), the proposed mixed-use development is generally comprised of low and medium density residential blocks, with mixed-use corridor and gateway commercial blocks located to the east and west of Tower Street South, a future school block, a business park, natural heritage areas, neighbourhood and community parks, six SWM ponds and internal roads.

### 2.2 Topography, Drainage and Natural Heritage Features

The site is located within the Upper Middle Grand River Subwatershed of the Grand River Watershed. Grand River is located approximately 800 metres (m) northwest of the site. In general, the site drains towards a municipal drain referred to as “Nichol Drain No. 2”, which is located in the central portion of the site, beginning east of Tower Street South and flowing in a southwest direction through the SWMF and towards Swan Creek. A detailed summary of drainage patterns at the site is provided in the South Fergus Master Environmental Servicing Plan (MESP) & Secondary Plan prepared by Tatham (Tatham, 2022), and the Existing Drainage Plan is provided in Appendix B.

Based on available on-line Grand River Conservation Authority (GRCA) mapping (<https://maps.grandriver.ca>), three Provincially Significant Wetlands (PSW’s) are located at the site and are generally located adjacent to Nichol Drain No. 2. The three PSWs are approximately 5.1 ha, 2.0 ha and 2.1 ha in areas from east to west, respectively (refer to Figure 2). Also, a relatively large PSW, approximately 23.4 ha in size, is located west of the site on the west side of Guelph Street and an unevaluated wetland, approximately 0.7 ha in size, is located approximately 325 m northeast of the site.

GRCA mapping indicates that portions of the site adjacent to Nichol Drain No. 2 and the three PSW's are located within GRCA regulated areas, as shown on Figure 3, Regulated Areas.

## 2.3 Physiography and Geology

The site is mapped within the physiographic region of southern Ontario known as the Guelph Drumlin Field. Physiographic mapping in the vicinity of the site indicates a drumlinized till plain. According to published mapping and as presented on Figure 4, Quaternary Map, the surficial soil conditions are composed of stone-poor sandy silt- to silty sand-textured glacial till overlain by sandy and gravelly glaciofluvial deposits. The geologic mapping is generally consistent with the conditions encountered during the site-specific subsurface investigation (discussed below in Section 3.2).

## 2.4 Wellhead Protection Areas (WHPA) and Significant Groundwater Recharge Areas (SGRA)

Based on available GRCA mapping (<https://maps.grandriver.ca>), one public use well (no. 6705606) is located approximately 400 m north of the site and one municipal well (no. 6715276) is located approximately 1.3 kilometres (km) northwest of the site. The site is located within the Wellhead Water Quantity Zone in an area designated by the GRCA as Significant Risk. Further, portions of the site are located within areas designated as Wellhead Protection Areas (WHPA)-B/C/D, or the 2-, 5- and 25-year travel time zones, respectively, as shown on Figure 5, Wellhead Protection Areas. Refer to Section 2.5, Water Well Records, for further discussion on the public use well (no. 6705606).

Portions of the site are located within a Significant Groundwater Recharge Area (SGRA), as shown on Figure 6, Significant Groundwater Recharge Areas. A SGRA is defined in O. Reg. 287/07 as an area within which it is desirable to regulate or monitor drinking water threats that may affect the recharge of an aquifer.

## 2.5 Water Well Records

Water well records were obtained from the Ministry of the Environment, Conservation and Parks (MECP). Approximately 93 water well records were reported for wells located within 500 m of the site, 10 of which are reported to be located on the site (nos. 7129536, 6713976, 7047856, 6706231, 6715679, 6704215, 6705444, 6715788, 6712498 and 6701780). The locations of the wells with reported water well records are shown on Figure 7, Ministry Recorded Wells. A table summarizing the water well record data is provided in Appendix C, MECP Recorded Wells. It is noted that, historically, there was not a requirement to register dug wells with the MECP, and they can be under-represented in the water well record database.

Little information was provided on 11 of the records (nos. 7129536 [on site], 7047857, 7047856 [on site], 6715145, 7184231, 6714798, 6715788 [on site], 7042040, 7042039, 7194694 and 7203122), which are not discussed further. The remaining 82 wells were constructed between 1948 and 2012 and include 7 test holes/observation wells (including no. 6715679 located on the site) and 75 water supply wells. The water supply wells are comprised of:

- One public use well (no. 6705606), located approximately 400 m north of the site. This deep drilled bedrock well was installed in July 1975 and is situated on the east side of the intersection of McQueen Boulevard and Scotland Street, with a ground surface elevation of approximately 422.1 m above sea level (masl), and with a reported well depth of 124.4 m. It is noted that the municipal well discussed in Section 2.4 (no. 6715276) is located more than 500 m from the site (i.e., 1.3 km northwest of the site) and is a deep drilled bedrock well with a reported well depth of 79.5 m;

- One municipal use well (i.e., no. 6712498), located on the west side of the site. This municipal use well was constructed in March 1998 and has a ground surface elevation of approximately 406.3 masl. The well is screened deep in the bedrock unit with a reported well depth of 128.0 m. The current status of this well is not known to WSP, however, it is noted that available GRCA mapping does not indicate that there is an active municipal supply well at this location;
- Sixty-five domestic wells, all of which are drilled wells with well depths ranging from about 19.5 m below ground surface (mbgs) to 78.6 mbgs, two of which are located on the site (nos. 6713976 and 6705444);
- Six livestock wells with well depths ranging from about 11.3 mbgs to 128.9 mbgs, three of which are located on the site (nos. 6706231, 6704215 and 6701780);
- One commercial well with a well depth of 39.6 mbgs; and
- One well of unknown use with a depth of 57.9 mbgs.

A door-to-door private water well survey was carried out on June 30<sup>th</sup>, 2022, at a total of 13 properties fronting onto either Guelph Street, Scotland Street, Jones Baseline or 2<sup>nd</sup> Line. The purposes of the well survey were to assess the locations of existing groundwater users and private wells; to assess the aquifers being utilized in the vicinity of the site; to document existing well conditions based on information supplied by the well owners; and to assist in assessing the potential impacts of the proposed development on local groundwater users.

Well owners were asked to complete a water well survey form, which requested basic information on water use, well construction, existing well conditions, and historical problems. Given the COVID-19 pandemic situation and the physical distancing restrictions in place at the time of the survey, one attempt was made to contact the residences and the well survey forms were left at the door, where possible, with information on how to return it to WSP. The well survey form was returned from 1 address; no responses were received from the remaining residences. Based on the information provided in the single survey response, a deep drilled well is present on the site at 935 Scotland Street (well approximately 70 m deep) and is interpreted to utilize the bedrock aquifer.

## **3.0 SITE CHARACTERIZATION**

### **3.1 Drilling and Monitoring Well Installation**

As a part of this hydrogeological investigation, ten boreholes (BH20-1 to BH20-10) were advanced to depths ranging from approximately 7.7 mbgs to 12.7 mbgs in December 2020 and January 2021. The locations of the boreholes are provided on Figure 2. Single 50-millimetre (mm) diameter monitoring wells were installed in BH20-2 to BH20-10, with nested wells (i.e., one deep and one shallow monitoring well) installed in BH20-6, BH20-8 and BH20-10. A sand filter pack was placed to surround the screen in each well. Above the screen, the annulus surrounding the PVC riser pipe was backfilled to the ground surface with bentonite pellets. Each monitoring well was completed with a protective monument-style protective casing set in concrete.

The field work for this investigation was monitored by a member of our field staff, who arranged for the clearance of underground services, observed the drilling and logged the boreholes. The soil samples obtained during this investigation were described in the field, placed in appropriate containers, labelled and transported to our Whitby laboratory for further examination and selective classification testing (natural water content and grain size distribution testing).

In addition, three shallow staff gauge (SG) and piezometer (P) pairs, SG1/P1 to SG3/P3, were manually installed in Nichol Drain No.2, as shown on Figure 2. All piezometers are 19-mm inside diameter stainless steel drive

points, installed to approximate depths of 1.0 mbgs to 1.5 mbgs. The three pairs were installed to assess the vertical hydraulic gradient.

The as-installed borehole, staff gauge and piezometer locations and elevations (referenced to a geodetic datum) were surveyed by the project surveyor and provided to WSP.

The subsurface soil and groundwater conditions encountered in the boreholes, and details of the monitoring well installations are provided on the Record of Borehole sheets (Appendix D). It should be noted that the boundaries between the strata on the borehole records have been inferred from drilling observations and non-continuous sampling. They generally represent transitions from one soil type to another and should not be inferred to represent exact planes of geological change. Further, conditions will vary between and beyond the boreholes.

### **3.2 Subsurface Soil Conditions**

The subsurface soils encountered are consistent with geological mapping for the area, and generally consisted of topsoil and localized fill soils overlying non-cohesive deposits (ranging in gradation from gravel and sand to sandy silt) and/or glacial till deposits (ranging in gradation from gravelly silty sand till to silty clay till). Localized cohesive deposits of silty clay to clayey silt were encountered at varying depths in BH20-2, BH20-3 and BH20-7.

A deposit of wet sand and gravel was encountered in BH20-1 beneath the glacial till soils at an approximate depth of 6.8 mbgs, and a deposit of wet sand was encountered beneath the silty clay soils in BH20-7 at an approximate depth of 5.3 mbgs.

The Record of Borehole sheets and grain size distribution curves for selected soil samples are provided in Appendix D. Inferred cross-sectional drawings are provided in Figures 8A and 8B.

### **3.3 Water Level Monitoring**

Groundwater levels were measured manually in the monitoring wells on January 19 and 29, March 12, June 11, July 23 and November 19, 2021, and June 30, July 5 and July 19, 2022. Water level depths and elevations are provided in Table E-1, Water Level Depths and Elevations (Appendix E). It should be noted that these observations reflect the groundwater conditions encountered at the time of the field investigation and some seasonal and annual fluctuations should be anticipated.

The depth to groundwater measured in the monitoring wells ranged from -0.12 mbgs (i.e., 0.12 m above ground surface; measured in BH20-7 on March 12, 2021) to 4.05 mbgs (BH20-10-D [deep] on July 23, 2021) and from elevations of 404.38 m (BH20-8-D [deep] on July 23, 2021) to 420.28 m (BH20-10-D [deep] and BH20-10-S [shallow] on March 12, 2021) on the dates monitored. The groundwater elevation data on March 12, 2021, are shown on Figure 9, Groundwater Flow. In general, shallow groundwater flow is inferred to follow topography, with flow in an eastern or western direction towards Nichol Drain No. 2, depending on location, as shown on Figure 9.

A total of 3 nested wells were installed at the site (BH20-6-S/D, BH20-8-S/D and BH20-10-S/D). The groundwater elevations in BH20-6-S (shallow) and BH20-8-S (shallow) were higher than the groundwater elevations in the deeper wells on all monitoring events, indicating a downward vertical gradient at those locations on those dates. Therefore, the groundwater levels measured in BH20-6-D (deep) and BH20-8-D (deep) are not considered representative of water table conditions. The groundwater elevations in BH20-10-S (shallow) and BH20-10-D (deep) were approximately equal on all monitoring events, indicating a neutral vertical gradient.



At the staff gauge and piezometer pair SG1/P1, the vertical gradient was upwards on the monitoring events on January 19, March 12 and November 19, 2021, and was downwards on the monitoring events on June 11 and July 23, 2021. The watercourse was observed to be frozen at the location of SG1 on January 29, 2021, and a staff gauge reading could not be measured. Also, SG1 was observed to be destroyed on June 30, 2022, and therefore no readings could be measured on June 30, July 5 and July 19, 2022.

At the staff gauge and piezometer pair SG2/P2, the vertical gradient was upwards on the monitoring events on January 19, March 12, June 11, and November 19, 2021, and was downwards on the monitoring events on July 23, 2021, June 30, July 5 and July 19, 2022. The watercourse was observed to be frozen at the location of SG2 on January 29, 2021, and a staff gauge reading could not be measured.

At the staff gauge and piezometer pair SG3/P3, the vertical gradient was upwards on the monitoring events on March 12 and November 19, 2021, and was downwards on the monitoring events on June 11 and July 23, 2021. The watercourse was observed to be frozen at the location of SG3 on January 19 and 29, 2021, and a staff gauge reading could not be measured. Also, the watercourse was observed to be dry at the location of SG3 on June 30 and July 19, 2022.

Automatic data loggers (i.e., pressure transducers) were installed in BH20-2, BH20-4, BH20-6-S (shallow), BH20-8-S (shallow), BH20-8-D (deep), BH20-10-S (shallow) and P2 on January 29, 2021, and set to record every six hours. The data loggers were downloaded on July 5, 2022. It is noted that the data logger installed in P2 appears to have malfunctioned and therefore no data could be obtained. Daily precipitation data was obtained from Environment and Climate Change Canada (ECCC) for the Fergus Shand Dam Meteorological Station (ID 6142400), which was the nearest station to the site with daily precipitation data for this period. Hydrographs of the groundwater level data with daily precipitation data are provided as Figure E-1 and graphs of the groundwater temperature data are provided as Figure E-2 (Appendix E). The data indicate that the groundwater elevation in all monitoring wells fluctuated seasonally, with groundwater levels generally increasing in the Fall and Spring and decreasing in the Winter and Summer. As shown, the groundwater elevations in monitoring wells BH20-2, BH20-4, BH20-6-S (shallow), BH20-8-S (shallow) and BH20-8-D (deep) increased with a delayed response to some rain events during this period. A similar but muted groundwater elevation trend is observed at BH20-10-S (shallow).

### 3.4 Hydraulic Testing

Single-well response testing (i.e., rising head testing) was carried out in BH20-3, BH20-4, BH20-6-S (shallow), BH20-8-S (shallow) and BH20-10-S (shallow) on June 11, 2021, and in BH20-2 on July 23, 2021. The rising head tests were carried out by rapidly lowering the water levels by purging with a dedicated Waterra foot valve and tubing. The resulting water level recoveries were monitored with an electronic water level tape and automatic pressure transducers. The recovery data were analyzed using the AQTESOLV for Windows (1996 – 2007) Version 4.5 software. The Bouwer and Rice (1976) method for unconfined conditions was applied to the rising head test data. Estimates of hydraulic conductivity (K) obtained from the rising head tests are summarized below in Table 1. Summary printouts of the rising head test data and results from AQTESOLV are included in Appendix F.

**Table 1: Summary of Estimated Hydraulic Conductivity**

Monitoring Well ID	Screened Interval (masl)	Screened Unit	K (m/s)
BH20-2	410.2 to 413.2	gravelly SILTY SAND (TILL)	$2 \times 10^{-8}$
BH20-3	406.7 to 409.8	SILTY CLAY / sandy SILT / sandy SILT (TILL)	$2 \times 10^{-7}$
BH20-4	413.3 to 414.8	gravelly SILTY SAND / SAND and GRAVEL	$5 \times 10^{-6}$
BH20-6-S	404.0 to 407.0	SILT and SAND (TILL)	$3 \times 10^{-8}$
BH20-8-S	403.2 to 406.2	sandy SILT / SILTY SAND / GRAVEL and SAND	$3 \times 10^{-7}$
BH20-10-S	417.3 to 420.4	SAND	$4 \times 10^{-5}$

**Notes:**

m/s – metres per second

The estimated hydraulic conductivity values are considered reasonable for the units tested.

### 3.5 Guelph Permeameter Testing

Soil infiltration rate testing was carried out on July 25, 2022, in the unsaturated zone, using a Guelph Permeameter (Soilmoisture Equipment Corp., Model 2800K1). The Guelph Permeameter was operated in accordance with the procedures outlined by the manufacturer (Soilmoisture Equipment Corp., 2012) using a single head method. The apparatus was installed at the base of hand-augered test holes.

Once the outflow of water at the depth of installation reached a steady-state flow rate, the field-saturated hydraulic conductivity,  $K_{fs}$ , of the soil was estimated using the following equation (Elrick et. al., 1989):

$$K_{fs} = \frac{C_1 Q_1}{2 \pi H_1^2 + \pi a^2 C_1 + 2 \pi \frac{H_1}{\alpha^*}}$$

Where:  $C_1$  = shape factor  
 $Q_1$  = flow rate (cm<sup>3</sup>/s)  
 $H_1$  = water column height (cm)  
 $a$  = well radius (cm)  
 $\alpha^*$  = alpha factor (0.12 cm<sup>-1</sup> for Type 3 soils)

The field data and analysis of the infiltration rate tests are presented as Figures F-1 to F-6, Appendix F. Based on the resulting  $K_{fs}$  in centimetres per second (cm/s), the corresponding infiltration rates (mm/hr) were estimated using the approximate relationship presented in the *Low Impact Development Stormwater Management Planning and Design Guide* (or “*Design Guide*”) (TRCA and CVCA, 2010). A summary of the infiltration rate test results is presented in Table 2, below.

**Table 2: Summary of Estimated Infiltration Rates**

Test	Soil Description	Test Depth Relative to Grade (mbgs)	Est. Field-Saturated Hydraulic Conductivity $K_{fs}$ (cm/s)	Estimated Infiltration Rate <sup>1</sup> (mm/hr)
GP-20-2 (near BH20-2)	gravelly SILTY SAND (TILL)	0.61	$2 \times 10^{-4}$	58
GP-20-4 (near BH20-4)	sandy SILT	0.60	$1 \times 10^{-4}$	50
GP-20-6 (near BH20-6-D)	sandy SILT to SILTY SAND	0.65	$2 \times 10^{-5}$	36
GP-20-7 (near BH20-7)	sandy SILTY CLAY to CLAYEY SILT	0.63	$5 \times 10^{-5}$	44
GP-20-8 (near BH20-8-D)	sandy SILT	0.71	$5 \times 10^{-4}$	67
GP-20-10 (near BH20-10-S)	SAND	0.65	$7 \times 10^{-4}$	71

**Notes:**

mbgs – metres below ground surface. cm/s - centimetres per second. mm/hr – millimetres per hour

<sup>1</sup> – based on Table C1 from TRCA and CVCA (2010).

The infiltration rate estimates from this investigation are based on the test methods discussed above and are for the corresponding soil types encountered. They represent the soil conditions at the tested locations and depths only; conditions may vary between and beyond the tested locations.

For design purposes, a correction factor should be applied to estimate the design infiltration rate in accordance with guidance provided in TRCA and CVCA (2010), to account for potential reductions in soil permeability due to compaction, smearing during the construction of a given infiltration feature and the gradual accumulation of fine sediments over the lifespan of the infiltration feature. Care should be taken during construction of any proposed infiltration measures to preserve the existing soil structure and avoid compaction and re-working which could reduce its infiltrative properties.

### 3.6 Groundwater Quality

Groundwater samples were collected from monitoring wells BH20-3, BH20-8-S (shallow) and BH20-10-S (shallow) on March 12, 2021, and from monitoring wells BH20-4, BH20-8-S (shallow) and BH20-10-S (shallow) on July 5, 2022. The samples were collected using a peristaltic pump, low flow sampling techniques, and generally accepted environmental engineering protocols, and stored on ice in coolers until delivered, under chain-of-custody documentation, to AGAT Laboratories of Mississauga, Ontario for chemical analysis.

The samples were analyzed for inorganic and general chemistry parameters and selected metals, and compared to the MECP *Policies, Guidelines and Provincial Water Quality Objectives of the Ministry of Environment and Energy (PWQO)*, Table 2 – Table of PWQOs and Interim PWQOs (July 1994, Reprinted February 1999). The

laboratory analytical reports are included in Appendix G. The following Table 3 summarizes the exceedances of the PWQO.

Groundwater sampled from a monitoring well can contain elevated levels of suspended sediment in the water (i.e., Total Suspended Solids [TSS]). The collected groundwater samples were not analyzed for TSS; however, the samples were analyzed for turbidity which has a positive correlation with TSS. The turbidity measurements for each groundwater sample are included below in Table 3. In general, the elevated concentrations of metals with exceedances are likely attributed to elevated levels of sediment in the groundwater samples and interference from the dissolution of suspended sediment during sample acidification. Therefore, should dewatering be required at the site, the amount of sediment in the water should be reduced prior to discharge in order to meet the PWQO (e.g., with the use of a sedimentation tank or sediment filter bag). However, the results indicate that the PWQO exceedance for iron in BH20-10-S on July 5, 2022, is primarily from the dissolved fraction, which may be present as a result of mineral deposits and may not be significantly lowered with the removal of sediment. It is noted that the sample collected from BH20-10-S on March 12, 2021, met the PWQO for iron.

**Table 3: Summary of Groundwater Quality Exceedances and Turbidity**

Parameter	Units	PWQO	BH20-3	BH20-4	BH20-8-S (shallow)	BH20-10-S (shallow)
<b>Groundwater Sample Collected on March 12, 2021 (BH20-3, BH20-8-S and BH20-10-S)</b>						
Total Cobalt	mg/L	0.0009	0.0008	NA	<b>0.0015</b>	<0.0005
Total Iron	mg/L	0.30	<b>1.84</b>	NA	<b>3.30</b>	0.049
Turbidity	NTU	NA	39.4	NA	234	4.4
<b>Groundwater Sample Collected on July 5, 2022 (BH20-4, BH20-8-S and BH20-10-S)</b>						
Total Cobalt	mg/L	0.0009	NA	<0.0005	<b>0.0020</b>	<0.0005
Total Iron	mg/L	0.30	NA	<0.010	<b>4.27</b>	<b>0.410</b>
Total Copper	mg/L	0.005	NA	0.001	<b>0.006</b>	0.001
Total Vanadium	mg/L	0.006	NA	<0.002	<b>0.007</b>	<0.002
Total Zinc	mg/L	0.030	NA	<0.020	<b>0.060</b>	<0.020
Turbidity	NTU	NA	NA	8.9	246	0.7

**Notes:**

**Bold font values** exceed the PWQO.

NA = Not Applicable

## 4.0 DISCUSSION

The site is located in the south of Fergus, Ontario, consisting primarily of undeveloped land comprised of a mixture of treed areas, agricultural fields and residential homes. The Grand River is located approximately 800 m northwest of the site and Nichol Drain No. 2 is located in the central portion of the site. In general, the site drains east and west, depending on location, towards Nichol Drain No. 2, which includes three PSW areas adjacent to

the watercourse. Portions of the site adjacent to Nichol Drain No. 2 and the three PSW's are located within GRCA regulated areas.

The findings of this investigation indicate that shallow native soils are primarily comprised of non-cohesive deposits and/or glacial till deposits. Based on MECP water well records, the thickness of the overburden unit ranges from about 25 m thick near the southeast portion of the site to about 9 m thick in the northwest portion of the site. In general, the overburden unit thins out moving northwest towards the Grand River, where MECP water well records indicate that bedrock is encountered at ground surface. Shallow groundwater flow at the site is inferred to follow local topography, with flow in an eastern or western direction towards Nichol Drain No. 2, depending on location.

In 1996, R.J. Burnside & Associates Ltd. (Burnside) issued the Nichol Drain No. 2 Subwatershed Study. Burnside indicated that Nichol Drain No. 2 is an intermittent watercourse and that groundwater discharge is limited in the headwater reaches in the Secondary Plan area. Data from the SG1/P1, SG2/P2 and SG3/P3 pairs installed in Nichol Drain No. 2 identified an upward hydraulic gradient at all three SG/P pairs in March and November 2021, and generally a downward hydraulic gradient in the June and July 2021/22 monitoring events. The data from the SG/P pairs indicate that the watercourse was frozen in late January 2021. No surface water was present at staff gauge SG3 on the monitoring events in July 2021 and in June and July 2022, with groundwater levels at least 0.9 m below ground surface in piezometer P3 on those dates. Collectively, these data confirm the intermittent nature of Nichol Drain No. 2 with seasonal groundwater discharge during the monitoring period.

Based on MECP water well records, there are a total of 75 water supply wells located within 500 m of the site, which are primarily comprised of deep drilled bedrock wells. The site is located within the Wellhead Water Quantity Zone in an area designated by the GRCA as Significant Risk, with portions of the site located within areas designated as WHPA-B/C/D, or the 2-, 5- and 25-year travel time zones, respectively. A public use well (no. 6705606) is located approximately 400 m north of the site and is a deep drilled bedrock well with a reported well depth of 124.4 m. Also, a municipal well (no. 6715276) is located approximately 1.3 km northwest of the site and is a deep drilled bedrock well with a reported well depth of 79.5 m. Portions of the site are mapped by GRCA as SGRA, likely due to published geological mapping indicating the presence of sandy and gravelly glaciofluvial deposits on parts of the site. It is noted that the geological mapping is generally consistent with the conditions encountered during the site-specific subsurface investigation.

The proposed mixed-use development is understood to be comprised of low and medium density residential blocks, with mixed-use corridor and gateway commercial blocks located to the east and west of Tower Street South, a future school block, a business park, natural heritage areas, neighbourhood and community parks, six SWM ponds and internal roads. It is recommended that a site-wide water balance assessment and feature-based water balance assessments for Nichol Drain No. 2 and the PSW's be conducted to assess the potential hydrogeological impacts of the proposed development with respect to average annual post-development infiltration rates. Also, a detailed assessment of short-term (construction) and long-term dewatering needs and potential impacts to receptors should be carried out at the time of detailed design and in conjunction with obtaining dewatering permitting from the MECP.

## 5.0 CLOSURE

We trust that this submission meets your current requirements. If you have any questions regarding the contents of this report, please contact the undersigned.

## Signature Page

Yours truly

**WSP Canada Inc. Golder Associates Ltd.**



Joel Gopaul, B.A.Sc.  
*Geo-Environmental Consultant*

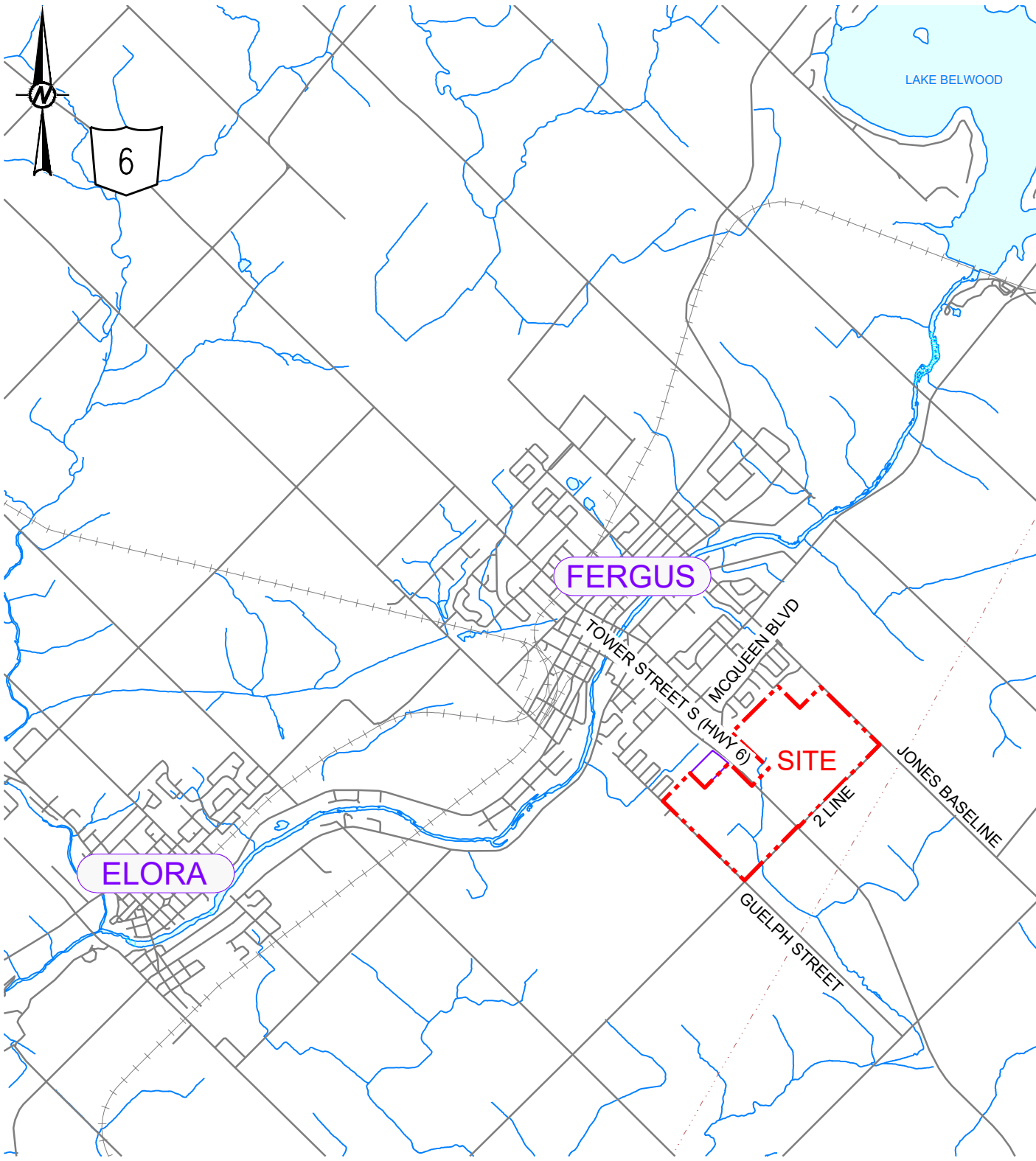


John Piersol, P.Geol.  
*Associate, Senior Hydrogeologist*

JJG/MAS/JP/lb

[https://golderassociates.sharepoint.com/sites/124833/project files/6 deliverables/report/20141301-rev0-hydrogeological investigation report - south fergus 4apr2023.docx](https://golderassociates.sharepoint.com/sites/124833/project%20files/6%20deliverables/report/20141301-rev0-hydrogeological%20investigation%20report%20-%20south%20fergus%204apr2023.docx)

## Figures



**PLAN LEGEND**

- - - - - PLAN BOUNDARY



CLIENT  
**TATHAM ENGINEERING LIMITED**

---

CONSULTANT

YYYY-MM-DD	2020-09-17
DESIGNED	
PREPARED	JPR
REVIEWED	JG
APPROVED	MAS

**wsp GOLDER**

PROJECT  
**SOUTH FERGUS  
 HYDROGEOLOGICAL INVESTIGATION**

---

TITLE  
**KEY PLAN**

---

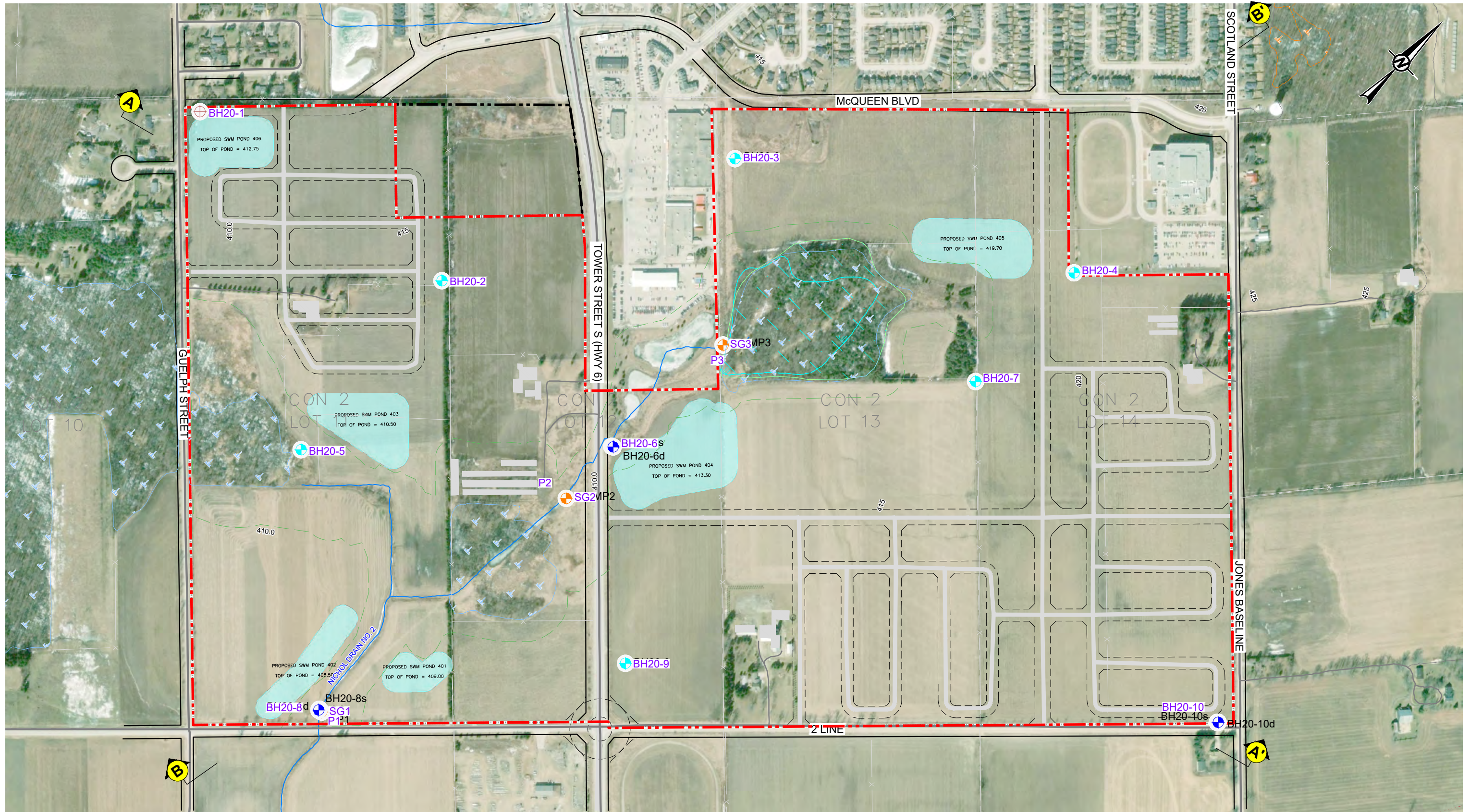
PROJECT NO.	CONTROL	REV.	FIGURE
20141301	0002	----	<b>1</b>

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25 mm  
 IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A



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**PLAN LEGEND**

- - - PLAN BOUNDARY
- + TEST BOREHOLE
- + SHALLOW MONITORING WELL
- + SHALLOW & DEEP NESTED MONITORING WELL
- + STAFF GAUGE / MINI-PIEZOMETER
- + PROVINCIAL SIGNIFICANT WETLANDS
- + UNEVALUATED WETLANDS

**MAP KEY**

ALL MAPPED LOCATIONS ARE APPROXIMATE AND NOT TO SCALE  
 PROPOSED DEVELOPMENT PLAN, TATHAM ENGINEERING, 2022

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.

0      120      240      360 m

1:6000

PLOTTED 11X17" TABLOID

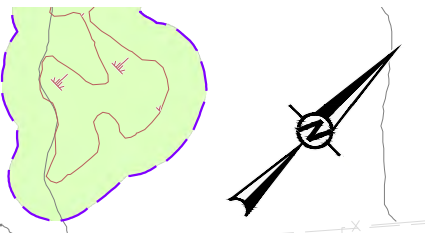
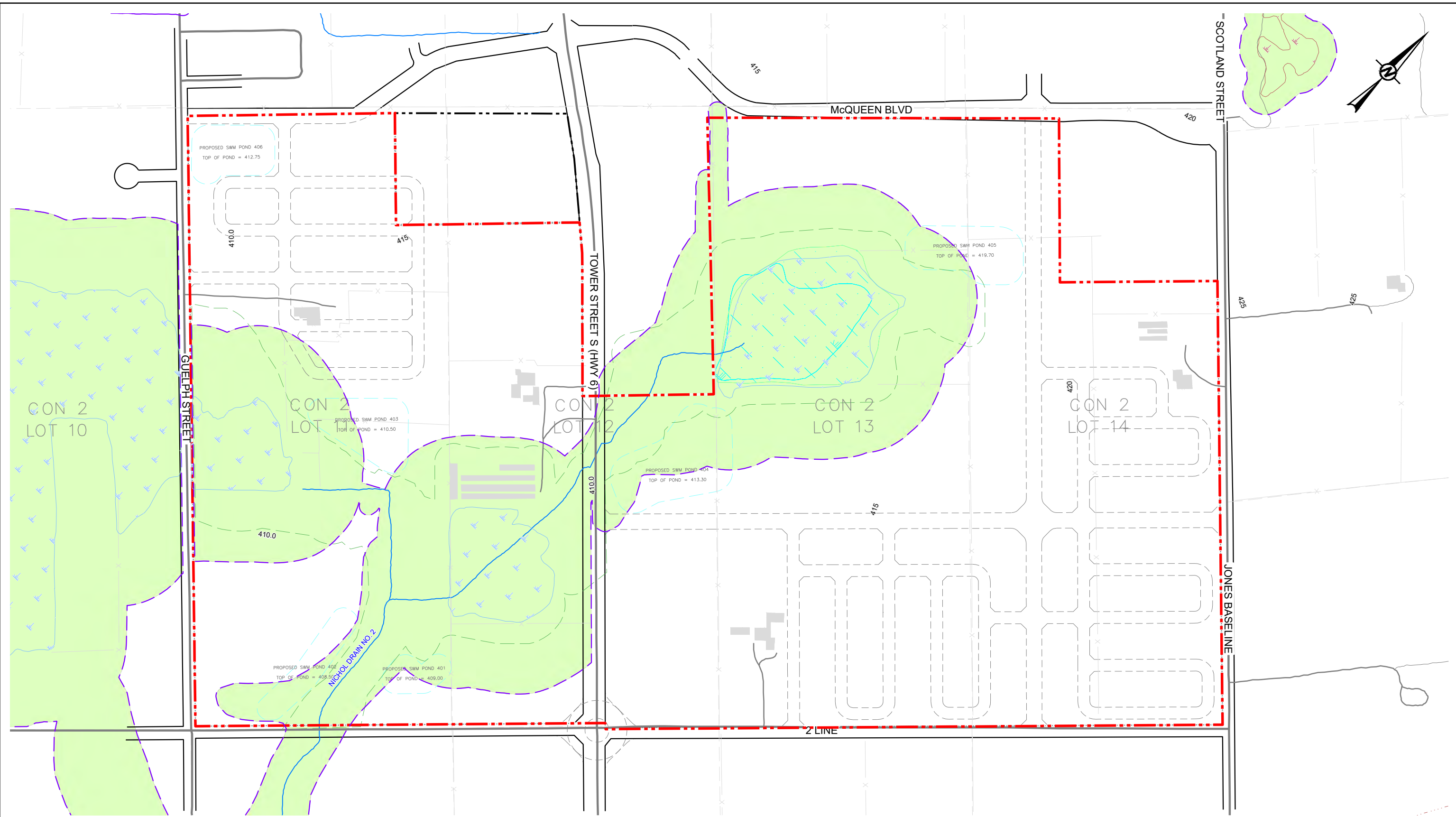
PROJECTION IS UTM NAD 83 ZONE 17

<p>CLIENT <b>TATHAM ENGINEERING LIMITED</b></p> <p>CONSULTANT</p>	<table border="0" style="width: 100%;"> <tr> <td>YYYY-MM-DD</td> <td>2022-07-28</td> </tr> <tr> <td>DESIGNED</td> <td></td> </tr> <tr> <td>PREPARED</td> <td>JPR</td> </tr> <tr> <td>REVIEWED</td> <td>JG</td> </tr> <tr> <td>APPROVED</td> <td>MAS</td> </tr> </table>	YYYY-MM-DD	2022-07-28	DESIGNED		PREPARED	JPR	REVIEWED	JG	APPROVED	MAS
YYYY-MM-DD	2022-07-28										
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PREPARED	JPR										
REVIEWED	JG										
APPROVED	MAS										

PROJECT <b>SOUTH FERGUS HYDROGEOLOGICAL INVESTIGATION</b>			
<b>TITLE SITE PLAN</b>			
PROJECT NO. 20141301	CONTROL 0002	REV. ---	FIGURE <b>2</b>

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4/B

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**PLAN LEGEND**

- - - - PLAN BOUNDARY
- REGULATED AREA (GRAND RIVER CONSERVATION AUTHORITY)
- CONSERVATION LIMIT
- ▲ ▲ ▲ PROVINCIALLY SIGNIFICANT WETLANDS
- ▲ ▲ ▲ UNEVALUATED WETLANDS

**NOTES:**

ALL MAPPED LOCATIONS ARE APPROXIMATE AND NOT TO SCALE

REGULATED AREAS AND WETLANDS COURTESY GRCA DIGITAL MAPPING 2022

0 120 240 360 m

1:6000

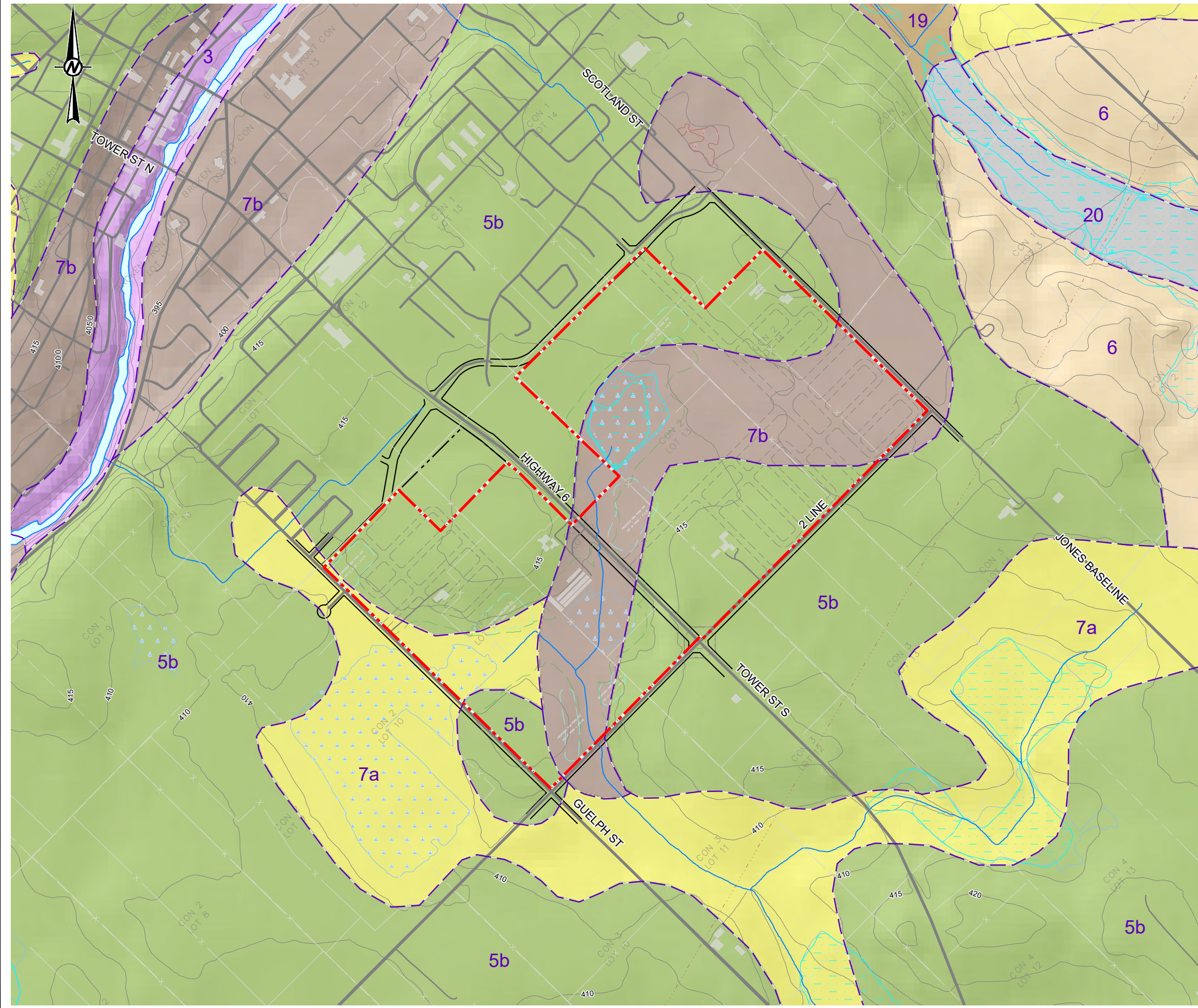
PLOTTED 11X17" TABLOID PROJECTION IS UTM NAD 83 ZONE 17

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PREPARED	JPR										
REVIEWED	JG										
APPROVED	MAS										

<p>PROJECT <b>SOUTH FERGUS HYDROGEOLOGICAL INVESTIGATION</b></p>			
<p>TITLE <b>REGULATED AREAS</b></p>			
PROJECT NO. 20141301	CONTROL 0002	REV. ---	FIGURE <b>3</b>

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS/B

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**SURFICIAL SOILS**

	20	ORGANIC DEPOSITS
	19	FLUVIAL SILT, SAND, GRAVEL
	7a	DISTAL SAND & GRAVEL
	7b	GLACIOFLUVIAL SAND & GRAVEL OUTWASH
	6	ICE CONTACT SEDIMENTS, ESKERS
	5b	ABLATION TILL
	3	PALEOZOIC BEDROCK

**PLAN LEGEND**

	PLAN BOUNDARY
	WETLANDS (GRCA)
	WETLANDS (MNR)

**REFERENCES & DISCLAIMERS**

QUATERNARY MAPPING ONTARIO GEOLOGICAL SURVEY, QUEEN'S PRINTER 2016

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.



**CLIENT**  
TATHAM ENGINEERING LIMITED

**PROJECT**  
SOUTH FERGUS  
HYDROGEOLOGICAL INVESTIGATION

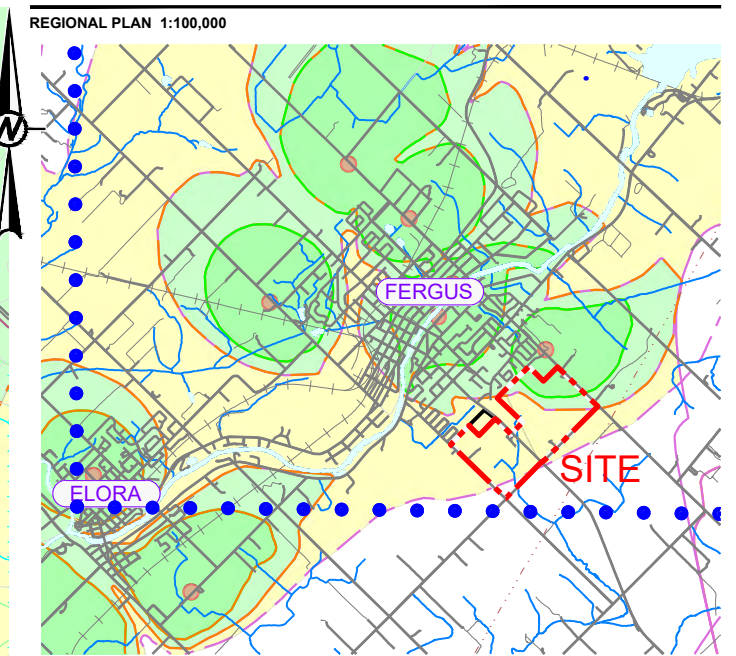
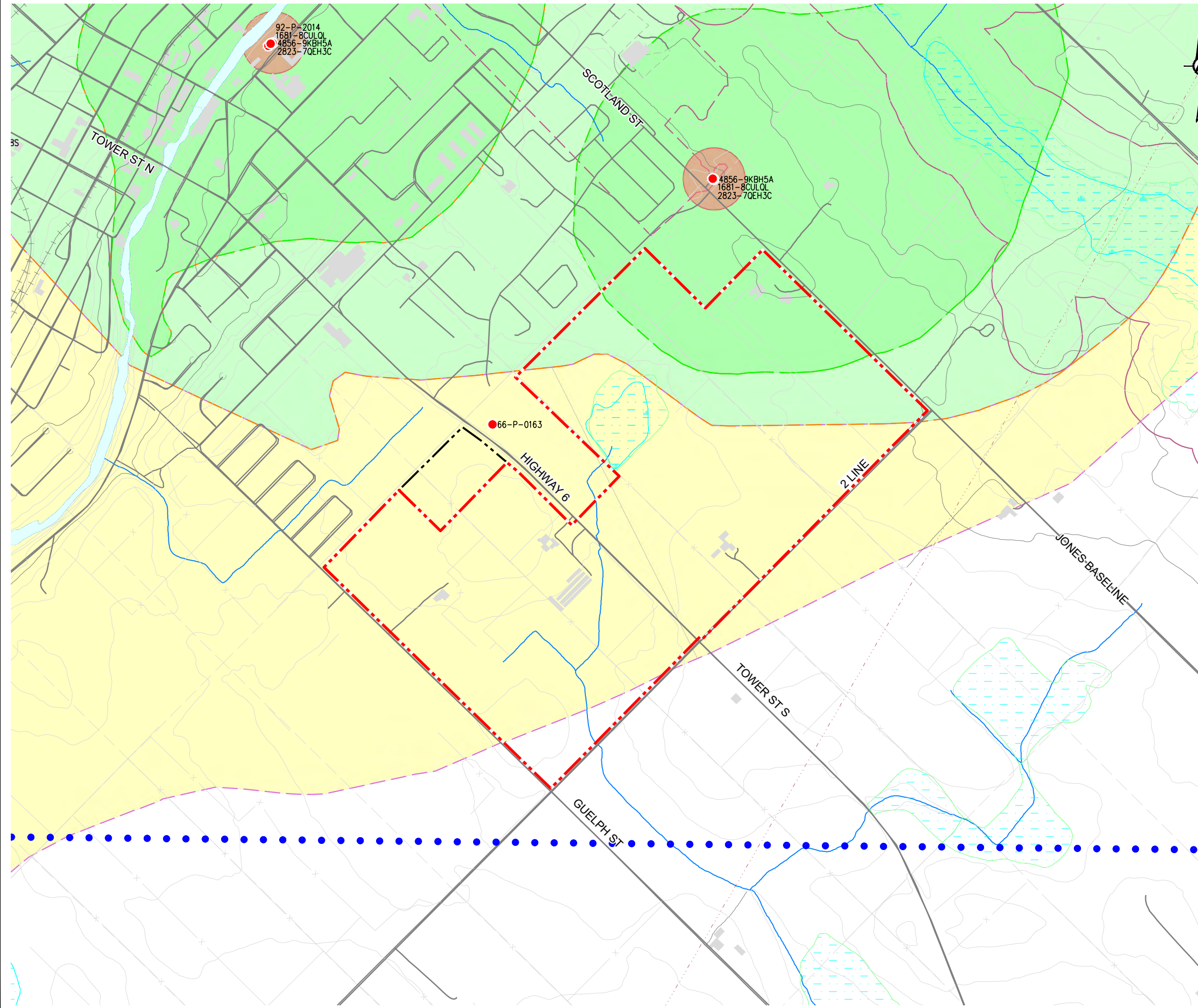
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QUATERNARY MAP

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	DESIGNED	
	PREPARED	JPR
	REVIEWED	JG
	APPROVED	MAS

<b>PROJECT NO.</b>	<b>CONTROL</b>	<b>REV.</b>	<b>FIGURE</b>
20141301	0002	----	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B

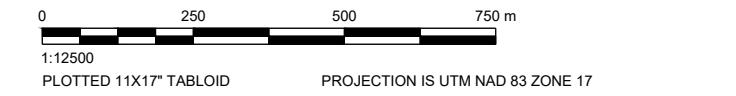
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**PLAN LEGEND**

- - - PLAN BOUNDARY
- WELLHEAD PROTECTION AREA A / MUNICIPAL WELL SITE
- 66-P-0163 PERMITTED WATER TAKING
- WELLHEAD PROTECTION AREA B
- WELLHEAD PROTECTION AREA C
- WELLHEAD PROTECTION AREA D
- ● ● ● WATER QUANTITY PROJECTION LIMIT

**REFERENCES & DISCLAIMERS**  
 WELLHEAD PROTECTION AREAS, GRAND VALLEY CONSERVATION AUTHORITY (GRCA); 2009  
 MAPPED FEATURES ARE APPROXIMATE AND NOT TO SCALE.



**CLIENT**  
 TATHAM ENGINEERING LIMITED

**PROJECT**  
 SOUTH FERGUS  
 HYDROGEOLOGICAL INVESTIGATION

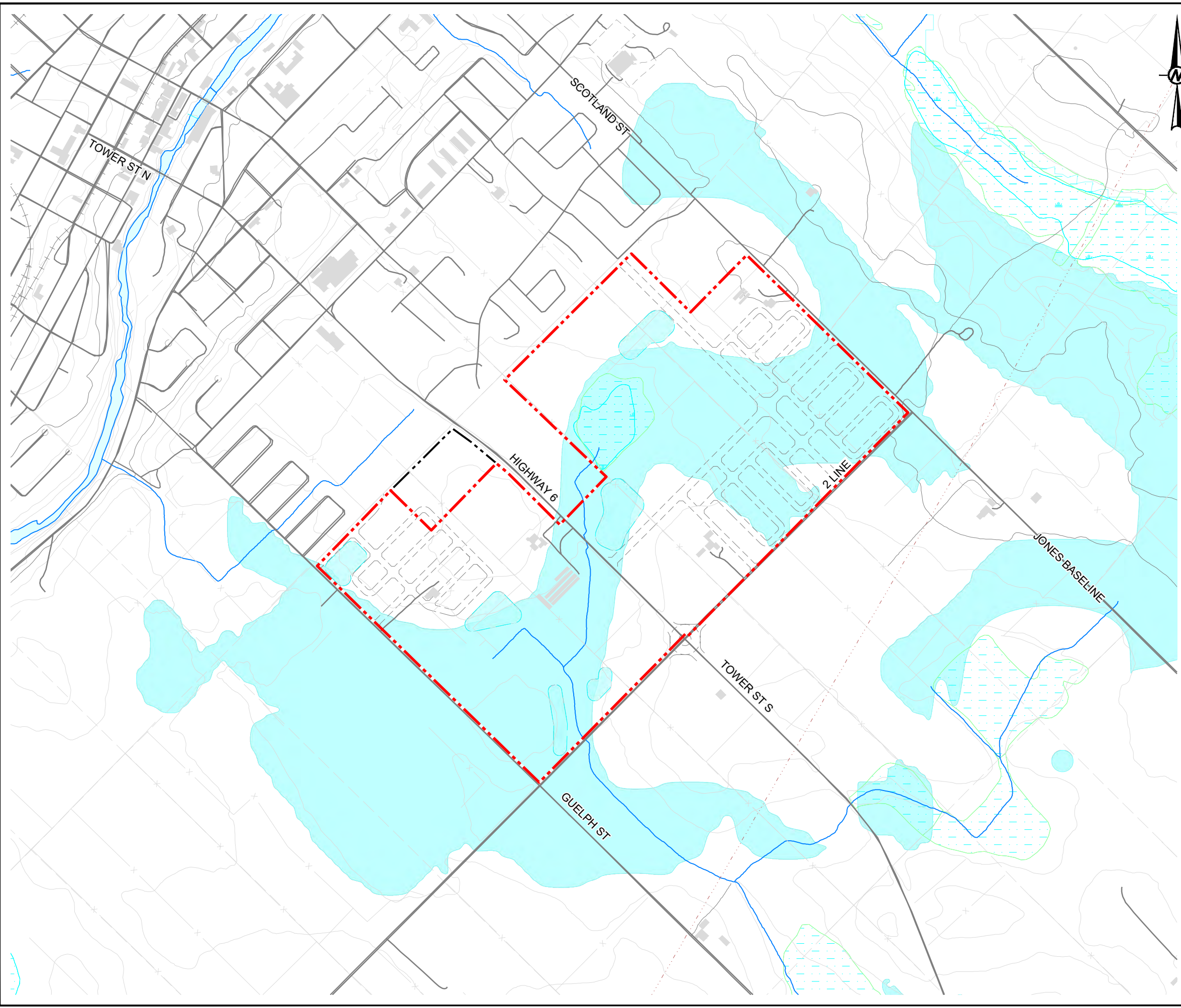
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**WELLHEAD PROTECTION AREAS**

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<b>REVIEWED</b>	JG	
<b>APPROVED</b>	MAS	



PROJECT NO. 20141301      CONTROL 0002      REV. ---      **FIGURE 5**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3S/B

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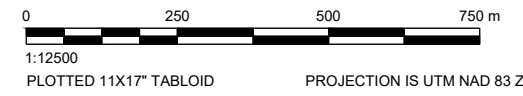


**PLAN LEGEND**

-  PLAN BOUNDARY
-  SIGNIFICANT RECHARGE AREA (>200 mm/Year)

**REFERENCES & DISCLAIMERS**

SIGNIFICANT RECHARGE AREAS, GRAND VALLEY CONSERVATION AUTHORITY (GRCA); 2009  
MAPPED FEATURES ARE APPROXIMATE AND NOT TO SCALE.



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TATHAM ENGINEERING LIMITED

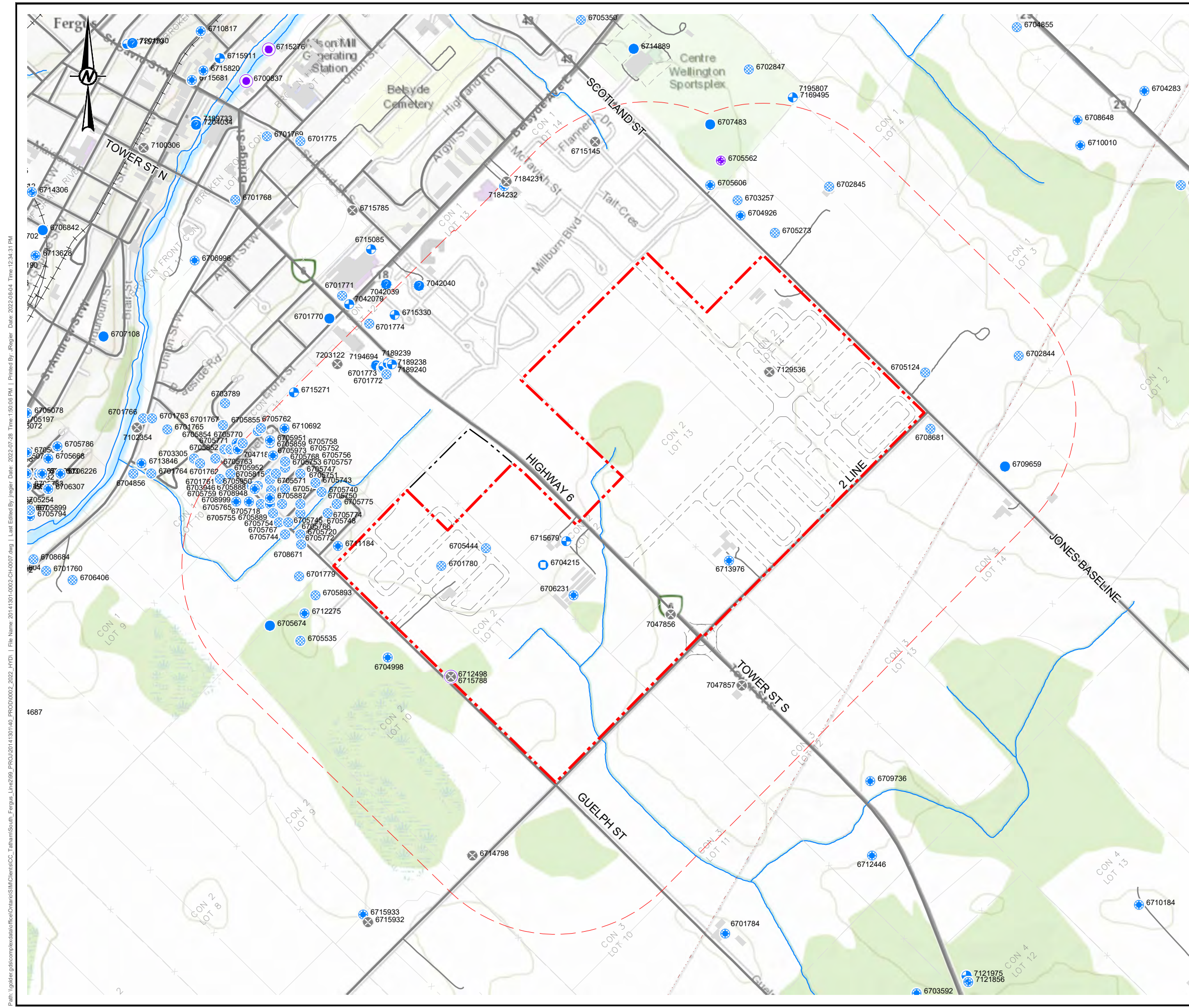
PROJECT  
SOUTH FERGUS  
HYDROGEOLOGICAL INVESTIGATION

**TITLE**  
**SIGNIFICANT GROUNDWATER RECHARGE AREAS**

CONSULTANT	YYYY-MM-DD	2022-07-028
	DESIGNED	
	PREPARED	JPR
	REVIEWED	JG
	APPROVED	MAS



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B



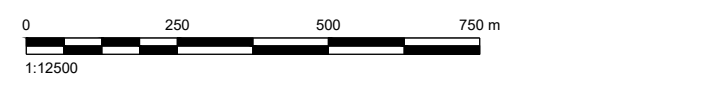
- RECORDED WELLS**
- SHALLOW DUG OR BORED <10 M
  - SANDPOINT
  - DEEP BORED WELL >10 M
  - DRILLED OVERBURDEN WELL
  - TEST OR OBSERVATION WELL
  - DRILLED BEDROCK WELL
  - MUNICIPAL / PUBLIC SUPPLY
  - MONITORING WELL
  - ⊗ RECORD OF ABANDONMENT
  - INFORMATION UNRECORDED

**PLAN LEGEND**

--- PLAN BOUNDARY WITH 500 m OFFSET

**REFERENCE**

MINISTRY OF ENVIRONMENT WATER WELL INFORMATION SYSTEM, QUEEN'S PRINTER. LOCATION AND ELEVATIONS OF FIELD VERIFIED WELLS ARE SUBJECT TO REVISION.



CLIENT  
TATHAM ENGINEERING LIMITED

PROJECT  
SOUTH FERGUSS  
HYDROGEOLOGICAL INVESTIGATION

TITLE  
**MINISTRY RECORDED WELLS**

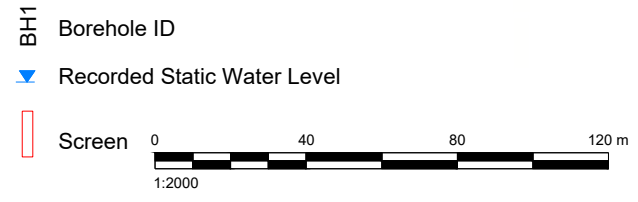
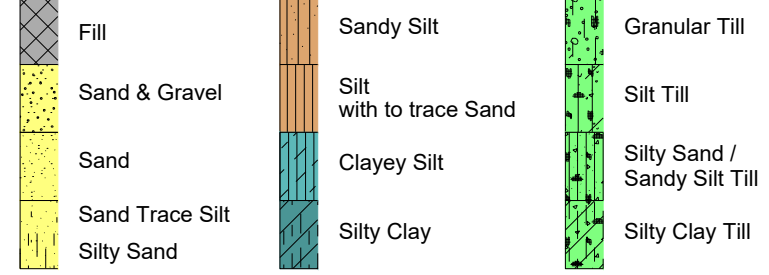
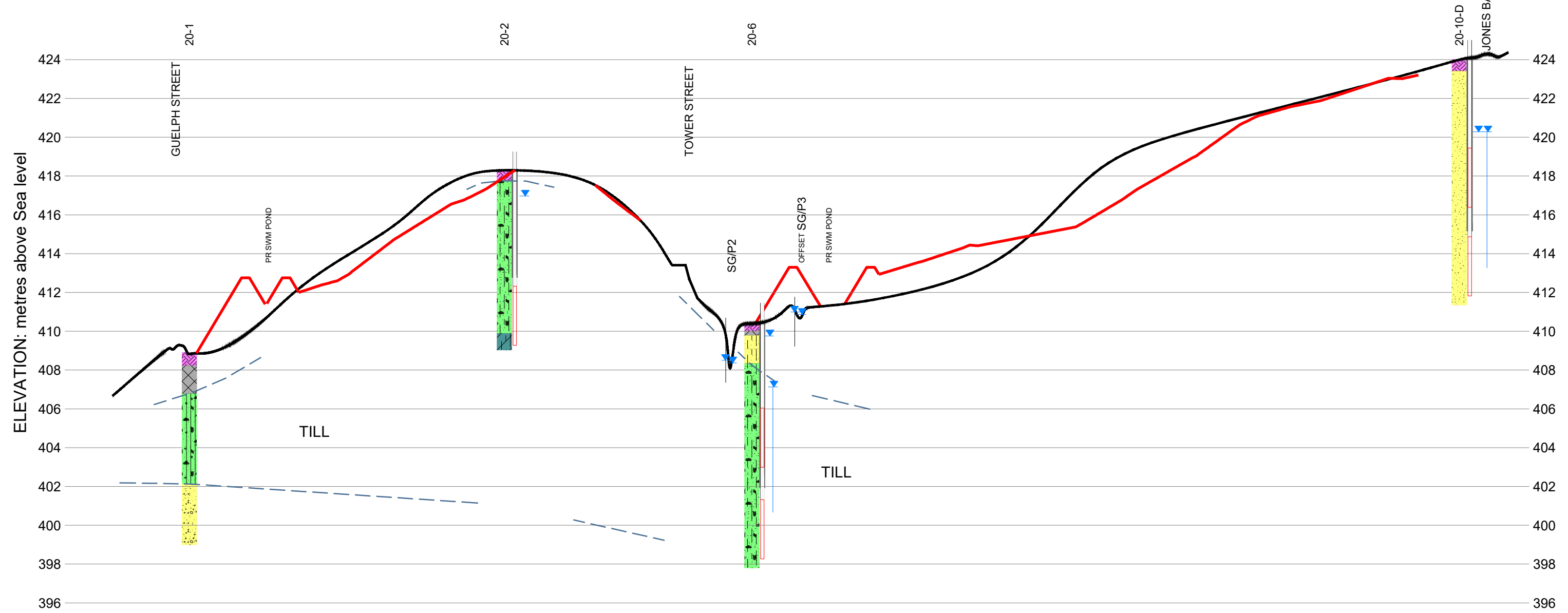
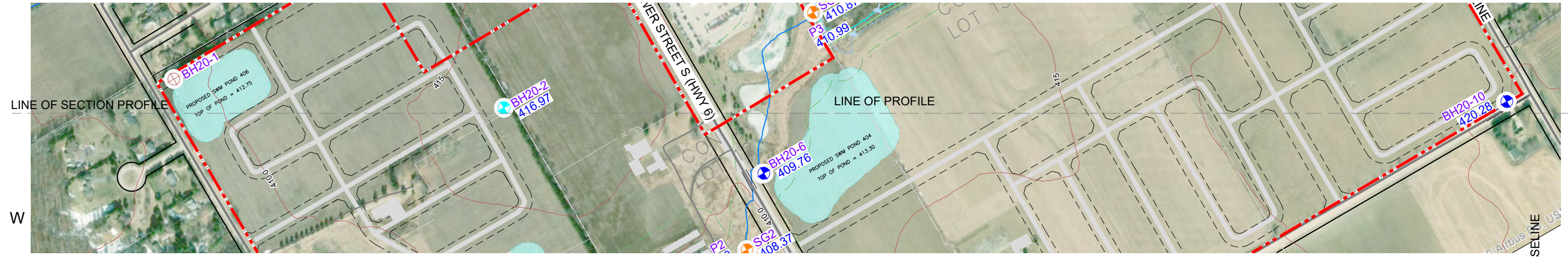
CONSULTANT	YYYY-MM-DD	2022-07-18
	DESIGNED	
	PREPARED	JPR
	REVIEWED	JG
	APPROVED	MAS

PROJECT NO. 20141301 CONTROL 0002 REV. --- FIGURE 7

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CLIENT  
 TATHAM ENGINEERING LIMITED

CONSULTANT	YYYY-MM-DD	2022-07-18
DESIGNED		
PREPARED	JPR	
REVIEWED	JG	
APPROVED	MAS	

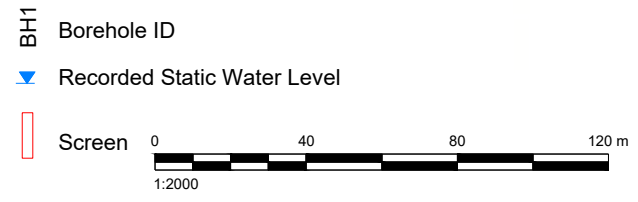
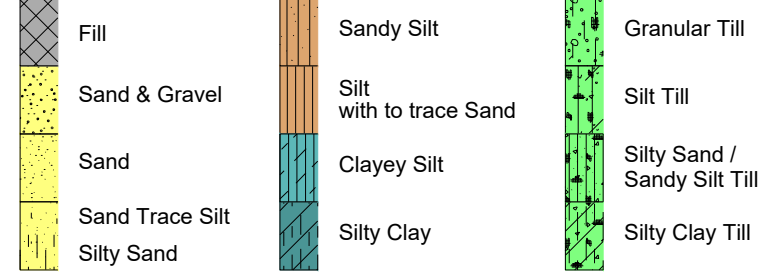
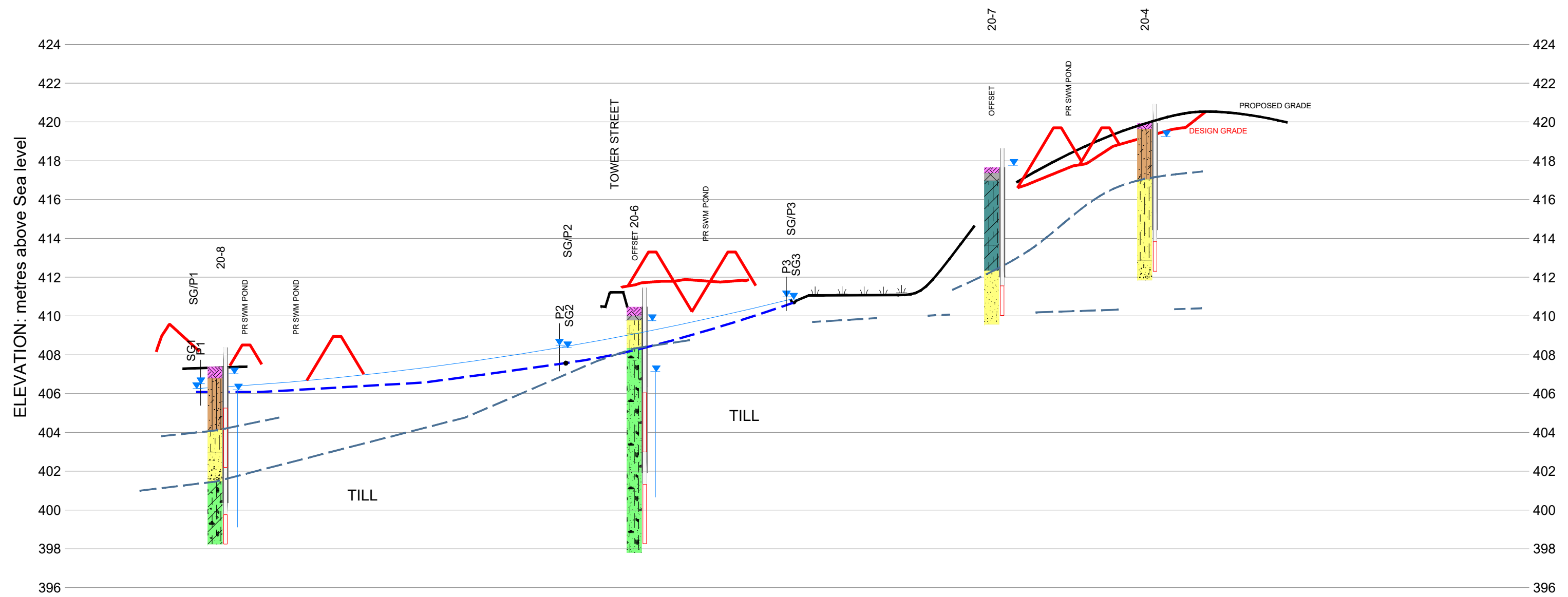
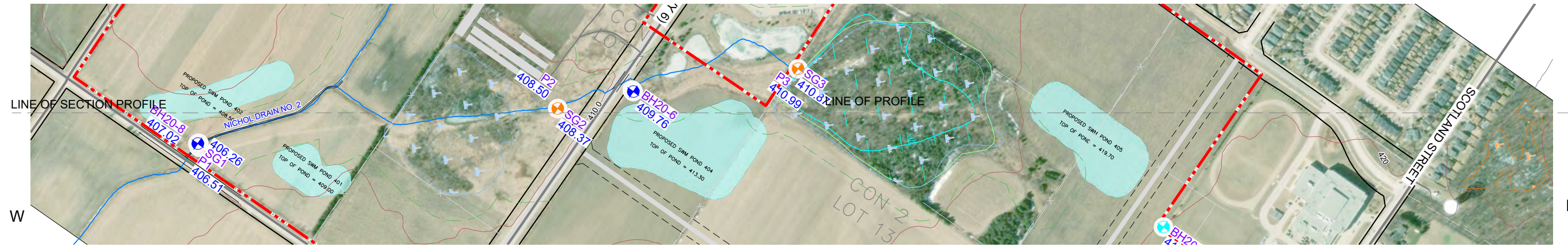
PROJECT  
 SOUTH FERGUS  
 HYDROGEOLOGICAL INVESTIGATION

TITLE  
**SITE SECTION A - A'**

PROJECT NO.	CONTROL	REV.	FIGURE
20141301	0002	---	8A

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANS1 B

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CLIENT  
TATHAM ENGINEERING LIMITED

CONSULTANT	YYYY-MM-DD	2022-07-18
	DESIGNED	
	PREPARED	JPR
	REVIEWED	JG
	APPROVED	MAS

PROJECT  
SOUTH FERGUS  
HYDROGEOLOGICAL INVESTIGATION

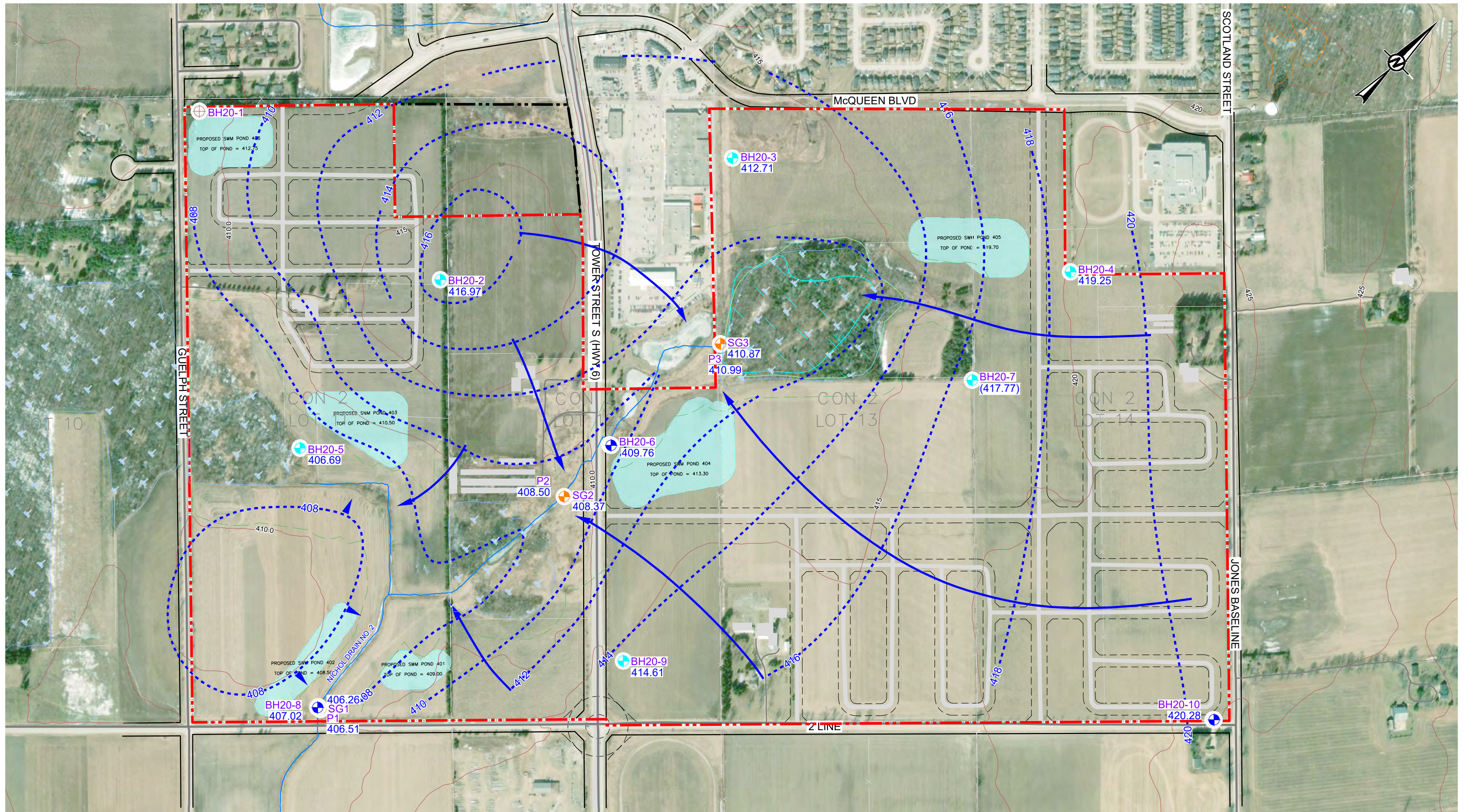
TITLE  
**SITE SECTION B - B'**

PROJECT NO.	CONTROL	REV.	FIGURE
20141301	0002	---	<b>8B</b>

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4/B



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**PLAN LEGEND**

- PLAN BOUNDARY
- + TEST BOREHOLE
- + SHALLOW MONITORING WELL
- + SHALLOW & DEEP NESTED MONITORING WELL
- + STAFF GAUGE / MINI-PIEZOMETER
- + 435.67 STATIC WATER LEVEL, VALUE IN BRACKETS FROM DEEPER SCREENED PORTION ( ) ARTESIAN
- INTERPOLATED GROUNDWATER FLOW
- | | | PROVINCIALLY SIGNIFICANT WETLANDS
- | | | UNEVALUATED

**MAP KEY**

ALL MAPPED LOCATIONS ARE APPROXIMATE AND NOT TO SCALE

WETLANDS GRCA

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.

0      120      240      360 m

1:6000

PLOTTED 11X17" TABLOID

PROJECTION IS UTM NAD 83 ZONE 17

<p>CLIENT <b>TATHAM ENGINEERING LIMITED</b></p> <p>CONSULTANT</p>	<table border="0" style="width: 100%;"> <tr> <td>YYYY-MM-DD</td> <td>2022-07-18</td> </tr> <tr> <td>DESIGNED</td> <td></td> </tr> <tr> <td>PREPARED</td> <td>JPR</td> </tr> <tr> <td>REVIEWED</td> <td>JG</td> </tr> <tr> <td>APPROVED</td> <td>MAS</td> </tr> </table>	YYYY-MM-DD	2022-07-18	DESIGNED		PREPARED	JPR	REVIEWED	JG	APPROVED	MAS
YYYY-MM-DD	2022-07-18										
DESIGNED											
PREPARED	JPR										
REVIEWED	JG										
APPROVED	MAS										

PROJECT <b>SOUTH FERGUS HYDROGEOLOGICAL INVESTIGATION</b>	
<b>TITLE</b>	
<b>GROUNDWATER FLOW 12 MARCH 2021</b>	
PROJECT NO. 20141301	CONTROL 0002
REV. ---	FIGURE <b>9</b>

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4S/B

**APPENDIX A**

**Important Information and  
Limitations of this Report**

## **IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT**

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**Standard of Care:** WSP Canada Inc. (WSP) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

**Basis and Use of the Report:** This report has been prepared for the specific site, design objective, development and purpose described to WSP by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. WSP cannot be responsible for use of this report, or portions thereof, unless WSP is requested to review and, if necessary, revise the report.

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The report is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, communications between WSP and the Client, and to any other reports prepared by WSP for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. WSP cannot be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

**Soil, Rock and Ground water Conditions:** Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, WSP does not warrant or guarantee the exactness of the descriptions.

## **IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT**

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Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that WSP interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

**Sample Disposal:** WSP will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

**Follow-Up and Construction Services:** All details of the design were not known at the time of submission of WSP's report. WSP should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of WSP's report.

During construction, WSP should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of WSP's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in WSP's report. Adequate field review, observation and testing during construction are necessary for WSP to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, WSP's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

**Changed Conditions and Drainage:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that WSP be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that WSP be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. WSP takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

**APPENDIX B**  
**Provided Drawings**

# Preferred Land Use Plan

## South Fergus Secondary Planning Area

### LEGEND

- South Fergus Planning Area
- Property Lines (Approximate)
- Natural Heritage Features
- Creek
- Natural Hazard Limit
- Proposed Land Use**
- Low Density Residential
- Medium Density Residential
- Mixed Use Corridor
- Gateway Commercial
- Business Park
- Community Park
- Natural Heritage
- Highway Commercial
- Special Policy Area
- Future School Location
- Neighbourhood Park Locations
- Preliminary SWM Locations
- Trail Corridor
- Proposed Collector Roads
- Potential Roundabout
- Property of Cultural Heritage Value or Interest

Date: May 26, 2022  
 Project: 19144A

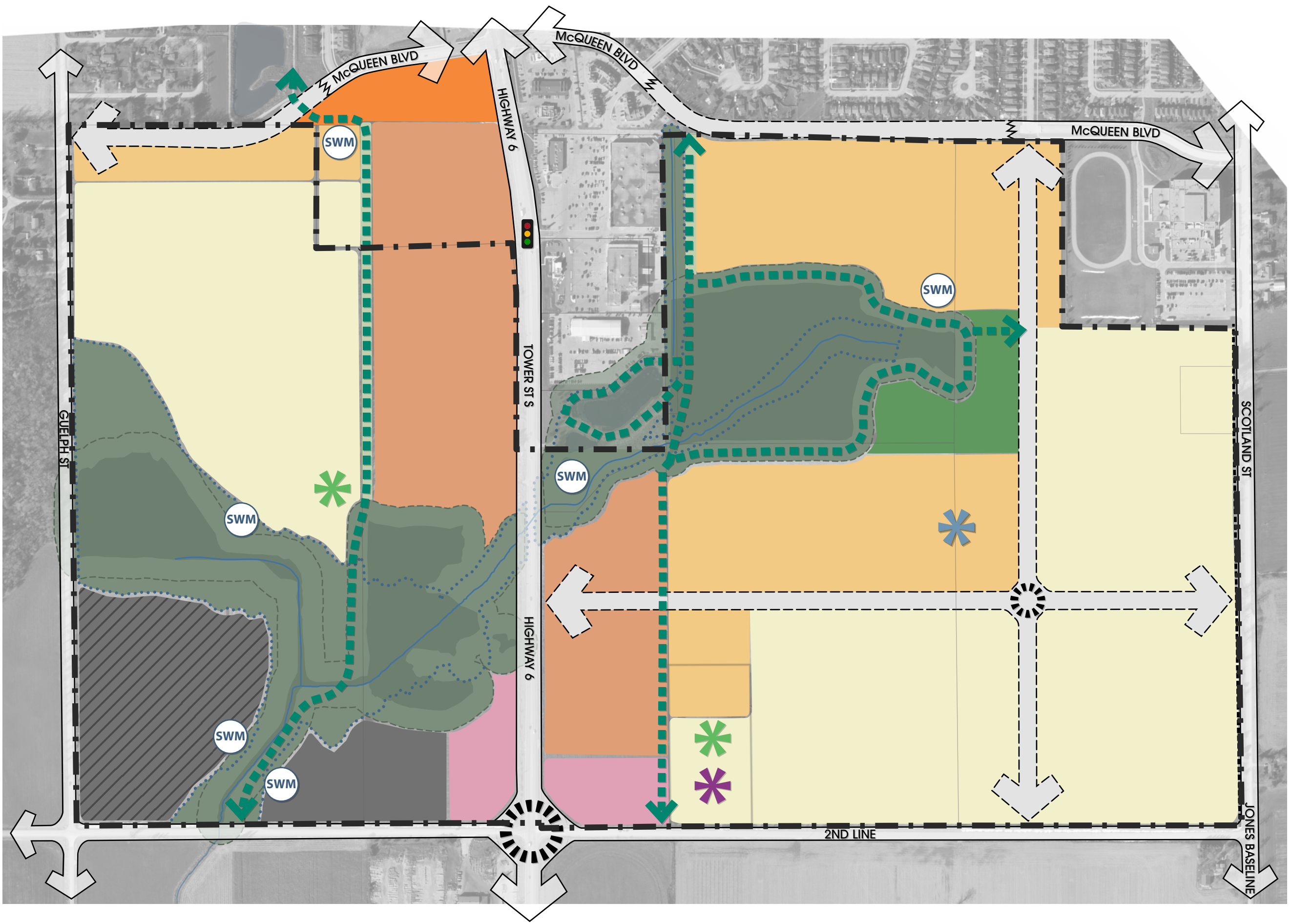
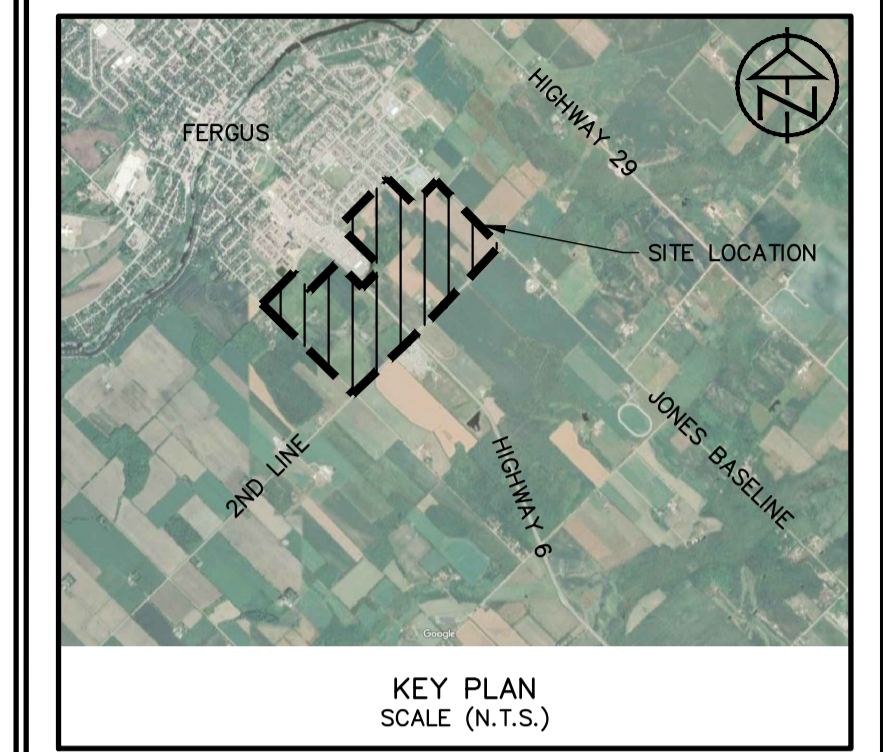


Figure 1: Preliminary Land Use Plan

DP-2  
EXISTING DRAINAGE PLAN

South Fergus MESP and Secondary Plan  
Town of Fergus  
Township of Centre Wellington  
County of Wellington



**CULVERTS**

CULVERT 1:	3.02m X 1.82m BOX CULVERT
CULVERT 2:	1.2m $\phi$ CSP
CULVERT 3:	3.0m X 2.0m BOX CULVERT
CULVERT 4:	0.55m $\phi$ & 0.6m $\phi$ HDPE
CULVERT 5:	TO BE DETERMINED
CULVERT 6:	TO BE DETERMINED
CULVERT 7:	TO BE DETERMINED
CULVERT 8:	0.45m $\phi$ CSP
CULVERT 9:	0.45m $\phi$ CSP

**LEGEND**

- SOUTH FERGUS SECONDARY PLAN AREA
- OVERLAND FLOW DIRECTION
- CATCHMENT BOUNDARY
- WETLANDS
- CATCHMENT ID
- CURVE NUMBER / IMPERVIOUS FRACTION
- CATCHMENT AREA
- SW STREAMFLOW MONITORING LOCATION
- RG RAIN GAUGE LOCATION
- POINT OF INTEREST

Base Map Source: TOPOGRAPHIC SURVEY (TATHAM) COMBINED WITH TOPOGRAPHIC MAPPING (NORTHWAY/PHOTOMAP REMOTE SENSING LTD.)

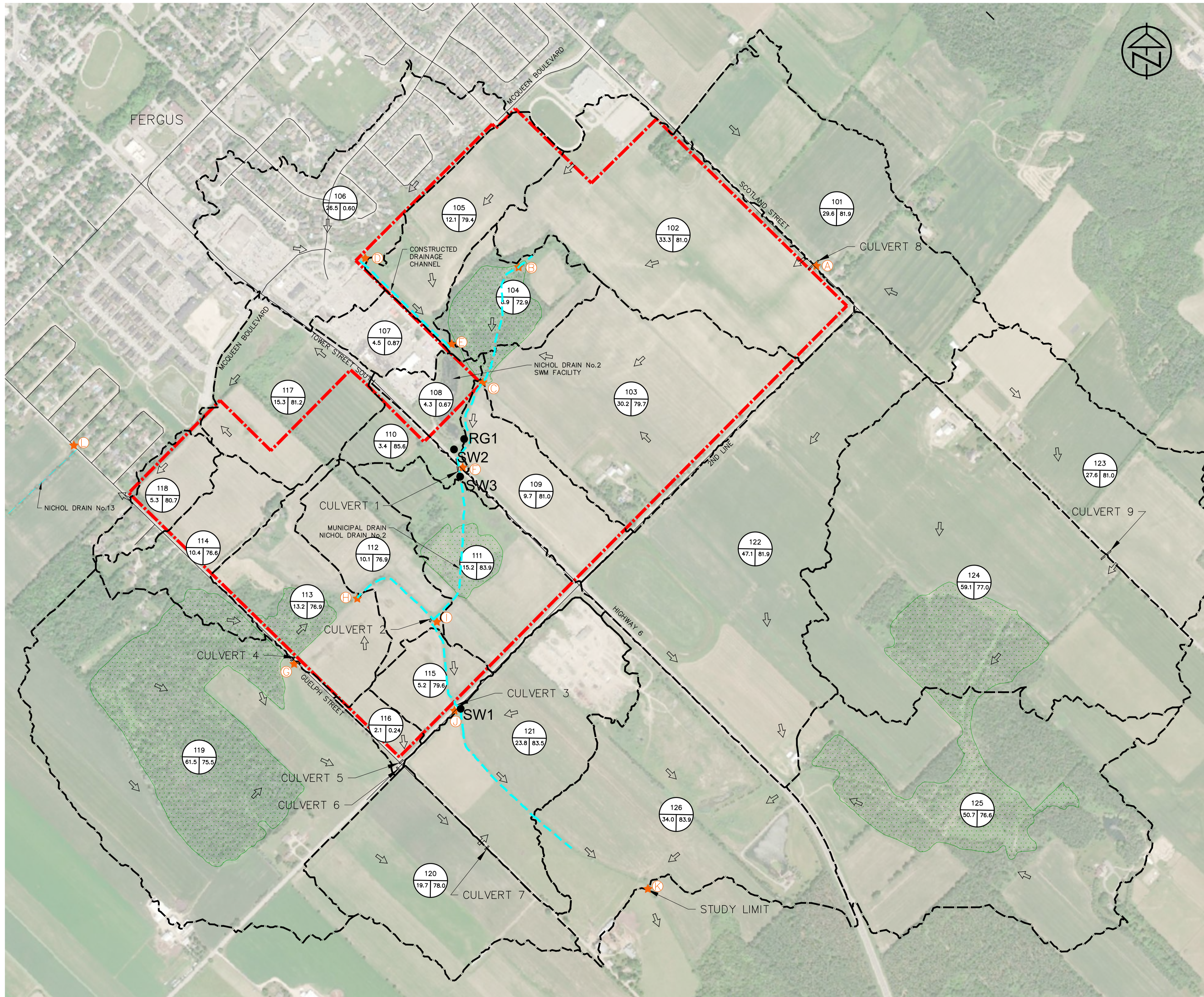
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**MHBC** PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

**FRICORP** ECOLOGICAL SERVICES

**TATHAM** ENGINEERING



**APPENDIX C**

**MECP Water Well  
Record Summary**



LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6701761	1 10	Jun-56	550197 4838104	411.5	59.4 Fr		22.3	45	120	22.9	2521 CT	WS DO	<b>MOE# 6701761</b> 0.0 CLAY 12.2 CLAY STNS 18.6 GREY LMSN 59.4
6701762	1 10	Apr-59	550132 4838155	412.1	52.4 Fr		23.2	32	120	23.2	2521 CT	WS DO	<b>MOE# 6701762</b> 0.0 CLAY 16.2 GREY LMSN 27.4 YLLW LMSN 30.5 GREY LMSN 42.7 YLLW LMSN 52.4
6701772		Apr-62	550746 4838448	414.8	39.6 Fr		16.8	32	120	18.3	1659 CT	WS CO	<b>MOE# 6701772</b> 0.0 CLAY MSND 4.6 CLAY STNS 14.6 GREY LMSN 39.6
6701773		Jun-63	550732 4838469	415.1	38.1 Fr		19.8	45	120	21.3	1659 CT	WS DO	<b>MOE# 6701773</b> 0.0 CLAY STNS 15.2 GREY LMSN 38.7
6701774		May-66	550689 4838615	415.4	21.3 Fr		21.9	55	15	25.9	2406 CT	WS DO	<b>MOE# 6701774</b> 0.0 TPSL 0.3 BRWN CLAY 10.7 GREY CLAY STNS 17.1 GREY LMSN 27.4 BRWN LMSN 52.1
6701779	2 10	Aug-67	550458 4837783	408.1	27.4 Fr		11.9	36	180	18.3	1659 CT	WS DO	<b>MOE# 6701779</b> 0.0 CLAY STNS 9.1 GREY LMSN 29.3
6701780	2 2	Nov-48	550926 4837818	411.8	126.5 Fr		12.2	36	360	36.6	2411 CT	WS ST	<b>MOE# 6701780</b> 0.0 CLAY 9.1 GRVL 12.2 LMSN 128.9
6702844	1 3	Apr-56	552828 4838509	426.7	54.9 Fr		11.0	45	240	13.1	1648 CT	WS DO	<b>MOE# 6702844</b> 0.0 CLAY STNS 22.9 GRVL 26.2 LMSN 54.9
6702845	1 4	Sep-64	552204 4839066	425.8	32.9 Fr		19.8	45	120	22.9	1659 CT	WS DO	<b>MOE# 6702845</b> 0.0 CLAY MSND 21.9 GREY LMSN 32.9
6703257	1 4	Sep-68	551902 4839021	422.1	45.7 Fr		18.3	45	120	25.9	2521 CT	WS DO	<b>MOE# 6703257</b> 0.0 CLAY 24.7 GREY LMSN 45.7
6703946	1 11	May-71	550312 4838071	411.5	38.1 Fr		8.5	27	480	15.2	1659 CT	WS DO	<b>MOE# 6703946</b> 0.0 CLAY STNS 9.1 GREY LMSN 38.1
6704215	2 12	Feb-71	551262 4837821	414.5	9.1 Fr 3.0 Fr		3.7	9	60	11.0	3637 BR	WS ST	<b>MOE# 6704215</b> 0.0 BRWN TPSL 0.3 BRWN CLAY SAND GRVL 3.0 GREY CLAY STNS SAND 11.3
6704926	1 4	Sep-73	551912 4838971	423.1	50.9 Fr 44.5 Fr		20.1	41	600	28.7	3316 RC	WS DO	<b>MOE# 6704926</b> 0.0 BRWN CLAY STNS 28.0 BRWN LMSN 45.7 WHITE LMSN 51.8
6704998	2 10	Feb-74	550750 4837516	410.0	38.1 Fr 30.5 Fr		10.1	45	60	13.7	2336 CT	WS DO	<b>MOE# 6704998</b> 0.0 BRWN CLAY STNS 4.6 BRWN CLAY GRVL 8.8 BRWN ROCK 27.4 BRWN ROCK 30.5 BRWN ROCK 38.4
6705124	1 3	Jun-74	552520 4838454	423.7	40.2 Fr		17.7	45	60	21.3	2336 RC	WS DO	<b>MOE# 6705124</b> 0.0 TPSL 0.3 BRWN CLAY FSND 19.8 GREY CLAY STNS 22.3 BRWN ROCK 25.9 GREY ROCK 31.7 BRWN ROCK 40.2
6705273	1 4	Sep-74	552025 4838914	422.1	22.3 Fr		16.5	23	60	19.8	3740 RA	WS DO	<b>MOE# 6705273</b> 0.0 BRWN CLAY STNS 13.1 GREY HPAN BLDL 18.6 BRWN LMSN LYRD 20.7 BRWN LMSN FCRD 22.3
6705444	2 11	Jan-75	551073 4837876	416.1	34.4 Fr		15.2	45	60	24.4	2521 CT	WS DO	<b>MOE# 6705444</b> 0.0 CLAY 9.4 GREY LMSN 34.4

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6705535	2 10	May-75	550462 4837571	411.5	33.5 Fr		9.1	68	60	18.3	2336 RC	WS DO	<b>MOE# 6705535</b> 0.0 BRWN CLAY STNS 11.6 BRWN ROCK 33.5
6705562	1 5	May-75	551847 4839152	422.1	99.1 Fr 48.8 Fr 19.8 Fr		15.2				2336 RC	TH MU	<b>MOE# 6705562</b> 0.0 TPSL 0.6 BRWN CLAY STNS 3.7 GREY CLAY STNS 14.6 BRWN ROCK 47.2 BRWN ROCK 100.0
6705571	1 11	Nov-75	550366 4838067	411.5	21.3 Fr		14.6	18	60	16.8	3740 RA	WS DO	<b>MOE# 6705571</b> 0.0 BLCK TPSL 0.3 BRWN CLAY STNS 11.3 BRWN LMSN 21.3
6705606	1 5	Jul-75	551812 4839071	422.1	107.3 Fr 74.7 Fr 45.7 Fr 45.7 Fr		16.8		60		2336 CT	WS PU	<b>MOE# 6705606</b> 0.0 BRWN CLAY STNS 4.0 GREY CLAY STNS 15.2 ROCK FCRD 20.1 BRWN ROCK 42.7 BRWN ROCK 67.1 YLLW ROCK 74.7 BRWN ROCK 99.7 GREY ROCK 108.2 GREY ROCK 124.4
6705674	2 10	Aug-75	550362 4837621	413.0	29.3 Fr		13.7	45	60		2336 RC	WS DO	<b>MOE# 6705674</b> 0.0 BRWN CLAY STNS 5.5 GREY CLAY STNS 12.2 BRWN ROCK 28.3 CLAY ROCK FCRD 29.3
6705718	1 11	Sep-75	550332 4838021	410.0	43.3 Fr		15.2	27	60	22.9	2336 RC	WS DO	<b>MOE# 6705718</b> 0.0 BRWN CLAY SAND GRVL 6.1 BRWN CLAY STNS SAND 9.8 GREY ROCK 15.8 BRWN ROCK 43.3
6705720	1 11	Sep-75	550462 4837921	410.0	29.3 - 24.4 -		14.6	36	60	18.3	2336 RC	WS DO	<b>MOE# 6705720</b> 0.0 BRWN CLAY STNS 8.8 BRWN LMSN 14.9 29.3
6705740	1 11	Oct-75	550532 4838061	411.5	38.7 Fr		16.2	36	60	21.3	2336 RC	WS DO	<b>MOE# 6705740</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS SAND 9.1 BRWN ROCK 38.7
6705743	1 11	Oct-75	550512 4838091	411.5	38.7 Fr		16.8	36	60	22.9	2336 RC	WS DO	<b>MOE# 6705743</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS SAND 9.1 BRWN ROCK 38.7
6705744	1 11	Oct-75	550412 4837921	410.0	29.6 Fr		13.4	36	60		2336 RC	WS DO	<b>MOE# 6705744</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 7.6 GREY CLAY STNS 9.1 BRWN ROCK 29.6
6705745	1 11	Oct-75	550462 4837991	410.0	29.6 Fr		13.4	36	60	22.9	2336 RC	WS DO	<b>MOE# 6705745</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 7.6 GREY CLAY STNS 9.1 BRWN ROCK 29.6
6705746	1 11	Oct-75	550412 4838071	411.5	38.7 Fr		16.5	36	60	22.9	2336 RC	WS DO	<b>MOE# 6705746</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 6.1 GREY CLAY STNS 11.6 BRWN ROCK 38.7
6705747	1 11	Oct-75	550462 4838121	411.5	38.7 Fr		16.5	36	60	22.9	2336 RC	WS DO	<b>MOE# 6705747</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 7.6 GREY CLAY STNS 11.6 BRWN ROCK 38.7
6705748	1 11	Oct-75	550462 4838021	410.0	38.7 -		16.5	36	60	21.3	2336 RC	WS DO	<b>MOE# 6705748</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 7.3 GREY CLAY STNS 11.9 BRWN ROCK 38.7

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6705750	1 11	Oct-75	550462 4838021	410.0	38.7 Fr		16.8	36	60	22.9	2336 RC	WS DO	<b>MOE# 6705750</b> 0.0 BRWN TPSL 0.3 BRWN CLAY 7.6 GREY CLAY STNS 11.6 BRWN ROCK 38.7
6705751	1 11	Jun-75	550382 4838121	411.5	36.6 Fr		15.5	36	60	22.9	2336 RC	WS DO	<b>MOE# 6705751</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 9.1 GREY CLAY STNS 12.8 BRWN ROCK 36.6
6705752	1 11	Oct-75	550362 4838121	411.5	41.8 Fr		18.6	36	60	24.4	2336 RC	WS DO	<b>MOE# 6705752</b> 0.0 TPSL 0.3 BRWN CLAY STNS 9.1 GREY CLAY STNS 12.8 BRWN ROCK 43.0
6705753	1 11	Jul-75	550412 4838151	411.5	36.6 Fr		15.2	36	60	22.6	2336 RC	WS DO	<b>MOE# 6705753</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 9.1 GREY CLAY STNS 12.8 BRWN ROCK 36.6
6705754	1 11	Jun-75	550372 4837991	410.0	36.6 Fr		15.2	36	60	22.3	2336 RC	WS DO	<b>MOE# 6705754</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 6.1 GREY CLAY STNS 10.4 BRWN ROCK 36.6
6705755	1 11	May-75	550402 4838021	410.0	37.8 Fr		14.3	36	60	21.3	2336 RC	WS DO	<b>MOE# 6705755</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 6.1 GREY CLAY STNS 10.4 BRWN ROCK 37.8
6705756	1 11	Dec-75	550362 4838121	411.5	41.1 -		18.9	36	60	24.4	2336 RC	WS DO	<b>MOE# 6705756</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 9.1 GREY CLAY STNS 12.8 BRWN ROCK 41.1
6705757	1 11	Nov-75	550412 4838141	413.0	38.1 Fr		20.1	36	60	24.4	2336 RC	WS DO	<b>MOE# 6705757</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 9.1 GREY CLAY 12.8 BRWN ROCK 38.1
6705758	1 11	Nov-75	550362 4838101	413.0	42.7 Fr		19.8	36	60	24.1	2336 RC	WS DO	<b>MOE# 6705758</b> 0.0 TPSL 0.3 BRWN CLAY STNS 8.8 GREY CLAY STNS 12.5 BRWN ROCK 42.7
6705759	1 11	Nov-75	550312 4838081	411.5	37.5 -		17.1	36	60	24.4	2336 RC	WS DO	<b>MOE# 6705759</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 10.1 BRWN ROCK 37.5
6705762	1 11	Nov-75	550332 4838271	413.0	47.9 Fr		25.9	36	60	29.9	2336 RA	WS DO	<b>MOE# 6705762</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 9.1 GREY CLAY STNS 15.2 BRWN ROCK 47.9
6705763	1 11	Nov-75	550182 4838171	413.0	47.9 Fr		25.6	36	60	29.9	2336 RA	WS DO	<b>MOE# 6705763</b> 0.0 BRWN TPSL 0.3 BRWN CLAY 7.6 GREY CLAY 14.0 BRWN ROCK 47.9
6705765	1 11	Apr-75	550322 4838081	411.5	42.7 Fr		21.3	45	60	25.9	2336 RC	WS DO	<b>MOE# 6705765</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 9.1 GREY CLAY STNS GRVL 14.3 BRWN ROCK 43.3
6705766	1 11	Sep-75	550422 4837961	410.0	33.8 Fr		14.6	45	60	19.8	2336 RC	WS DO	<b>MOE# 6705766</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 7.6 GREY CLAY STNS 10.7 BRWN ROCK 33.8

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6705767	1 11	Sep-75	550392 4837961	410.0	38.1 Fr		14.6	45	60	19.8	2336 RC	WS ST	<b>MOE# 6705767</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 7.6 GREY CLAY STNS 10.7 BRWN ROCK 38.1
6705768	1 11	Jun-75	550412 4838161	413.0	43.0 Fr		18.9	45	60	24.4	2336 RC	WS DO	<b>MOE# 6705768</b> 0.0 BRWN CLAY STNS 7.6 GREY CLAY STNS 14.0 BRWN ROCK 43.0
6705770	1 11	Aug-75	550272 4838221	413.0	39.0 Fr		23.8	32	60	27.4	2336 RC	WS DO	<b>MOE# 6705770</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS SAND 12.8 BRWN ROCK 39.0
6705772	1 11	Oct-75	550462 4837921	408.4	29.3 Fr		13.7	45	60	18.3	2336 RR	WS DO	<b>MOE# 6705772</b> 0.0 BRWN CLAY STNS 7.9 BRWN ROCK 29.3
6705774	1 11	Oct-75	550552 4837991	410.0	38.4 Fr		16.8	68	60	22.9	2336 RC	WS ST	<b>MOE# 6705774</b> 0.0 BRWN CLAY STNS 8.5 BRWN ROCK 38.4
6705775	1 11	Oct-75	550582 4838021	410.0	38.4 Fr		16.8	68	60	21.3	2336 RC	WS DO	<b>MOE# 6705775</b> 0.0 BRWN CLAY STNS 8.5 BRWN ROCK 38.4
6705815	1 11	Oct-75	550232 4838121	413.0	32.6 Fr		18.3	23	150	24.4	3740 RA	WS DO	<b>MOE# 6705815</b> 0.0 BLCK TPSL 0.3 BRWN CLAY STNS 11.3 BRWN LMSN CLAY LYRD 32.6
6705855	1 11	Dec-75	550322 4838261	413.0	45.1 Fr		24.4	36	60	32.0	2336 RC	WS DO	<b>MOE# 6705855</b> 0.0 BRWN TPSL 0.3 BRWN CLAY STNS 7.6 GREY CLAY STNS 13.4 BRWN ROCK 45.1
6705859	1 11	Dec-75	550362 4838221	413.0	44.5 Fr		22.9	36	60	30.5	2336 RA	WS DO	<b>MOE# 6705859</b> 0.0 TPSL 0.3 BRWN CLAY STNS 7.6 GREY CLAY STNS 14.0 BRWN ROCK 44.5
6705887	1 11	Jan-76	550362 4838041	410.0	48.2 Fr		15.2	36	60	21.3	2336 CT	WS DO	<b>MOE# 6705887</b> 0.0 BRWN CLAY STNS GRVL 9.1 BRWN ROCK 48.2
6705888	1 11	Jan-76	550302 4838081	411.5	45.1 Fr		21.3	36	60	27.4	2336 CT	WS DO	<b>MOE# 6705888</b> 0.0 BRWN CLAY STNS 10.1 BRWN ROCK 45.1
6705889	1 11	Jan-76	550362 4838021	410.0	38.4 Fr		22.9	36	60	30.5	2336 CT	WS DO	<b>MOE# 6705889</b> 0.0 BRWN CLAY STNS GRVL 11.0 BRWN ROCK 38.4
6705893	2 10	Dec-75	550512 4837721	408.4	23.8 Fr		10.1	27	60	11.3	3740 RA	WS DO	<b>MOE# 6705893</b> 0.0 BRWN CLAY 4.6 GREY HPAN BLDR 10.4 GREY LMSN 14.6 BRWN LMSN 23.8
6705950	1 11	Mar-76	550312 4838071	411.5	36.0 Fr		16.2	36	60	19.8	2336 CT	WS DO	<b>MOE# 6705950</b> 0.0 TPSL 0.3 BRWN CLAY STNS GRVL 9.1 BRWN ROCK 36.0
6705951	1 11	Jun-76	550362 4838231	413.0	44.8 Fr		22.9	36	60	29.0	2336 CT	WS DO	<b>MOE# 6705951</b> 0.0 BRWN CLAY STNS GRVL 12.8 BRWN ROCK 44.8
6705952	1 11	Jul-76	550312 4838071	411.5	36.0 Fr		20.4	36	60	24.4	2336 CT	WS DO	<b>MOE# 6705952</b> 0.0 BRWN CLAY STNS GRVL 9.1 BRWN ROCK 36.0
6705973	1 11	Mar-76	550372 4838181	413.0	44.2 Fr		18.3	45	60	21.3	2336 CT	WS DO	<b>MOE# 6705973</b> 0.0 BRWN CLAY SAND STNS 10.4 BRWN ROCK 25.9 BRWN CLAY ROCK 29.0 BRWN ROCK 45.1

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6706231	2 12	Dec-76	551362 4837721	410.0	38.1 Fr		7.3	82	120	15.2	2564 CT	WS ST	<b>MOE# 6706231</b> 0.0 GRVL CLAY 11.6 GREY LMSN 39.3
6707483	1 5	Feb-81	551812 4839271	420.6	57.9 Fr 44.2 Fr		22.6	73	120	24.7	2336 RC	WS ST	<b>MOE# 6707483</b> 0.0 TPSL 0.3 BRWN CLAY STNS 6.1 GREY CLAY STNS 20.7 GREY CLAY GRVL 22.6 GREY STNS 26.8 BRWN STNS MGRD 44.2 BRWN STNS LTCL 58.8
6708671	2 11	Nov-86	550465 4837888	409.7			9.1	45	120	19.8	2564 CT	WS DO	<b>MOE# 6708671</b> 0.0 CLAY 6.1 GRVL 13.7 LMSN 31.1
6708681	3 14	Jul-86	552537 4838269	425.8	53.6 Fr		21.9	23	210	23.2	1669 CT	WS DO	<b>MOE# 6708681</b> 0.0 BLCK TPSL 0.6 BRWN CLAY 3.0 BRWN SAND 12.2 BRWN GRVL 18.3 GREY HPAN 25.6 BRWN LMSN 53.6
6708948	1 10	Jul-87	550293 4838029	410.0	36.6 Fr		20.7	27	120	70.1	2644 RA	WS DO	<b>MOE# 6708948</b> 0.0 TPSL CLAY 6.7 CLAY STNS 12.2 LMSN 78.6
6708999	1 10	Nov-87	550251 4838029	410.0	62.5 Fr		18.3	23	60	23.8	3740 RC	WS DO	<b>MOE# 6708999</b> 0.0 BRWN CLAY 5.5 GREY HPAN STNS 12.2 GREY LMSN 62.5
6709659	1 2	Jul-88	552783 4838145	431.9	19.5 Fr		7.3	50	120	13.1	3518 RA	WS DO	<b>MOE# 6709659</b> 0.0 BRWN TPSL 0.6 BRWN CLAY SAND SOFT 4.9 BRWN SAND STNS CLAY 18.3 BRWN GRVL 19.5
6710692	1 14	Jul-91	550410 4838270	414.8	61.9 Fr 50.6 Fr		30.2	91	60		2663 RA	WS DO	<b>MOE# 6710692</b> 0.0 BRWN TPSL FILL 0.3 BRWN CLAY FGVL 10.7 GREY CLAY FGVL 18.3 BRWN ROCK 61.9
6711184	1 11	May-93	550586 4837883	408.7	34.1 Fr		13.7	45	1440	15.2	3317 RC	WS DO	<b>MOE# 6711184</b> 0.0 BRWN CLAY STNS SAND 9.4 BRWN LMSN CLAY 18.3 BRWN LMSN 39.6
6712275	2 4	Jun-97	550476 4837661	410.6	35.4 Fr		13.7	114	60	19.8	2336 RA	WS DO	<b>MOE# 6712275</b> 0.0 BRWN CLAY STNS 4.6 GREY CLAY STNS 11.3 BRWN ROCK 24.4 BRWN ROCK 35.4
6712498	2 11	Mar-98	550958 4837453	406.3	128.0 Fr 112.8 Fr 94.5 Fr 94.5 Fr 94.5 Fr 94.5 Fr 94.5 Fr 94.5 Fr		4.9				2336 RA	WS MU	<b>MOE# 6712498</b> 0.0 BRWN PRDG FILL 0.3 BLCK TPSL 0.6 BRWN CLAY SAND 1.5 BRWN CLAY STNS 2.7 GREY CLAY GRVL 7.3 GREY GRVL CLAY 8.5 GREY CLAY SAND GRVL 9.8 GREY LMSN FCRD CLAY 14.9 BRWN LMSN FCRD CLAY 43.9 GREY LMSN FCRD CLAY 71.6 GREY LMSN DKCL 78.6 GREY LMSN LTCL 112.5 GREY SNDS LTCL 114.0 GREY LMSN LTCL 118.0 GREY LMSN SNDS 128.0
6713976	2 12	Nov-01	551874 4837835	416.7	51.8 -		14.3	32	60	33.5	6865 RC	WS DO	<b>MOE# 6713976</b> 0.0 BRWN CLAY 1.2 BRWN CLAY GRVL 4.6 GREY CLAY STNS 18.3 GREY LMSN 19.5 BRWN LMSN 37.2 LMSN 51.8
6714798	2 10	Oct-03	551029 4836864	409.7			NR				6865 -	AQ NU	<b>MOE# 6714798</b> 0.0

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6715145	1 14	Jul-04	551433 4839214	417.0			NR				7238 -	AB -	<b>MOE# 6715145 TAG#A008933</b> 0.0
6715271		Jan-05	550441 4838389	416.1	0.6 Un	1.5 -1.5	NR				6607 -	OW -	<b>MOE# 6715271 TAG#A019245</b> 0.0 BRWN SAND 0.9 BRWN TILL 3.0
6715330		May-05	550773 4838644	416.7	1.5 Un	2.4 -2.1	NR				6607 -	OW -	<b>MOE# 6715330 TAG#A016916</b> 0.0 BRWN SILT TPSL 0.9 BRWN SILT SAND CLAY 4.6
6715679	2 12	Nov-05	551338 4837899	413.6		3.0 -3.0	NR				7230 -	TH NU	<b>MOE# 6715679 TAG#A035788</b> 0.0 BRWN TPSL 0.6 BRWN SAND GRVL 6.1
6715788	2 11	Apr-06	551016 4837414	409.0			NR				4011 -	AB -	<b>MOE# 6715788</b> 0.0
7042039		Sep-06	550745 4838745	416.1			NR				1737 -	- -	<b>MOE# 7042039</b> 0.0
7042040		Sep-06	550853 4838740	416.1			NR				1737 -	- -	<b>MOE# 7042040</b> 0.0
7047187	1 11	Jun-07	550256 4838201	414.8	39.0 Fr		25.0	36	60	25.9	6865 RA	WS DO	<b>MOE# 7047187 TAG#A034710</b> 0.0 BRWN CLAY STNS 10.1 BRWN GRVL SAND CLAY 16.2 GREY LMSN 21.3 GREY LMSN LYRD 39.6
7047856	2 12	Jul-07	551682 4837658	414.5			NR				2663 -	AB -	<b>MOE# 7047856</b> 0.0
7047857	3 12	Jul-07	551916 4837424	416.1			NR				2663 -	AB -	<b>MOE# 7047857</b> 0.0
7129536	2 14	Jul-09	552007 4838456	419.1			NR				7221 -	AS -	<b>MOE# 7129536</b> 0.0
7184231	1 14	Jun-12	551141 4839083	420.0			NR				7146 -	AS -	<b>MOE# 7184231</b> 0.0
7184232	1 13	Jun-12	551133 4839068	420.0	54.9 Fr		23.2	55	120	24.4	7146 CT	WS -	<b>MOE# 7184232 TAG#A124137</b> 0.0 BRWN TPSL 0.6 BRWN CLAY STNS 6.1 GREY CLAY 12.2 GREY CLAY GRVL 22.9 BRWN LMSN 29.0 BRWN SHLE LMSN 54.9 BRWN LMSN HARD 57.9
7189238		Mar-12	550736 4838474	415.1		1.2 -3.0	NR				7238 -	OW TH	<b>MOE# 7189238 TAG#A102173</b> 0.0 BRWN FILL GRVL SOFT 1.5 BRWN SILT CLAY SOFT 3.0 BRWN TILL GRVL HARD 4.3
7189239		Mar-12	550750 4838485	415.4		1.2 -3.0	NR				7238 -	OW TH	<b>MOE# 7189239 TAG#A102170</b> 0.0 BRWN FILL GRVL SOFT 1.5 BRWN SILT CLAY SOFT 3.0 BRWN TILL GRVL HARD 4.3
7189240		Mar-12	550764 4838481	415.1		1.2 -3.0	NR				7238 -	OW TH	<b>MOE# 7189240 TAG#A102176</b> 0.0 BRWN FILL GRVL SOFT 1.5 BRWN SILT CLAY SOFT 3.0 BRWN TILL GRVL HARD 4.3
7194694		Feb-12	550712 4838478	415.4			NR				7215 -	- -	<b>MOE# 7194694 TAG#A126388</b> 0.0
7203122		May-13	550584 4838482	415.7			NR				7385 -	AB NU	<b>MOE# 7203122</b> 0.0

LABEL	CON	DATE	EASTING	ELEV	WTR FND	SCR TOP LEN	SWL	RATE	TIME	PL	DRILLER	TYPE	WELL NAME
	LOT	mmm-yr	NORTHING	masl	mbgl Qu	mbgl m	mbgl	L/min	min	mbgl	METHOD	STAT	DESCRIPTION OF MATERIALS

QUALITY:		TYPE:		USE:		METHOD :			
Fr	Fresh	WS	Water Supply	CO	Comercial	NU	Not Used	CT	Cable Tool
Mn	Mineral	AQ	Abandoned Quality	DO	Domestic	IR	Irrigation	JT	Jetting
Sa	Salty	AS	Abandoned Supply	MU	Municipal	AL	Alteration	RC	Rotary Conventional
Su	Sulphur	AB	Abandonment Record	PU	Public	MO	Monitoring	RA	Rotary Air
--	Unrecorded	TH	Test Hole or Observation	ST	Stock	-	Not Recorded	BR	Boring

Easting and Northings UTM NAD 83 Zone 17, Translated from Recorded UTM NAD, subject to Field Verified Location or Improved Location Accuracy.

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**APPENDIX D**

**Record of Borehole Sheets &  
Grain Size Distribution Curves**



PROJECT: 20141301 (1000)  
 LOCATION: N 4837829.60; E 550594.30

# RECORD OF BOREHOLE: 20-1

SHEET 1 OF 2  
 DATUM: Geodetic

BORING DATE: December 14, 15 and 18, 2020

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. rem V.		+		Q - U -			Wp
0		GROUND SURFACE		408.91													
		TOPSOIL		0.00	1	SS	10										
1		FILL - (ML) sandy SILT, some gravel; brown, oxidation staining; non-cohesive, moist to wet, loose to compact		408.22	2	SS	9										
		- Auger grinding from depths of 1.5 m to 1.7 m		0.69	3	SS	20										
2		(ML) sandy SILT, trace plastic fines; some gravel; brown to grey (TILL), non-cohesive, moist, very dense		406.78	4	SS	95/0.28										
		- Auger grinding from depths of 5.2 m to 5.5 m		2.13	5	SS	95										
		- Becoming grey at a depth of 5.5 m			6	SS	100/0.18										
6		- Auger grinding from depths of 5.6 m to 5.9 m			7	SS	50/0.13										
		- Auger grinding from depths of 6.3 m to 6.6 m															
7		(SP) SAND and GRAVEL, brown; non-cohesive, wet, very dense		402.13													
		- Auger grinding from depths of 7.0 m to 7.3 m		6.78													
		- Auger grinding from depths of 7.6 m to 9.1 m															
10				399.00	10	SS	50/0.03										
				9.97													

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PROJECT: 20141301 (1000)  
 LOCATION: N 4837829.60; E 550594.30

# RECORD OF BOREHOLE: 20-1

SHEET 2 OF 2  
 DATUM: Geodetic

BORING DATE: December 14, 15 and 18, 2020

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. + rem V. ⊕	Q - U - ●	Wp	W	Wi			
10		-- CONTINUED FROM PREVIOUS PAGE -- END OF BOREHOLE															
11		NOTE: 1. Rock fragments recovered from casing upon completion of drilling.															
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

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DEPTH SCALE

1 : 50



LOGGED: AGB  
 CHECKED: MJB

# RECORD OF BOREHOLE: 20-2

BORING DATE: December 17, 2020

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>		
0		GROUND SURFACE		418.26											
		TOPSOIL		0.00	1	SS	5								50 mm Stick-up Casing
		(SM) gravelly SILTY SAND, brown (TILL); non-cohesive, moist, dense to very dense		417.75											
				0.51											
1					2	SS	40								
2		- Auger grinding at depth of 1.7 m			3	SS	39								
3					4	SS	94								11-Jun-21
															Bentonite
4		- Auger grinding from depths of 4.0 m to 5.3 m													
5		- Auger grinding from depths of 4.9 m to 5.3 m			5	SS	95/0.28								
6		- Auger grinding from depths of 6.1 m to 6.7 m			6	SS	50/0.08								
7		- Auger grinding from depths of 7.2 m to 7.6 m													
8					8	SS	50/0.1								
9		(CL) SILTY CLAY, trace sand, grey; cohesive, w<PL, hard		409.88											
				8.38											
10		END OF BOREHOLE		409.04	9	SS	50/0.06								
				9.22											
		NOTE: 1. Ground water level measured in monitoring well as follows:													
		CONTINUED NEXT PAGE													

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PROJECT: 20141301 (1000)  
 LOCATION: N 4837914.60; E 551074.40

# RECORD OF BOREHOLE: 20-2

SHEET 2 OF 2  
 DATUM: Geodetic

BORING DATE: December 17, 2020

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. rem V.	+ ⊕	- ⊙	Wp	W			Wi
							20	40	60	80							
		-- CONTINUED FROM PREVIOUS PAGE --															
		Date	Depth(m)	Elev. (m)													
		19-Jan-21	2.52	415.74													
		29-Jan-21	2.48	415.79													
		12-Mar-21	1.30	416.97													
		11-Jun-21	2.39	415.87													
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

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DEPTH SCALE

1 : 50



LOGGED: AGB

CHECKED: MJB

PROJECT: 20141301 (1000)  
 LOCATION: N 4838399.70; E 551274.30

# RECORD OF BOREHOLE: 20-3

SHEET 1 OF 1  
 DATUM: Geodetic

BORING DATE: January 6, 2021

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+	Q - U -			Wp
0		GROUND SURFACE		413.40													
		TOPSOIL		0.00 413.20													
		FILL - (SM) SILTY SAND, some gravel, trace plastic fines; brown; organic inclusions; non-cohesive, moist to wet, compact to loose		0.20	1	SS	13									50 mm Stick-up Casing	
1					2	SS	9										
		(ML) sandy SILT, some gravel; trace plastic fines; brown; non-cohesive, moist, compact to dense - Oxidation stain from 1.5 m to 2.0 m - Auger grinding from depths of 1.8 m to 2.1 m		412.03 1.37	3	SS	13										
2					4	SS	36										
3					5	SS	36										
4		(CL) SILTY CLAY, some sand, grey; cohesive, w<PL, hard		409.59 3.81													
5					6	SS	76										
6		(ML) sandy SILT, trace plastic fines; grey; non-cohesive, moist, dense		407.84 5.56													
7					7	SS	39										
8		(ML) sandy SILT, some gravel; grey (TILL); non-cohesive, wet, very dense		406.53 6.87													
					8	SS	92/0.25										
8		END OF BOREHOLE		405.37 8.03													
9		NOTE: 1. Ground water level measured in monitoring well as follows:															
		Date	Depth(m)	Elev. (m)													
		19-Jan-21	1.12	412.28													
		29-Jan-21	1.49	411.92													
		12-Mar-21	0.69	412.71													
		11-Jun-21	1.92	411.48													
10																	

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DEPTH SCALE

1 : 50



LOGGED: AGB  
 CHECKED: MJB

PROJECT: 20141301 (1000)  
 LOCATION: N 4838662.50; E 551803.90

# RECORD OF BOREHOLE: 20-4

SHEET 1 OF 1  
 DATUM: Geodetic

BORING DATE: January 6, 2021

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH				WATER CONTENT PERCENT					
							Cu, kPa		nat V. rem V.		+		-			Wp
0		GROUND SURFACE		419.93												
		TOPSOIL		0.00												
		(ML) sandy SILT, some gravel; trace plastic fines; brown; non-cohesive, moist, compact		419.63 0.30	1	SS	12								50 mm Stick-up Casing	
1					2	SS	10									
					3	SS	25									
2					4	SS	15									
					5	SS	27								11-Jun-21	
3		(SM) gravelly SILTY SAND, brown; non-cohesive, wet, compact to dense		417.03 2.90											Bentonite	
					6	SS	32									
4					7	SS	32									
5		- Auger grinding from depths of 4.6 m to 5.2 m													MH	
6															Sand	
7															Screen and Sand	
					8	SS	6									
8		END OF BOREHOLE		411.85 8.08												
9		NOTE: 1. Ground water level measured in monitoring well as follows:  Date            Depth(m)    Elev. (m) 19-Jan-21     1.17        418.76 29-Jan-21     1.51        418.42 12-Mar-21     0.68        419.25 11-Jun-21     1.80        418.13														
10																

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PROJECT: 20141301 (1000)  
 LOCATION: N 4837552.60; E 551107.40

# RECORD OF BOREHOLE: 20-5

SHEET 1 OF 1  
 DATUM: Geodetic

BORING DATE: December 16, 2020

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. rem V.		+		-			Wp
0		GROUND SURFACE		407.29													
		TOPSOIL		0.00													
		FILL - (SM) SILTY SAND, grey; non-cohesive, moist, loose		406.83	1	SS	5									50 mm Stick-up Casing	
		FILL - (CL) sandy SILTY CLAY, some gravel; brown; rootlets; cohesive, w-PL, stiff		406.60													
				0.46													
1				406.60	2	SS	10										
				0.69													
		(SM) gravelly SILTY SAND, grey (TILL); non-cohesive, moist, very dense		405.92													
				1.37												11-Jun-21	
					3	SS	10										
2																Bentonite	
					4	SS	72										
3																	
		- Auger grinding from depths of 3.1 m to 3.8 m															
					5	SS	50/0.08										
4																	
					6	SS	50/0.08										
5																	
6																	
					7	SS	50/0.15										
7																	
8		END OF BOREHOLE		399.64	8	SS	50/0.03										
				7.65													
9		NOTE: 1. Ground water level measured in monitoring well as follows:															
		Date            Depth(m)    Elev. (m)															
		19-Jan-21      0.65        406.65															
		29-Jan-21      0.75        406.55															
		12-Mar-21      0.60        406.69															
		11-Jun-21      1.17        406.12															
10																	

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DEPTH SCALE  
1 : 50



LOGGED: AGB  
CHECKED: MJB

# RECORD OF BOREHOLE: 20-6

BORING DATE: January 8, 2021

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
0		GROUND SURFACE		410.46												20-6-S	20-6-D
		TOPSOIL		0.00	1	SS	8										
		FILL - (ML) sandy SILT, some gravel; brown, oxidation staining; organic inclusions, non-cohesive, moist, loose (SM) SILTY SAND, some gravel; brown; non-cohesive, moist, compact		410.00													
				0.46													
		(SP) SAND, non-cohesive, wet, compact		409.77													
				0.69													
		(ML) SILT and SAND, some gravel; grey (TILL); non-cohesive, moist, very dense		409.09													
				1.37													
				408.33													
				2.13													
					4	SS	70										
					5	SS	95										
					6	SS	50/0.08										
					7	SS	50/0.1										
		- Auger grinding from depths of 7.6 m to 8.2 m			8	SS	50/0.03										
		- Auger grinding from depths of 9.0 m to 9.1 m			9	SS	100/0.25										
		- Auger grinding from depths of 9.5 m to 9.8 m			10	SS	50/0.13										
		CONTINUED NEXT PAGE															

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PROJECT: 20141301 (1000)  
 LOCATION: N 4837920.60; E 551468.90

# RECORD OF BOREHOLE: 20-6

SHEET 2 OF 2  
 DATUM: Geodetic

BORING DATE: January 8, 2021

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. rem V.		+		Q - U -		Wp	
10	Track Mounted CME 76 125 mm O.D. Tritone	-- CONTINUED FROM PREVIOUS PAGE --					20	40	60	80	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup>	10 <sup>-3</sup>		20-6-S	20-6-D
11		(ML) SILT and SAND, some gravel; grey (TILL); non-cohesive, moist, very dense															
12																	
13		END OF BOREHOLE		397.81													
14		NOTES:		12.65													
15		1. Ground water level measured in shallow monitoring well (20-6-S) as follows:															
			Date	Depth(m)	Elev. (m)												
			19-Jan-21	1.11	409.37												
			29-Jan-21	1.06	409.42												
			12-Mar-21	0.71	409.76												
			11-Jun-21	1.27	409.21												
16		2. Ground water level measured in deep monitoring well (20-6-D) as follows:															
			Date	Depth(m)	Elev. (m)												
			19-Jan-21	3.24	407.22												
			29-Jan-21	3.33	407.14												
			12-Mar-21	3.34	407.13												
			11-Jun-21	3.75	406.71												
17																	
18																	
19																	
20																	

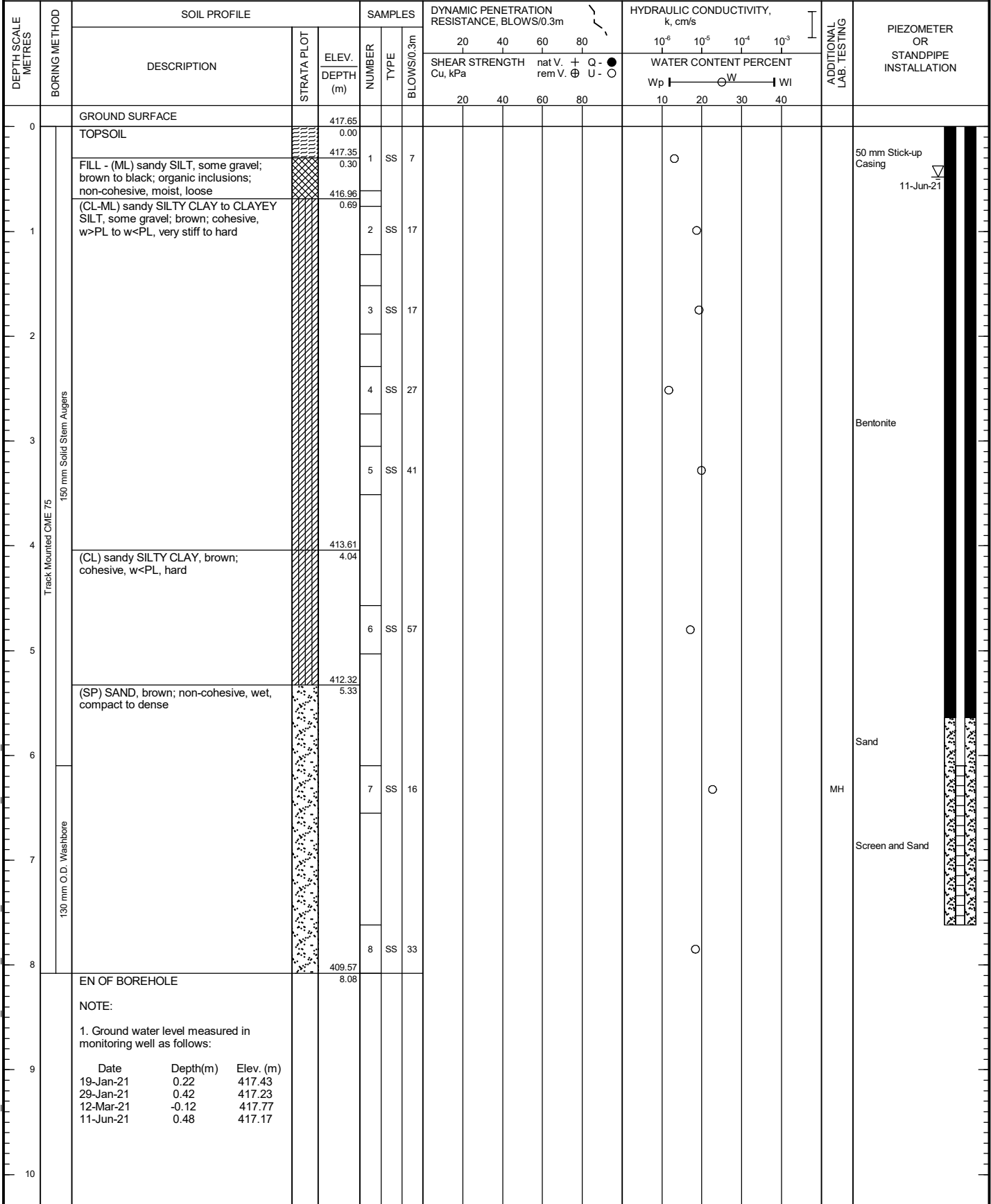
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# RECORD OF BOREHOLE: 20-7

BORING DATE: January 8, 2021

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC



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PROJECT: 20141301 (1000)  
 LOCATION: N 4837269.10; E 551432.50

# RECORD OF BOREHOLE: 20-8

SHEET 1 OF 2  
 DATUM: Geodetic

BORING DATE: December 21, 2020

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. +	rem V. ⊕	Q - ●		U - ○	Wp
0		GROUND SURFACE		407.38												20-8-S	20-8-D
		TOPSOIL		406.69	1	SS	6										
1		(ML) sandy SILT, some gravel; brown, oxidation staining; non-cohesive, moist, compact		404.10	2	SS	10										
				402.96	3	SS	19										
2				404.10	4	SS	16										
		(SM) SILTY SAND, brown; non-cohesive, wet, loose to compact		402.96	5	SS	9										
3				401.46	6	SS	22										
4				402.96	7	SS	41										
5		(GP) GRAVEL and SAND, grey; non-cohesive, wet, dense to very dense		401.46	8A	SS	100/0.25										
		- Auger grinding from depths of 5.0 m to 5.2 m		401.46	8B	SS	50/0.08										
6		(CL-ML) sandy SILTY CLAY to CLAYEY SILT, some gravel; grey (TILL); cohesive, w<PL, hard		398.24	9	SS	50/0.1										
		- Auger grinding from depths of 6.1 m to 6.4 m			10	SS											
		- Auger grinding from depths of 6.6 m to 7.0 m															
7																	
8																	
9		END OF BOREHOLE															
10		NOTES: 1. SPT attempted at 9.1 m terminated due to split spoon refusal.															

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DEPTH SCALE  
1 : 50



LOGGED: AGB  
CHECKED: MJB

PROJECT: 20141301 (1000)  
 LOCATION: N 4837269.10; E 551432.50

# RECORD OF BOREHOLE: 20-8

SHEET 2 OF 2  
 DATUM: Geodetic

BORING DATE: December 21, 2020

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION																		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT																							
								Cu, kPa		nat V. rem V.		+		Q - U -					Wp		W		Wi												
10		-- CONTINUED FROM PREVIOUS PAGE --						20	40	60	80						20-8-S	20-8-D																	
11		2. Ground water level measured in shallow monitoring well (20-8-S) as follows:  <table border="1"> <thead> <tr> <th>Date</th> <th>Depth(m)</th> <th>Elev. (m)</th> </tr> </thead> <tbody> <tr> <td>19-Jan-21</td> <td>0.63</td> <td>406.82</td> </tr> <tr> <td>29-Jan-21</td> <td>0.87</td> <td>406.58</td> </tr> <tr> <td>12-Mar-21</td> <td>0.43</td> <td>407.02</td> </tr> <tr> <td>11-Jun-21</td> <td>1.29</td> <td>406.16</td> </tr> </tbody> </table>			Date	Depth(m)	Elev. (m)	19-Jan-21	0.63	406.82	29-Jan-21	0.87	406.58	12-Mar-21	0.43	407.02	11-Jun-21	1.29	406.16																
Date	Depth(m)	Elev. (m)																																	
19-Jan-21	0.63	406.82																																	
29-Jan-21	0.87	406.58																																	
12-Mar-21	0.43	407.02																																	
11-Jun-21	1.29	406.16																																	
12		3. Ground water level measured in deep monitoring well (20-8-D) as follows:  <table border="1"> <thead> <tr> <th>Date</th> <th>Depth(m)</th> <th>Elev. (m)</th> </tr> </thead> <tbody> <tr> <td>19-Jan-21</td> <td>0.62</td> <td>406.76</td> </tr> <tr> <td>29-Jan-21</td> <td>1.23</td> <td>406.15</td> </tr> <tr> <td>12-Mar-21</td> <td>1.20</td> <td>406.19</td> </tr> <tr> <td>11-Jun-21</td> <td>2.37</td> <td>405.01</td> </tr> </tbody> </table>			Date	Depth(m)	Elev. (m)	19-Jan-21	0.62	406.76	29-Jan-21	1.23	406.15	12-Mar-21	1.20	406.19	11-Jun-21	2.37	405.01																
Date	Depth(m)	Elev. (m)																																	
19-Jan-21	0.62	406.76																																	
29-Jan-21	1.23	406.15																																	
12-Mar-21	1.20	406.19																																	
11-Jun-21	2.37	405.01																																	
13																																			
14																																			
15																																			
16																																			
17																																			
18																																			
19																																			
20																																			

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PROJECT: 20141301 (1000)  
 LOCATION: N 4837682.00; E 551736.20

# RECORD OF BOREHOLE: 20-9

SHEET 1 OF 1  
 DATUM: Geodetic

BORING DATE: January 5, 2021

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. rem V.	+	Q - U -			Wp
0		GROUND SURFACE		414.98													
		TOPSOIL		0.00													
		(CL-ML) sandy SILTY CLAY to CLAYEY SILT, some gravel; brown (TILL); cohesive, w<PL, very stiff to hard		414.68	1	SS	4									50 mm Stick-up Casing	
1				0.30	2	SS	15										
		- Auger grinding from depths of 1.5 m to 2.3 m			3	SS	18										
2					4	SS	64									Bentonite	
		- Auger grinding from depths of 2.7 m to 3.1 m			5	SS	50/0.13									11-Jun-21	
3					6	SS	50/0.2										
		- Auger grinding from depths of 4.9 m to 6.1 m			7	SS	50/0.05										
4					8	SS	50/0.1										
		- Auger grinding from depths of 6.1 m to 7.0 m															
5																	
6																	
7																	
8		END OF BOREHOLE		407.26	8	SS	50/0.1										
		NOTE:		7.72													
		1. Ground water level measured in monitoring well as follows:															
		Date	Depth(m)	Elev. (m)													
		19-Jan-21	0.41	414.58													
		29-Jan-21	0.88	414.11													
		12-Mar-21	0.37	414.61													
		11-Jun-21	2.11	412.88													
9																	
10																	

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# RECORD OF BOREHOLE: 20-10

BORING DATE: January 11, 2021

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. +	rem V. ⊕	Q - ●		U - ○	Wp
0		GROUND SURFACE		424.01												20-10-S	20-10-D
		TOPSOIL		0.00	1	SS	7										
1		(SP) SAND, trace gravel, trace to some fines; brown; non-cohesive, moist to wet, compact to very dense		423.40	2	SS	25										
				0.61	3	SS	35										
2					4	SS	32										
3					5	SS	70										
4					6	SS	47										
5					7	SS	28										
6					8	SS	34										
7					9	SS	67										
8																	
9																	
10																	

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PROJECT: 20141301 (1000)  
 LOCATION: N 4838305.50; E 552497.70

# RECORD OF BOREHOLE: 20-10

SHEET 2 OF 2  
 DATUM: Geodetic

BORING DATE: January 11, 2021

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

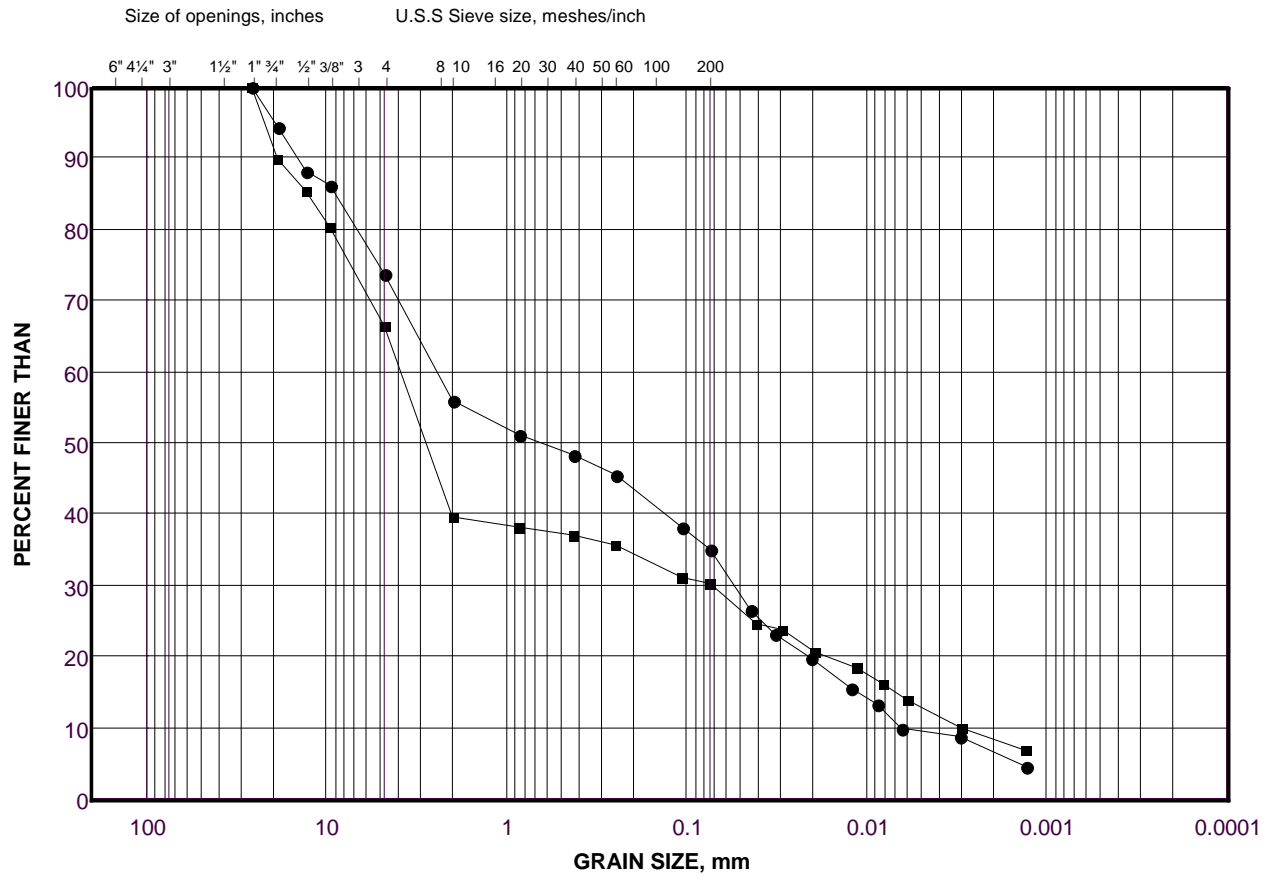
DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT						
								20	40	60	80	nat V. +	Q - ●	rem V. ⊕	U - ○		Wp	W
10	Track Mounted CME 75 150 mm Solid Stem Augers	-- CONTINUED FROM PREVIOUS PAGE --														20-10-S	20-10-D	
11		(SP) SAND, trace gravel, trace to some fines; brown; non-cohesive, moist to wet, compact to very dense			10	SS	84											
12						11	SS	81										
13		END OF BOREHOLE		411.36														
14		NOTES:		12.65														
15		1. Ground water level measured in shallow monitoring well (20-6-S) as follows:																
			Date	Depth(m)	Elev. (m)													
			19-Jan-21	3.80	420.18													
			29-Jan-21	3.87	420.11													
			12-Mar-21	3.71	420.28													
			11-Jun-21	3.84	420.14													
16		2. Ground water level measured in deep monitoring well (20-6-D) as follows:																
			Date	Depth(m)	Elev. (m)													
			19-Jan-21	3.83	420.18													
			29-Jan-21	3.92	420.10													
			12-Mar-21	3.73	420.28													
			11-Jun-21	3.87	420.14													

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# GRAIN SIZE DISTRIBUTION

(SM) gravelly SILTY SAND (TILL)

FIGURE i



<b>COBBLE</b>	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
	<b>GRAVEL SIZE</b>		<b>SAND SIZE</b>			<b>FINE GRAINED</b>
<b>SIZE</b>						

**LEGEND**

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	20-5	6	4.6 - 4.7
■	20-2	8	7.6 - 7.7

Project Number: 20141301

Checked By: \_\_\_\_\_

**Golder Associates**

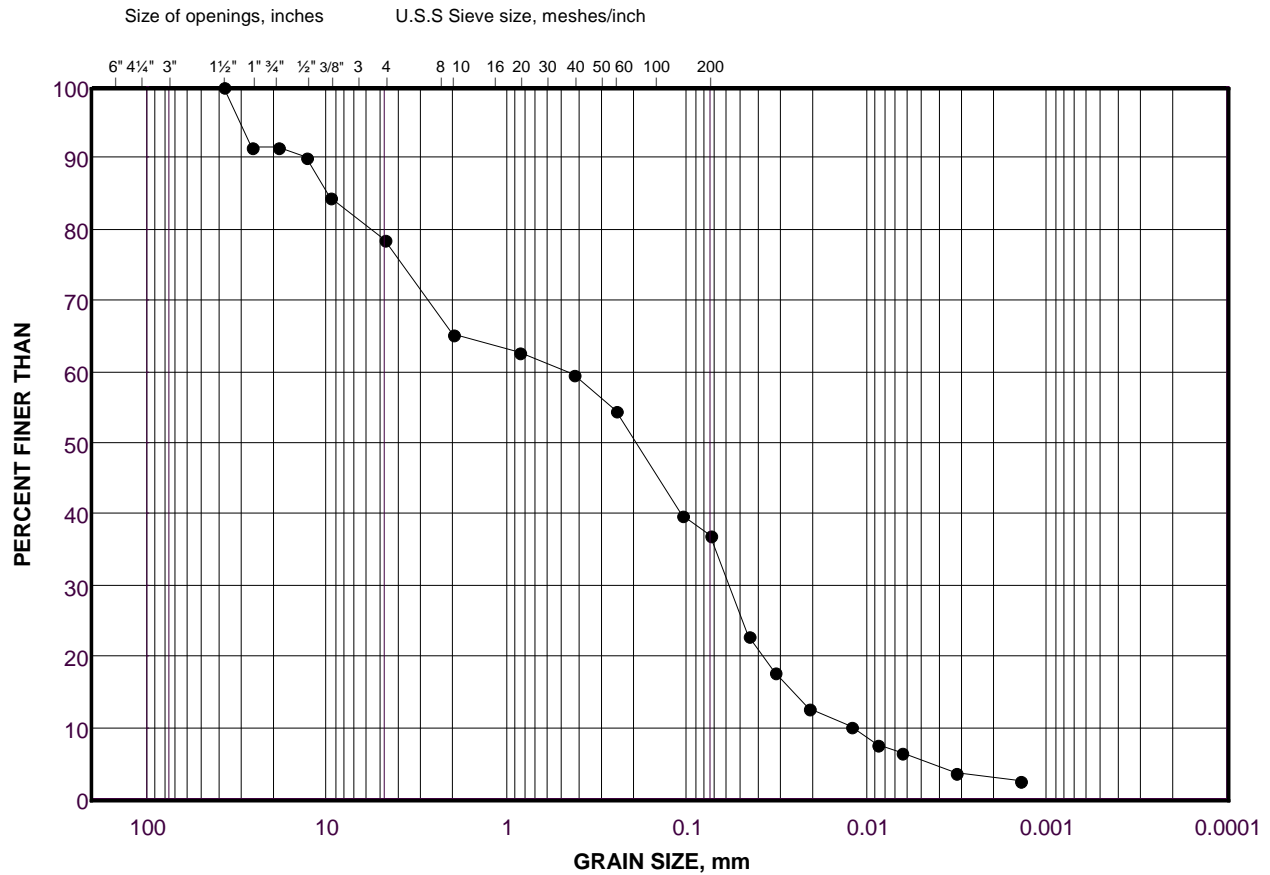
Date: 14-Jun-21



# GRAIN SIZE DISTRIBUTION

(SM) gravelly SILTY SAND

FIGURE ii



COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
	GRAVEL SIZE		SAND SIZE			
SIZE						

## LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
•	20-4	6	4.6 - 5.0

Project Number: 20141301

Checked By: \_\_\_\_\_

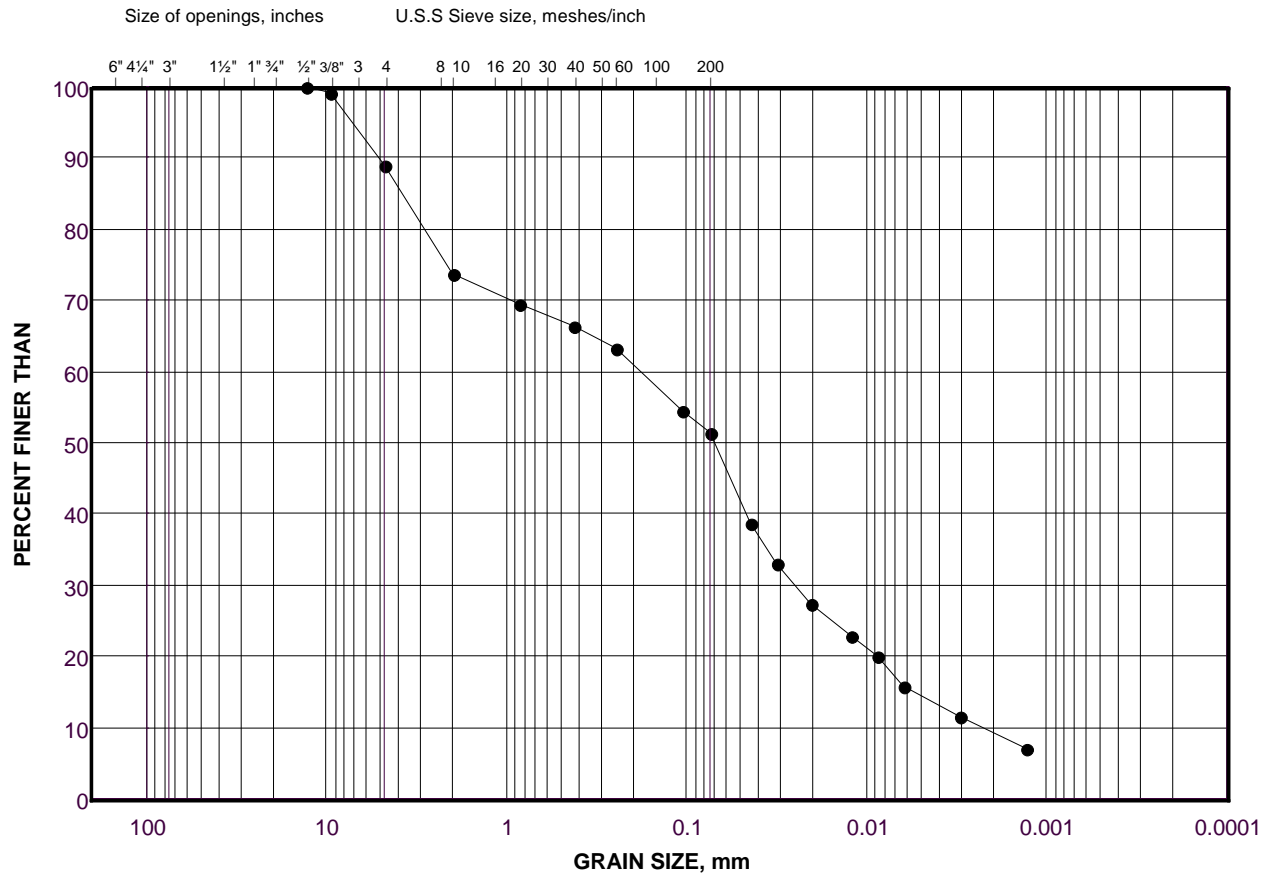
**Golder Associates**

Date: 14-Jun-21

# GRAIN SIZE DISTRIBUTION

(ML) SILT and SAND (TILL)

FIGURE iii



COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
	GRAVEL SIZE		SAND SIZE			

## LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	20-6	9	8.2 - 8.6

Project Number: 20141301

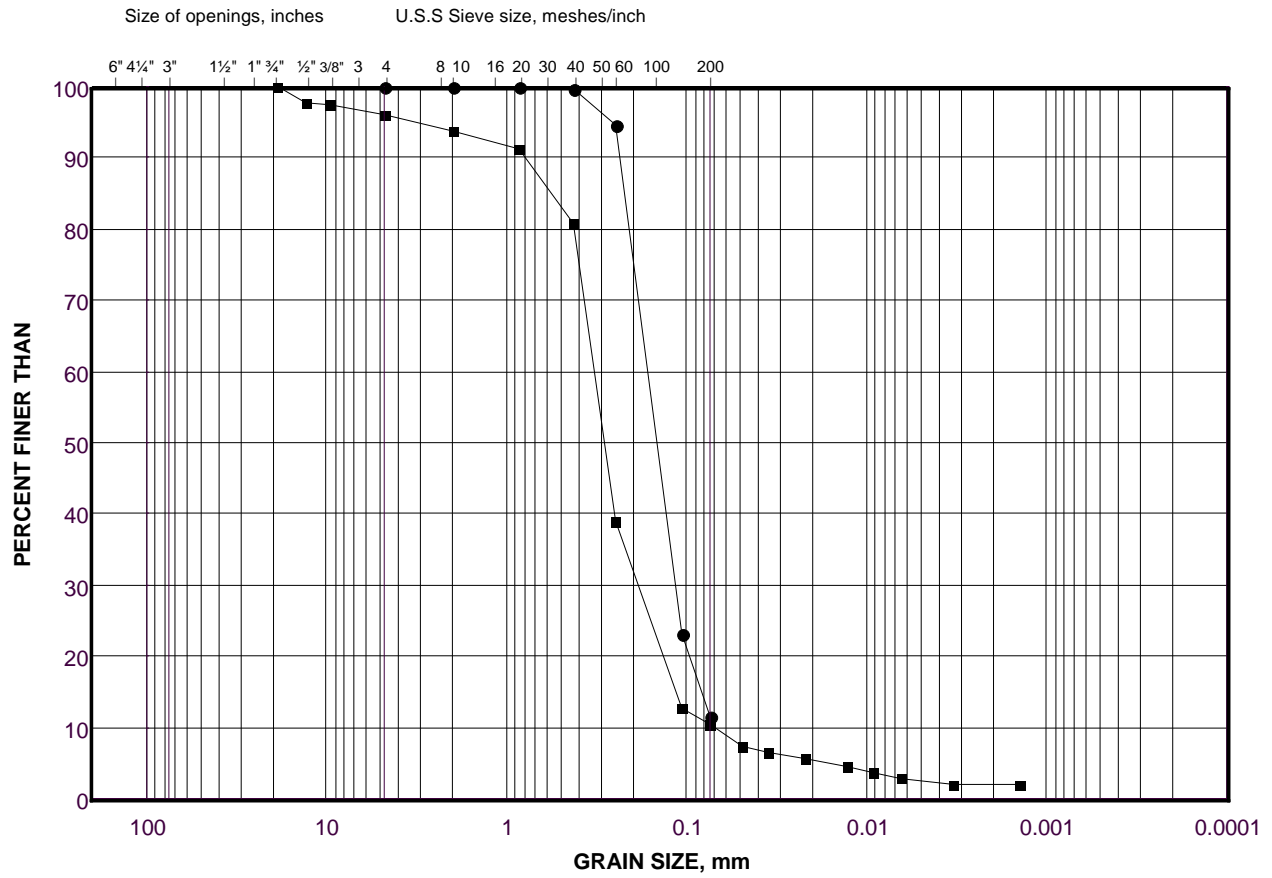
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**Golder Associates**

Date: 14-Jun-21

# GRAIN SIZE DISTRIBUTION (SP) SAND

FIGURE iv



## LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	20-7	7	6.1 - 6.6
■	20-10	8	7.6 - 8.1

Project Number: 20141301

Checked By: \_\_\_\_\_

**Golder Associates**

Date: 14-Jun-21

**APPENDIX E**

**Water Level Depths and Elevations**

**Table E-1 - Water Level Depths and Elevations  
Proposed Mixed-Use Development, Fergus, Ontario**

Monitoring Well ID	Ground Surface Elevation (m)	Screen Interval (m)			19-Jan-21		29-Jan-21		12-Mar-21		11-Jun-21		23-Jul-21		19-Nov-21		30-Jun-22		05-Jul-22		19-Jul-22	
					Depth (mbgs)	Elevation (m)	Depth (mbgs)	Elevation (m)	Depth (mbgs)	Elevation (m)	Depth (mbgs)	Elevation (m)	Depth (mbgs)	Elevation (m)	Depth (mbgs)	Elevation (m)	Depth (mbgs)	Elevation (m)	Depth (mbgs)	Elevation (m)	Depth (mbgs)	Elevation (m)
BH20-2	418.26	410.2	to	413.2	2.52	415.74	2.48	415.79	1.30	416.97	2.39	415.87	3.61	414.65	2.50	415.76	2.40	415.86	2.53	415.73	3.16	415.10
BH20-3	413.40	406.7	to	409.8	1.12	412.28	1.49	411.92	0.69	412.71	1.92	411.48	2.43	410.98	1.24	412.16	NA - Destroyed		NA - Destroyed		NA - Destroyed	
BH20-4	419.93	413.3	to	414.8	1.17	418.76	1.51	418.42	0.68	419.25	1.80	418.13	2.35	417.58	1.32	418.61	1.95	417.98	2.03	417.90	2.31	417.62
BH20-5	407.29	400.7	to	403.7	0.65	406.65	0.75	406.55	0.60	406.69	1.17	406.12	1.97	405.32	0.68	406.61	1.02	406.27	-	-	1.48	405.81
BH20-6-S	410.47	404.0	to	407.0	1.11	409.37	1.06	409.42	0.71	409.76	1.27	409.21	1.57	408.90	0.80	409.68	1.49	408.99	1.55	408.92	1.78	408.69
BH20-6-D	410.46	399.3	to	402.3	3.24	407.22	3.33	407.14	3.34	407.13	3.75	406.71	4.04	406.42	2.99	407.48	3.67	406.79	3.72	406.74	3.91	406.55
BH20-7	417.65	410.9	to	412.4	0.22	417.43	0.42	417.23	-0.12	417.77	0.48	417.17	0.84	416.81	0.16	417.49	0.68	416.98	-	-	0.86	416.79
BH20-8-S	407.45	403.2	to	406.2	0.63	406.82	0.87	406.58	0.43	407.02	1.29	406.16	1.51	405.94	0.61	406.84	1.32	406.13	1.37	406.08	1.63	405.82
BH20-8-D	407.38	399.1	to	400.6	0.62	406.76	1.23	406.15	1.20	406.19	2.37	405.01	3.00	404.38	1.85	405.54	2.47	404.92	2.53	404.85	2.85	404.53
BH20-9	414.98	408.3	to	411.4	0.41	414.58	0.88	414.11	0.37	414.61	2.11	412.88	2.45	412.53	0.68	414.30	2.14	412.85	-	-	2.54	412.44
BH20-10-S	423.98	417.3	to	420.4	3.80	420.18	3.87	420.11	3.71	420.28	3.84	420.14	4.02	419.97	3.98	420.01	3.78	420.20	3.81	420.17	3.91	420.07
BH20-10-D	424.01	412.8	to	415.8	3.83	420.18	3.92	420.10	3.73	420.28	3.87	420.14	4.05	419.96	4.02	419.99	3.81	420.20	3.84	420.17	3.94	420.07
<b>Piezometer</b>																						
P1	406.55	-	-	-	0.31	406.24	0.34	406.21	0.04	406.51	0.49	406.06	0.39	406.16	0.31	406.24	0.47	406.09	0.46	406.09	0.57	405.98
P2	408.49	-	-	-	0.21	408.29	0.26	408.24	-0.01	408.50	0.46	408.03	0.45	408.05	0.19	408.30	0.43	408.06	0.48	408.02	0.65	407.84
P3	411.11	-	-	-	0.27	410.84	0.32	410.80	0.12	410.99	0.40	410.72	0.86	410.26	0.27	410.85	0.87	410.24	-	-	DRY	
<b>Staff Gauge</b>																						
SG1	405.82	-	-	-	-0.35	406.17	N/A - Frozen		-0.44	406.26	-0.40	406.22	-0.39	406.21	-0.36	406.18	NA - Destroyed		NA - Destroyed		NA - Destroyed	
SG2	407.57	-	-	-	-0.54	408.11	N/A - Frozen		-0.795	408.37	-0.42	407.99	-0.64	408.21	-0.58	408.15	-0.54	408.11	-0.66	408.23	-0.43	408.00
SG3	410.72	-	-	-	N/A - Frozen		N/A - Frozen		-0.15	410.87	-0.02	410.74	DRY		-0.05	410.77	DRY		-	-	DRY	

**Notes:**

- 1) mbgs = metres below ground surface
- 2) A negative water level depth represents an above ground surface water level.
- 3) NA = Not Accessible

Figure E-1: BH20-2, BH20-4, BH20-6-S, BH20-8-S, BH20-8-D & BH20-10-S Hydrograph  
Proposed Mixed-Use Development  
Fergus, Ontario

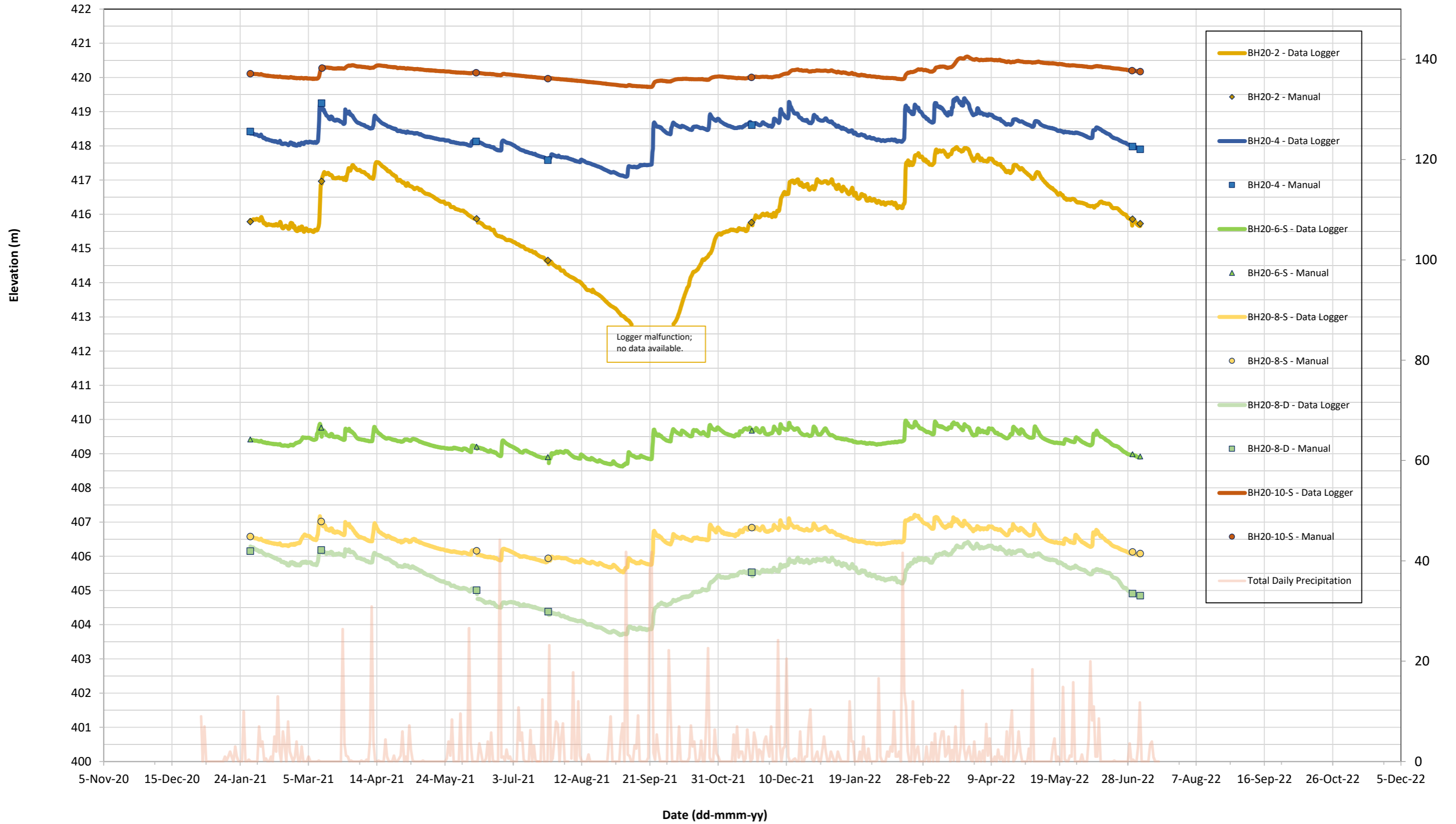
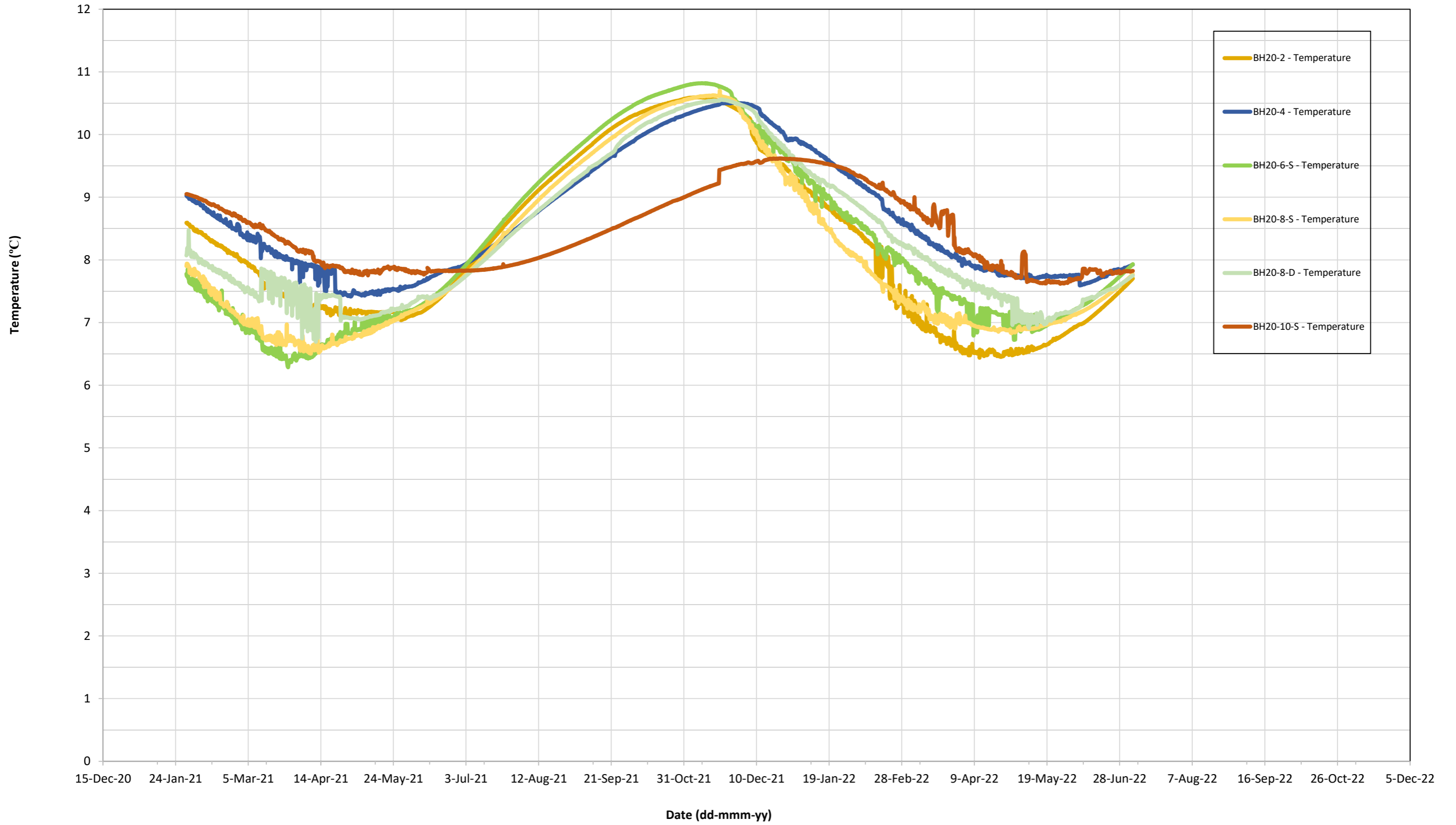


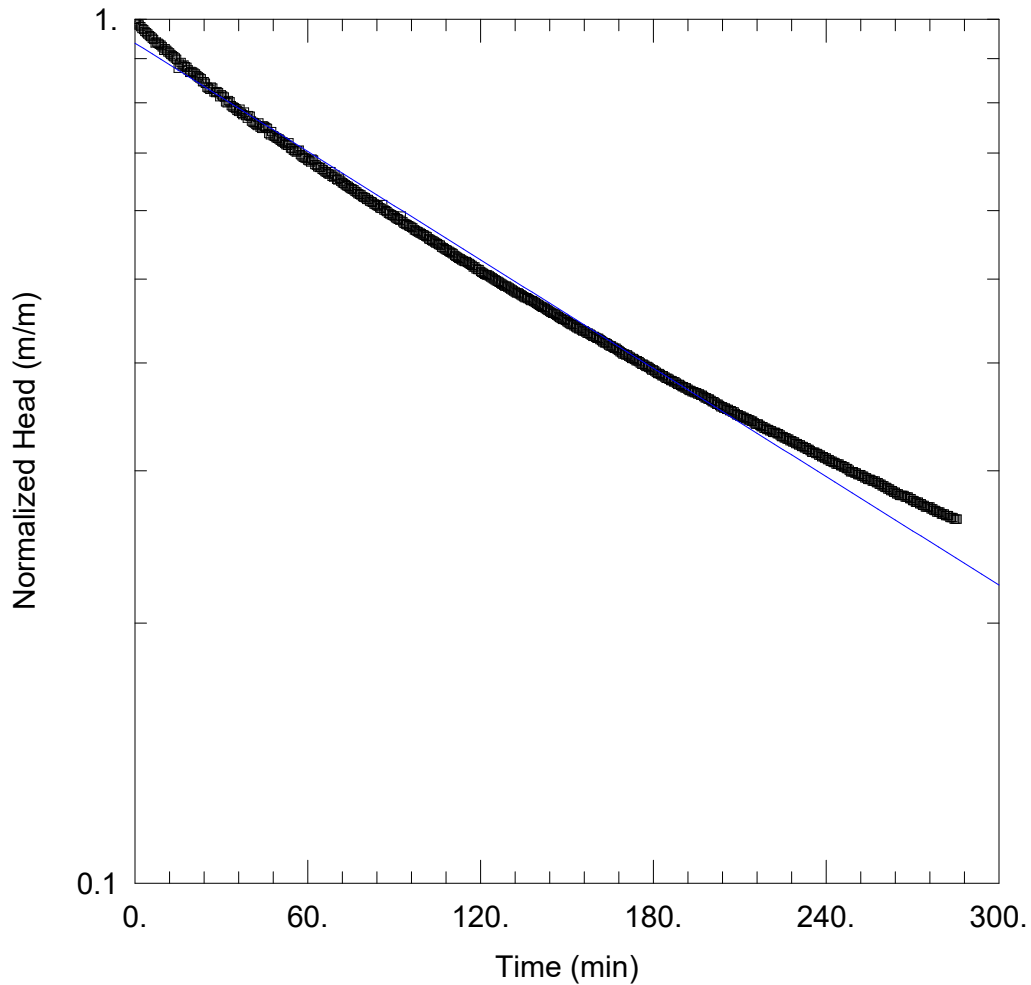
Figure E-2: BH20-2, BH20-4, BH20-6-S, BH20-8-S, BH20-8-D & BH20-10-S Temperature  
Proposed Mixed-Use Development  
Fergus, Ontario



**APPENDIX F**

**Hydraulic Conductivity Testing**





### WELL TEST ANALYSIS

#### PROJECT INFORMATION

Company: WSP Canada Inc.  
 Client: Tathum Engineering Ltd  
 Project: 20141301  
 Location: South Fergus  
 Test Well: BH20-2  
 Test Date: 23Jul2021

#### AQUIFER DATA

Saturated Thickness: 5.39 m                      Anisotropy Ratio (Kz/Kr): 1.

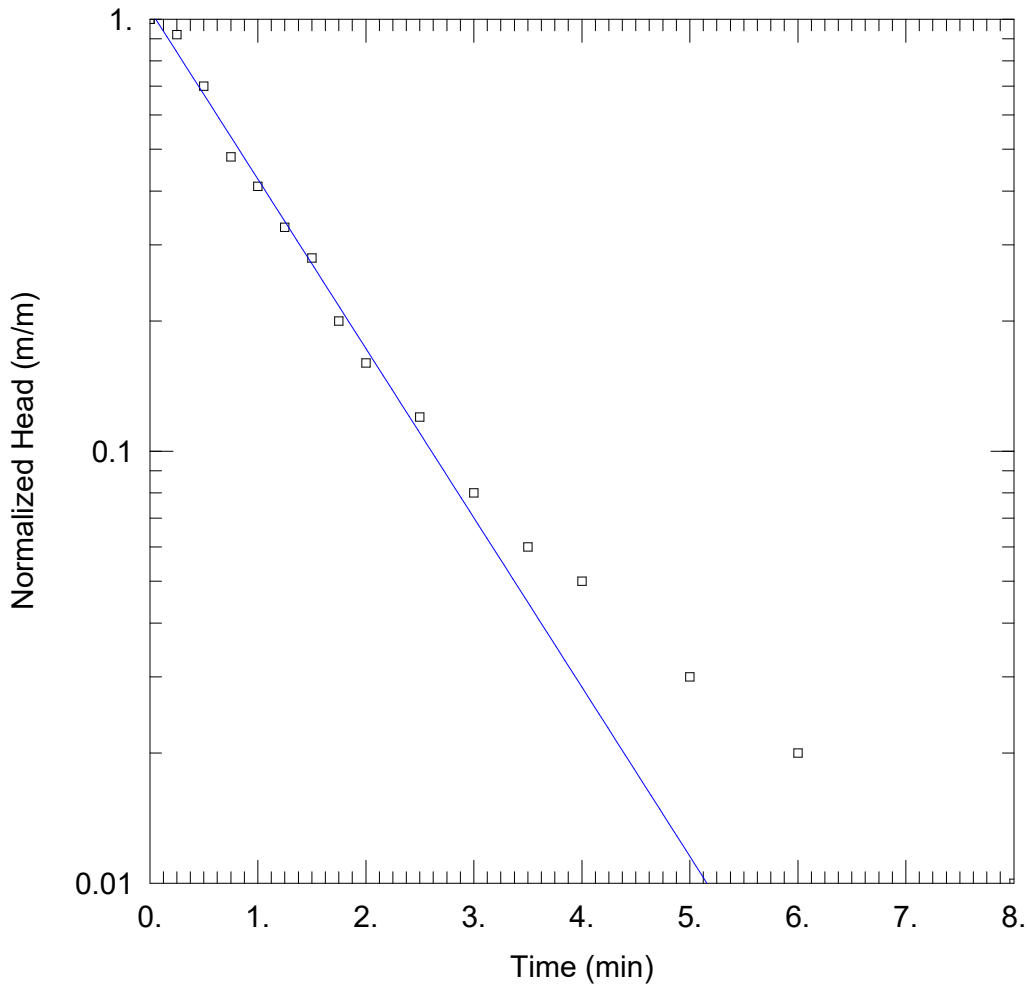
#### WELL DATA (BH20-2)

Initial Displacement: 0.815 m                      Static Water Column Height: 5.39 m  
 Total Well Penetration Depth: 5.39 m                      Screen Length: 3.5 m  
 Casing Radius: 0.025 m                      Well Radius: 0.075 m

#### SOLUTION

Aquifer Model: Unconfined                      Solution Method: Bouwer-Rice  
 K = 2.3E-8 m/sec                      y0 = 0.7645 m





### WELL TEST ANALYSIS

#### PROJECT INFORMATION

Company: WSP Canada Inc.  
 Client: Tatham Engineering Ltd  
 Project: 20141301  
 Location: South Fergus  
 Test Well: BH20-4  
 Test Date: 11June2021

#### AQUIFER DATA

Saturated Thickness: 6.28 m                      Anisotropy Ratio (Kz/Kr): 1.

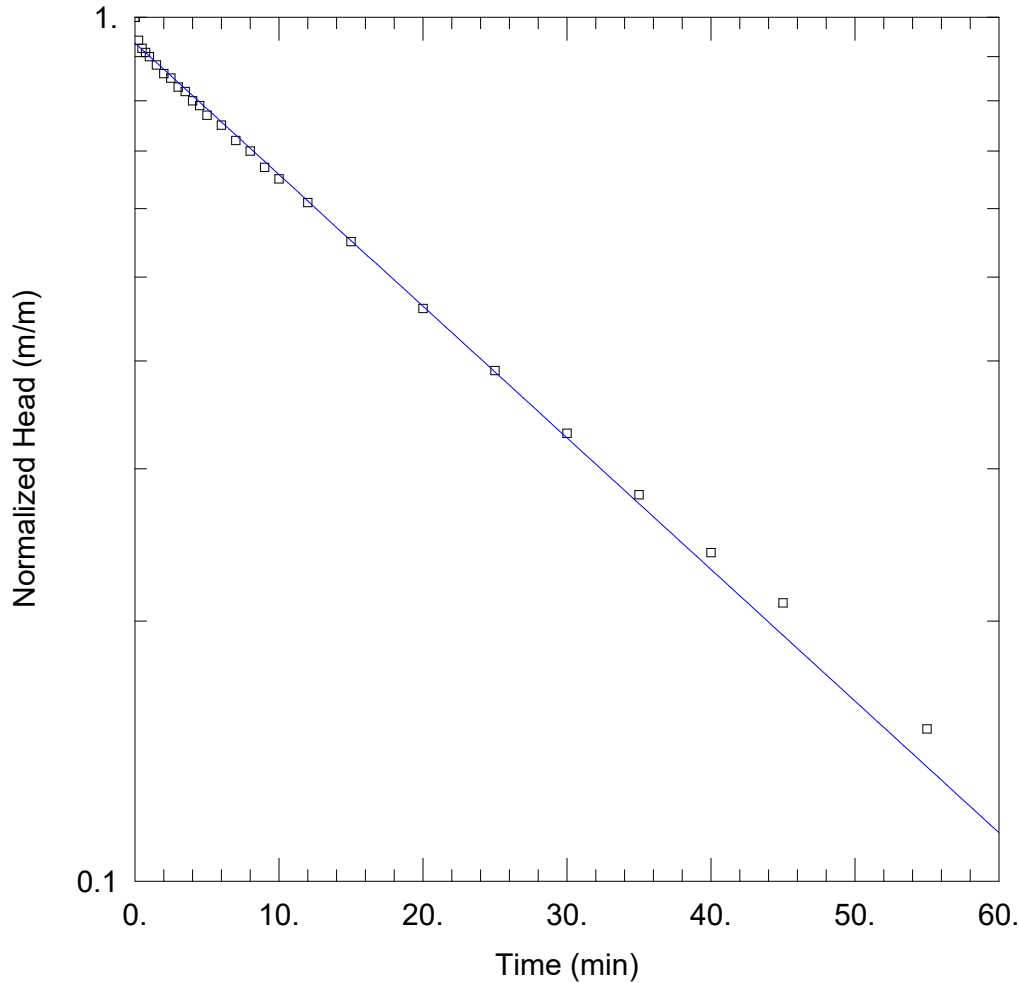
#### WELL DATA (BH20-4)

Initial Displacement: 1. m                      Static Water Column Height: 6.28 m  
 Total Well Penetration Depth: 5.8 m                      Screen Length: 2.1 m  
 Casing Radius: 0.025 m                      Well Radius: 0.108 m

#### SOLUTION

Aquifer Model: Unconfined                      Solution Method: Bower-Rice  
 K = 5.439E-6 m/sec                      y0 = 1.049 m





### WELL TEST ANALYSIS

#### PROJECT INFORMATION

Company: WSP Canada Inc.  
 Client: Tatham Engineering Ltd  
 Project: 20141301  
 Location: South Fergus  
 Test Well: BH20-8-S  
 Test Date: 11June2021

#### AQUIFER DATA

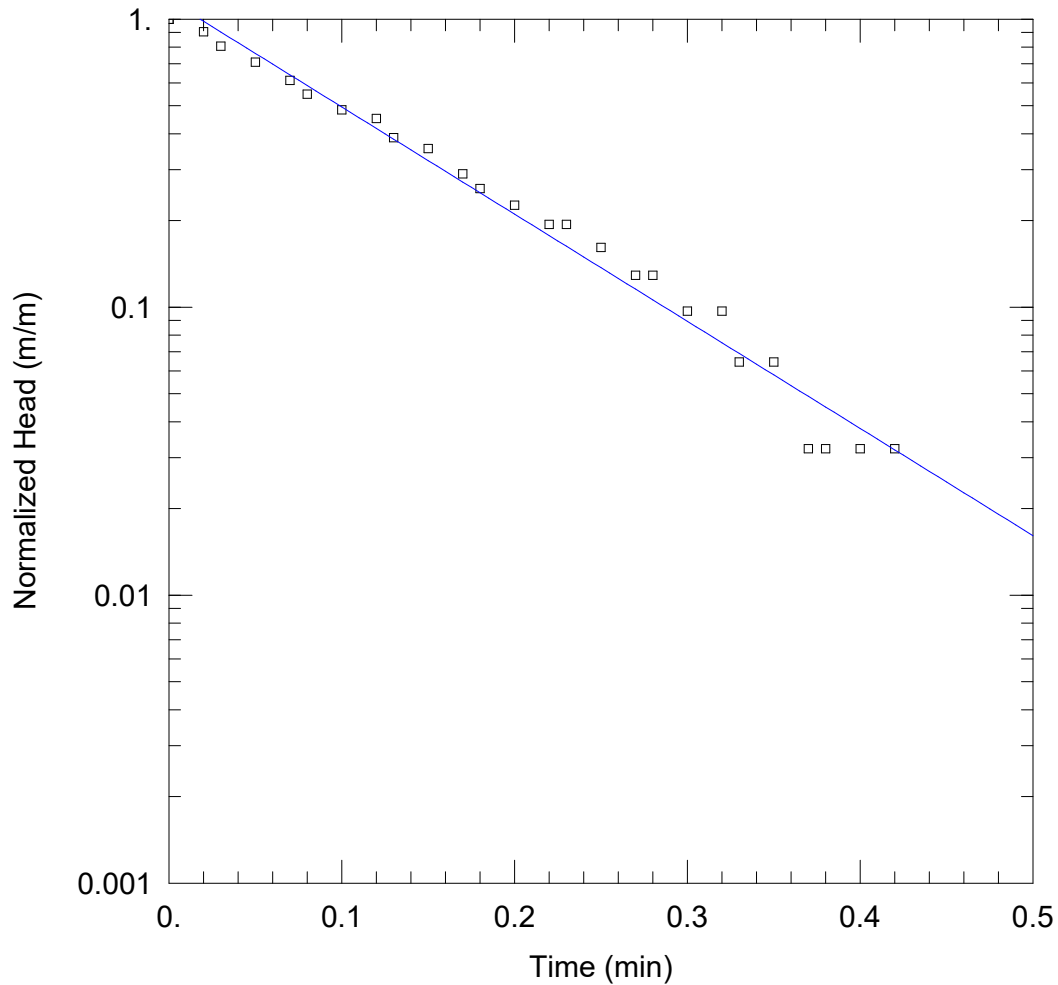
Saturated Thickness: 4.63 m                      Anisotropy Ratio (Kz/Kr): 1.

#### WELL DATA (BH20-8-S)

Initial Displacement: 1. m                      Static Water Column Height: 4.63 m  
 Total Well Penetration Depth: 3.91 m      Screen Length: 3.4 m  
 Casing Radius: 0.034 m                      Well Radius: 0.05 m

#### SOLUTION

Aquifer Model: Unconfined                      Solution Method: Bouwer-Rice  
 K = 3.031E-7 m/sec                      y0 = 0.9335 m



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: WSP Canada Inc.  
 Client: Tatham Engineering Ltd  
 Project: 20141301  
 Location: South Fergus  
 Test Well: BH20-10-S  
 Test Date: 11June2021

AQUIFER DATA

Saturated Thickness: 8.81 m                      Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH20-10-S)

Initial Displacement: 0.31 m                      Static Water Column Height: 8.81 m  
 Total Well Penetration Depth: 3.76 m                      Screen Length: 3.3 m  
 Casing Radius: 0.025 m                      Well Radius: 0.075 m

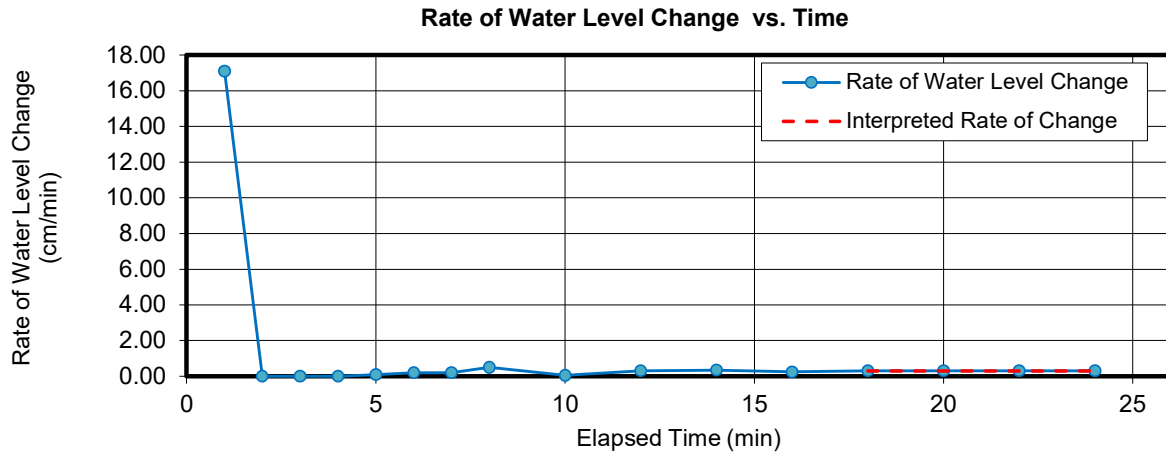
SOLUTION

Aquifer Model: Unconfined                      Solution Method: Bowser-Rice  
 K = 3.456E-5 m/sec                      y0 = 0.3616 m

# Constant Head Permeameter Test Report - GP20-2

Figure F-1

Approximate Location: 1.5 m South of BH20-2  
 Test Depth: 0.61 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	0.0	0.0	0.00
1.0	17.1	17.1	17.10
2.0	17.1	0.0	0.00
3.0	17.1	0.0	0.00
4.0	17.1	0.0	0.00
5.0	17.2	0.1	0.10
6.0	17.4	0.2	0.20
7.0	17.6	0.2	0.20
8.0	18.1	0.5	0.50
10.0	18.2	0.1	0.05
12.0	18.8	0.6	0.30
14.0	19.5	0.7	0.35
16.0	20.0	0.5	0.25
18.0	20.6	0.6	0.30
20.0	21.2	0.6	0.30
22.0	21.8	0.6	0.30
24.0	22.4	0.6	0.30

Soil Type 3 - gravelly SILTY SAND (TILL)

**Interpreted Rate of:**

Water Level Change ( $R_1$ ) = 5E-03 cm/s  
 Steady Intake Water Rate ( $Q_1$ ) = 2E-01 cm<sup>3</sup>/s  
 hole radius ( $a$ ) = 3 cm  
 Water column height in hole ( $H_1$ ) = 10 cm  
 Shape factor for  $H_1/a$  ( $C_1$ ) = 1.3 -  
 Soil Type Coefficient  $\alpha^*$  = 0.12 cm<sup>-1</sup>

**Single Head Analysis**

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi \alpha^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

Field Saturated Hydraulic Conductivity ( $K_{fs}$ )

$K_{fs} = 2E-04$  cm/s

   =input data

DATE: 2022-07-19  
 PROJECT: 20141301

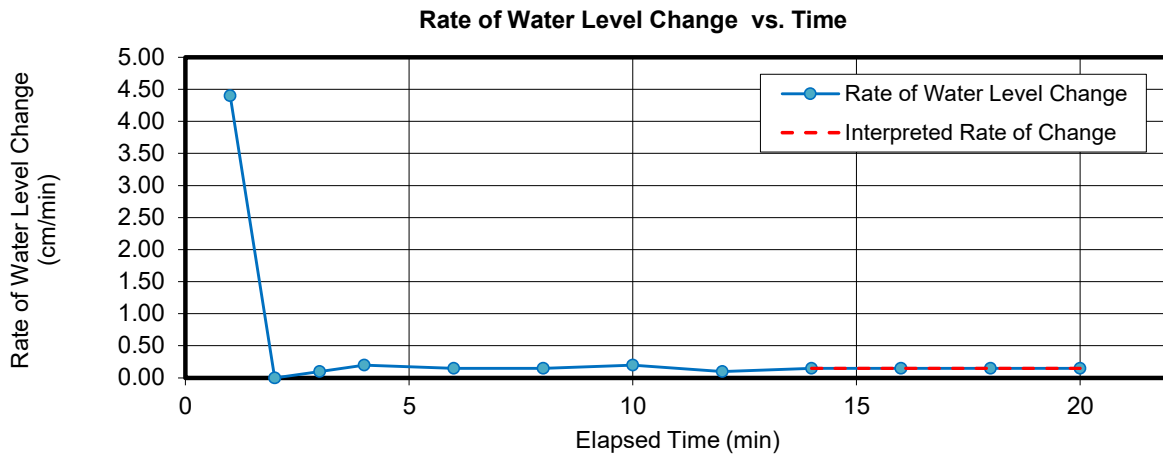


PREPARED BY: AGB  
 REVIEW: JG

# Constant Head Permeameter Test Report - Test GP20-4

Figure F-2

Approximate Location: 1.4 m North of BH20-4  
 Test Depth: 0.60 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	0.0	0.0	0.00
1.0	4.4	4.4	4.40
2.0	4.4	0.0	0.00
3.0	4.5	0.1	0.10
4.0	4.7	0.2	0.20
6.0	5.0	0.3	0.15
8.0	5.3	0.3	0.15
10.0	5.7	0.4	0.20
12.0	5.9	0.2	0.10
14.0	6.2	0.3	0.15
16.0	6.5	0.3	0.15
18.0	6.8	0.3	0.15
20.0	7.1	0.3	0.15

**Soil Type 3 - sandy SILT**

**Interpreted Rate of:**

Water Level Change ( $R_1$ ) = 3E-03 cm/s

Steady Intake Water Rate ( $Q_1$ ) = 9E-02 cm<sup>3</sup>/s

hole radius ( $a$ ) = 3 cm

Water column height in hole ( $H_1$ ) = 10 cm

Shape factor for  $H_1/a$  ( $C_1$ ) = 1.3 -

Soil Type Coefficient  $\alpha^*$  = 0.12 cm<sup>-1</sup>

**Single Head Analysis**

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

Field Saturated Hydraulic Conductivity ( $K_{fs}$ )

**$K_{fs} = 1E-04$  cm/s**

   =input data

DATE: 2022-07-19  
 PROJECT: 20141301



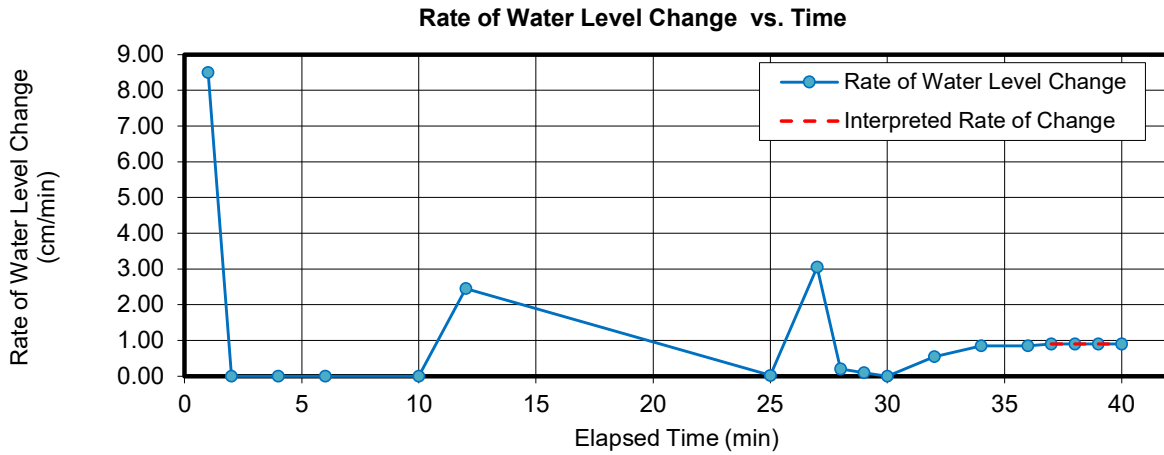
PREPARED BY: AGB  
 REVIEW: JG



# Constant Head Permeameter Test Report - GP20-6

Figure F-3

Approximate Location: 2 m East of BH20-6-D  
 Test Depth: 0.65 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	0.0	0.0	0.00
1.0	8.5	8.5	8.50
2.0	8.5	0.0	0.00
4.0	8.5	0.0	0.00
6.0	8.5	0.0	0.00
10.0	8.5	0.0	0.00
12.0	13.4	4.9	2.45
25.0	13.7	0.3	0.02
27.0	19.8	6.1	3.05
28.0	20.0	0.2	0.20
29.0	20.1	0.1	0.10
30.0	20.1	0.0	0.00
32.0	21.2	1.1	0.55
34.0	22.9	1.7	0.85
36.0	24.6	1.7	0.85
37.0	25.5	0.9	0.90
38.0	26.4	0.9	0.90
39.0	27.3	0.9	0.90
40.0	28.2	0.9	0.90

**Soil Type 3 - sandy SILT to SILTY SAND**

**Interpreted Rate of:**

Water Level Change ( $R_1$ ) = 2E-02 cm/s  
 Steady Intake Water Rate ( $Q_1$ ) = 3E-02 cm<sup>3</sup>/s  
 hole radius ( $a$ ) = 3 cm  
 Water column height in hole ( $H_1$ ) = 20 cm  
 Shape factor for  $H_1/a$  ( $C_1$ ) = 2.0 -  
 Soil Type Coefficient  $\alpha^*$  = 0.12 cm<sup>-1</sup>

**Single Head Analysis**

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

Field Saturated Hydraulic Conductivity ( $K_{fs}$ )

$K_{fs} = 2E-05$  cm/s

   =input data

DATE: 2022-07-19  
 PROJECT: 20141301

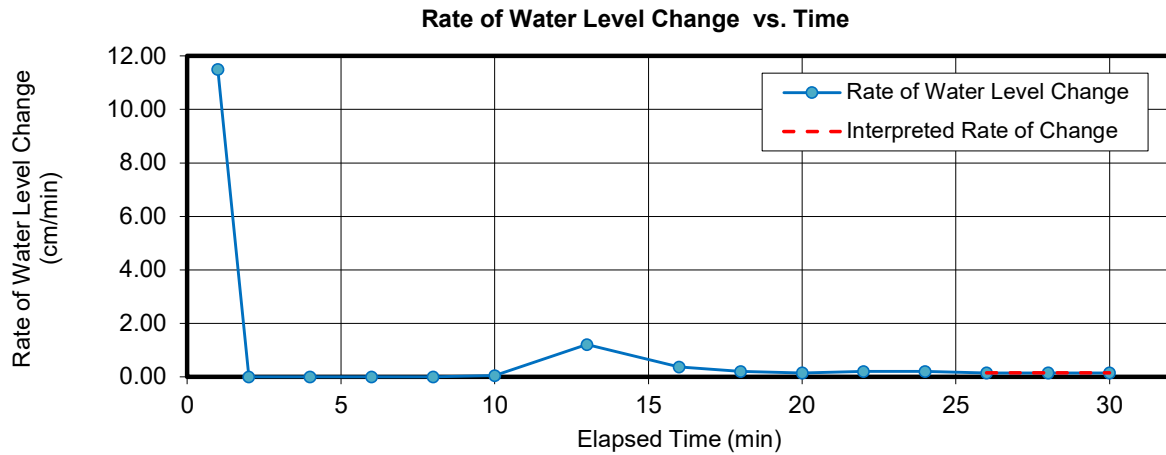


PREPARED BY: AGB  
 REVIEW: JG

# Constant Head Permeameter Test Report - Test GP20-7

Figure F-4

Approximate Location: 2 m East of BH20-7  
 Test Depth: 0.63 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	0.0	0.0	0.00
1.0	11.5	11.5	11.50
2.0	11.5	0.0	0.00
4.0	11.5	0.0	0.00
6.0	11.5	0.0	0.00
8.0	11.5	0.0	0.00
10.0	11.6	0.1	0.05
13.0	15.2	3.6	1.20
16.0	16.3	1.1	0.37
18.0	16.7	0.4	0.20
20.0	17.0	0.3	0.15
22.0	17.4	0.4	0.20
24.0	17.8	0.4	0.20
26.0	18.1	0.3	0.15
28.0	18.4	0.3	0.15
30.0	18.7	0.3	0.15

**Soil Type 3 - sandy SILTY CLAY to CLAYEY SILT**

**Interpreted Rate of:**

Water Level Change ( $R_1$ ) = 3E-03 cm/s  
 Steady Intake Water Rate ( $Q_1$ ) = 9E-02 cm<sup>3</sup>/s  
 hole radius ( $a$ ) = 3 cm  
 Water column height in hole ( $H_1$ ) = 20 cm  
 Shape factor for  $H_1/a = (C_1) = 2.0$  -  
 Soil Type Coefficient  $\alpha^* = 0.12$  cm<sup>-1</sup>

**Single Head Analysis**

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi \alpha^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

Field Saturated Hydraulic Conductivity ( $K_{fs}$ )

**$K_{fs} = 5E-05$  cm/s**

   =input data

DATE: 2022-07-19  
 PROJECT: 20141301

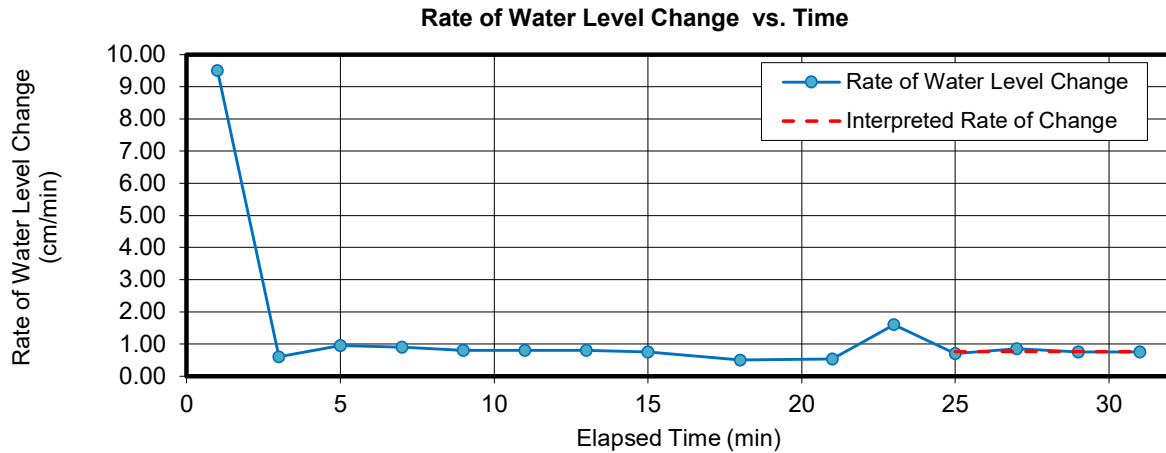


PREPARED BY: AGB  
 REVIEW: JG

# Constant Head Permeameter Test Report - GP20-8

Figure F-5

Approximate Location: 1.5 m West of BH20-8-D  
 Test Depth: 0.71 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	0.0	0.0	0.00
1.0	9.5	9.5	9.50
3.0	10.7	1.2	0.60
5.0	12.6	1.9	0.95
7.0	14.4	1.8	0.90
9.0	16.0	1.6	0.80
11.0	17.6	1.6	0.80
13.0	19.2	1.6	0.80
15.0	20.7	1.5	0.75
18.0	22.2	1.5	0.50
21.0	23.8	1.6	0.53
23.0	27.0	3.2	1.60
25.0	28.4	1.4	0.70
27.0	30.1	1.7	0.85
29.0	31.6	1.5	0.75
31.0	33.1	1.5	0.75

**Soil Type 3 - sandy SILT**

**Interpreted Rate of:**

Water Level Change ( $R_1$ ) = 1E-02 cm/s  
 Steady Intake Water Rate ( $Q_1$ ) = 4E-01 cm<sup>3</sup>/s  
 hole radius ( $a$ ) = 3 cm  
 Water column height in hole ( $H_1$ ) = 10 cm  
 Shape factor for  $H_1/a$  ( $C_1$ ) = 1.3 -  
 Soil Type Coefficient  $\alpha^*$  = 0.12 cm<sup>-1</sup>

**Single Head Analysis**

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi \alpha^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

Field Saturated Hydraulic Conductivity ( $K_{fs}$ )

**$K_{fs} = 5E-04$  cm/s**

   =input data

DATE: 2022-07-19  
 PROJECT: 20141301

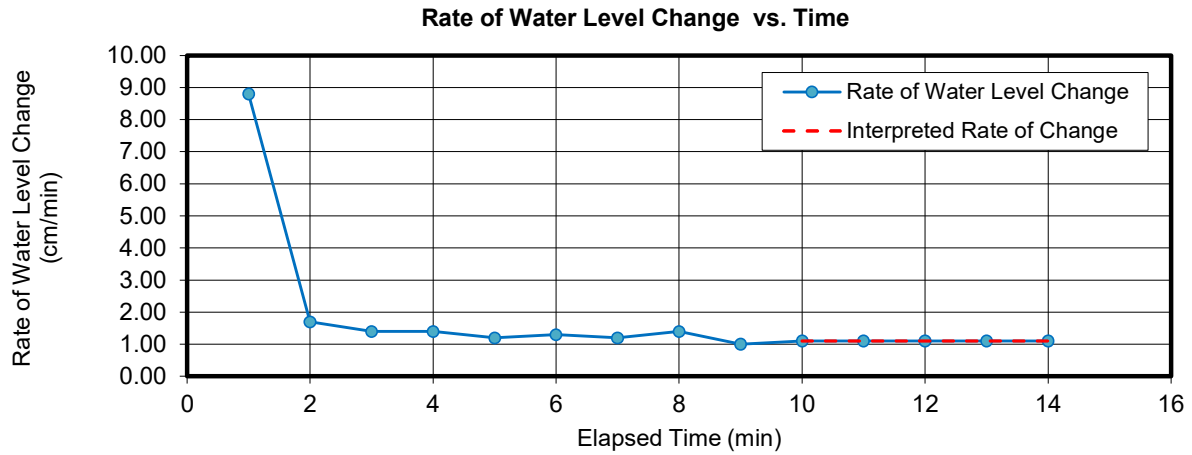


PREPARED BY: AGB  
 REVIEW: JG

# Constant Head Permeameter Test Report - GP20-10

Figure F-6

Approximate Location: 1 m North of BH20-10-S  
 Test Depth: 0.65 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	0.0	0.0	0.00
1.0	8.8	8.8	8.80
2.0	10.5	1.7	1.70
3.0	11.9	1.4	1.40
4.0	13.3	1.4	1.40
5.0	14.5	1.2	1.20
6.0	15.8	1.3	1.30
7.0	17.0	1.2	1.20
8.0	18.4	1.4	1.40
9.0	19.4	1.0	1.00
10.0	20.5	1.1	1.10
11.0	21.6	1.1	1.10
12.0	22.7	1.1	1.10
13.0	23.8	1.1	1.10
14.0	24.9	1.1	1.10

**Soil Type 3 - SAND**

**Interpreted Rate of:**

Water Level Change ( $R_1$ ) = 2E-02 cm/s  
 Steady Intake Water Rate ( $Q_1$ ) = 6E-01 cm<sup>3</sup>/s  
 hole radius ( $a$ ) = 3 cm  
 Water column height in hole ( $H_1$ ) = 10 cm  
 Shape factor for  $H_1/a$  ( $C_1$ ) = 1.3 -  
 Soil Type Coefficient  $\alpha^*$  = 0.12 cm<sup>-1</sup>

**Single Head Analysis**

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi \alpha^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

Field Saturated Hydraulic Conductivity ( $K_{fs}$ )

$K_{fs} = 7E-04$  cm/s

  =input data

DATE: 2022-07-19  
 PROJECT: 20141301



PREPARED BY: AGB  
 REVIEW: JG

**APPENDIX G**

**Groundwater Analytical Results**



**CLIENT NAME: GOLDER ASSOCIATES LTD.  
100 SCOTIA COURT  
WHITBY, ON L1N8Y6  
(905) 723-2727**

**ATTENTION TO: Joel Gopaul  
PROJECT: 20141301**

**AGAT WORK ORDER: 21T721685**

**WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer**

**DATE REPORTED: Mar 23, 2021**

**PAGES (INCLUDING COVER): 11**

**VERSION\*: 1**

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

\*Notes

**Disclaimer:**

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



## Certificate of Analysis

AGAT WORK ORDER: 21T721685

PROJECT: 20141301

5835 COOPERS AVENUE  
 MISSISSAUGA, ONTARIO  
 CANADA L4Z 1Y2  
 TEL (905)712-5100  
 FAX (905)712-5122  
<http://www.agatlabs.com>

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLING SITE:

SAMPLED BY:

### Dissolved Al & Hg

DATE RECEIVED: 2021-03-15

DATE REPORTED: 2021-03-23

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	20-3-F	20-8-SF	20-10-SF
				SAMPLE TYPE:	Water	Water	Water
				DATE SAMPLED:	2021-03-12	2021-03-12	2021-03-12
					10:00	12:00	16:00
					2217740	2217743	2217745
Aluminum-dissolved	mg/L	*	0.004		<0.004	<0.004	<0.004
Dissolved Mercury	mg/L	0.0002	0.0001		<0.0001	<0.0001	<0.0001

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to PWQO \* Variable - refer to guideline reference document  
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**2217740-2217745** Metals analysis completed on a filtered sample.

Analysis performed at AGAT Toronto (unless marked by \*)

Certified By:

*José Veraástegui*



## Certificate of Analysis

AGAT WORK ORDER: 21T721685

PROJECT: 20141301

5835 COOPERS AVENUE  
MISSISSAUGA, ONTARIO  
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FAX (905)712-5122  
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CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLING SITE:

SAMPLED BY:

### Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2021-03-15

DATE REPORTED: 2021-03-23

Parameter	Unit	SAMPLE DESCRIPTION:		20-3		20-8-S		20-10-S	
		G / S	RDL	RDL	RDL	RDL	RDL	RDL	
Electrical Conductivity	µS/cm		2	920	2	663	2	2210	
pH	pH Units	6.5-8.5	NA	7.87	NA	7.90	NA	7.71	
Saturation pH (Calculated)				6.52		6.79		6.75	
Langelier Index (Calculated)				1.35		1.11		0.960	
Hardness (as CaCO3) (Calculated)	mg/L		0.5	583	0.5	430	0.5	508	
Total Dissolved Solids	mg/L		20	530	20	354	20	1150	
Alkalinity (as CaCO3)	mg/L		5	401	5	276	5	278	
Bicarbonate (as CaCO3)	mg/L		5	401	5	276	5	278	
Carbonate (as CaCO3)	mg/L		5	<5	5	<5	5	<5	
Hydroxide (as CaCO3)	mg/L		5	<5	5	<5	5	<5	
Fluoride	mg/L		0.05	<0.05	0.05	<0.05	0.07	<0.07	
Chloride	mg/L		0.50	24.4	0.20	25.3	1.0	528	
Nitrate as N	mg/L		0.25	<0.25	0.10	0.65	0.5	0.6	
Nitrite as N	mg/L		0.25	<0.25	0.10	<0.10	0.5	<0.5	
Bromide	mg/L		0.25	<0.25	0.10	<0.10	0.5	<0.5	
Sulphate	mg/L		0.50	70.9	0.20	35.0	1.0	16.2	
Ortho Phosphate as P	mg/L		0.50	<0.50	0.20	<0.20	1.0	<1.0	
Reactive Silica	mg/L		0.25	21.6	0.05	15.1	0.05	8.09	
Ammonia as N	mg/L		0.02	<0.02	0.02	0.04	0.02	0.14	
Ammonia-Un-ionized (Calculated)	mg/L	0.02	0.000002	<0.000002	0.000002	0.00173	0.000002	0.00400	
Total Phosphorus	mg/L	*	0.02	0.05	0.06	0.19	0.02	<0.02	
Total Organic Carbon	mg/L		0.5	1.4	0.5	1.2	0.5	2.3	
True Colour	TCU		5	<5	5	<5	5	<5	
Turbidity	NTU		0.5	39.4	0.5	234	0.5	4.4	
Total Calcium	mg/L		0.05	137	0.05	115	0.05	166	
Total Magnesium	mg/L		0.05	58.5	0.05	34.7	0.05	22.7	
Total Potassium	mg/L		0.05	1.60	0.05	2.15	0.05	1.34	
Total Sodium	mg/L		0.05	8.05	0.05	5.56	0.05	234	
Total Antimony	mg/L	0.020	0.001	<0.001	0.001	<0.001	0.001	<0.001	

Certified By:

*Yris Veraestegui*





## Certificate of Analysis

AGAT WORK ORDER: 21T721685

PROJECT: 20141301

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CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLING SITE:

SAMPLED BY:

### Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2021-03-15

DATE REPORTED: 2021-03-23

Parameter	Unit	SAMPLE DESCRIPTION:		20-3		20-8-S		20-10-S	
		SAMPLE TYPE:		Water		Water		Water	
		DATE SAMPLED:		2021-03-12 10:00		2021-03-12 12:00		2021-03-12 16:00	
		G / S	RDL	2217736	RDL	2217742	RDL	2217744	
Total Arsenic	mg/L	0.1	0.003	0.004	0.003	0.004	0.003	<0.003	
Total Barium	mg/L		0.002	0.120	0.002	0.134	0.002	0.101	
Total Beryllium	mg/L	*	0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	
Total Boron	mg/L	0.2	0.010	0.018	0.010	0.015	0.010	0.023	
Total Cadmium	mg/L	0.0002	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	
Total Chromium	mg/L		0.003	<0.003	0.003	0.003	0.003	<0.003	
Total Cobalt	mg/L	0.0009	0.0005	0.0008	0.0005	<b>0.0015</b>	0.0005	<0.0005	
Total Copper	mg/L	0.005	0.001	<b>0.001</b>	0.001	0.003	0.001	<0.001	
Total Iron	mg/L	0.3	0.010	<b>1.84</b>	0.010	<b>3.30</b>	0.010	0.049	
Total Lead	mg/L	*	0.001	<0.001	0.001	0.004	0.001	<0.001	
Total Manganese	mg/L		0.002	0.160	0.002	0.287	0.002	0.115	
Total Molybdenum	mg/L	0.040	0.002	<0.002	0.002	0.002	0.002	<0.002	
Total Nickel	mg/L	0.025	0.003	<0.003	0.003	0.004	0.003	0.021	
Total Selenium	mg/L	0.1	0.004	<0.004	0.004	<0.004	0.004	<0.004	
Total Silver	mg/L	0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	
Total Strontium	mg/L		0.005	0.288	0.005	0.222	0.005	0.717	
Total Thallium	mg/L	0.0003	0.0003	<0.0003	0.0003	<0.0003	0.0003	<0.0003	
Total Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	
Total Titanium	mg/L		0.002	0.016	0.002	0.122	0.002	<0.002	
Total Tungsten	mg/L	0.030	0.010	<0.010	0.010	<0.010	0.010	<0.010	
Total Uranium	mg/L	0.005	0.002	<0.002	0.002	0.002	0.002	<0.002	
Total Vanadium	mg/L	0.006	0.002	<0.002	0.002	0.005	0.002	<0.002	
Total Zinc	mg/L	0.030	0.005	<0.005	0.005	0.014	0.005	<0.005	
Total Zirconium	mg/L	0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004	

Certified By:

*Yris Veraestegui*



**AGAT** Laboratories

# Certificate of Analysis

AGAT WORK ORDER: 21T721685

PROJECT: 20141301

5835 COOPERS AVENUE  
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CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLING SITE:

SAMPLED BY:

## Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2021-03-15

DATE REPORTED: 2021-03-23

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to PWQO \* Variable - refer to guideline reference document  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**2217736** Dilution required, RDL has been increased accordingly.  
Un-ionized Ammonia detection limit is a calculated RDL. The calculation of Un-ionized Ammonia is based on lab measured parameters (ammonia as N, pH and temperature). Values are reported as calculated.

**2217742-2217744** Dilution required, RDL has been increased accordingly.  
Analysis performed at AGAT Toronto (unless marked by \*)

Certified By:



**Exceedance Summary**

AGAT WORK ORDER: 21T721685

PROJECT: 20141301

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CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
2217736	20-3	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Iron	mg/L	0.3	1.84
2217742	20-8-S	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Cobalt	mg/L	0.0009	0.0015
2217742	20-8-S	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Iron	mg/L	0.3	3.30

## Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 21T721685

PROJECT: 20141301

ATTENTION TO: Joel Gopaul

SAMPLING SITE:

SAMPLED BY:

Water Analysis															
RPT Date: Mar 23, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Water Quality Assessment - PWQO (mg/L)															
Electrical Conductivity	2217742	2217742	663	665	0.3%	< 2	102%	90%	110%						
pH	2217742	2217742	7.90	7.63	3.5%	NA	101%	90%	110%						
Total Dissolved Solids	2207987		172	180	4.5%	< 20	98%	80%	120%						
Alkalinity (as CaCO3)	2217742	2217742	276	273	1.1%	< 5	88%	80%	120%						
Bicarbonate (as CaCO3)	2217742	2217742	276	273	1.1%	< 5	NA								
Carbonate (as CaCO3)	2217742	2217742	<5	<5	NA	< 5	NA								
Hydroxide (as CaCO3)	2217742	2217742	<5	<5	NA	< 5	NA								
Fluoride	2217736	2217736	<0.05	<0.05	NA	< 0.05	99%	90%	110%	104%	90%	110%	100%	85%	115%
Chloride	2217736	2217736	24.4	25.0	2.4%	< 0.10	90%	70%	130%	104%	80%	120%	107%	70%	130%
Nitrate as N	2217736	2217736	<0.25	<0.25	NA	< 0.05	94%	70%	130%	105%	80%	120%	107%	70%	130%
Nitrite as N	2217736	2217736	<0.25	<0.25	NA	< 0.05	94%	70%	130%	102%	80%	120%	102%	70%	130%
Bromide	2217736	2217736	<0.25	<0.25	NA	< 0.05	107%	90%	110%	107%	90%	110%	111%	85%	115%
Sulphate	2217736	2217736	70.9	70.6	0.4%	< 0.10	98%	70%	130%	105%	80%	120%	105%	70%	130%
Ortho Phosphate as P	2217736	2217736	<0.50	<0.50	NA	< 0.10	98%	70%	130%	101%	80%	120%	100%	70%	130%
Reactive Silica	2222108		18.1	18.3	1.1%	< 0.05	98%	90%	110%	100%	90%	110%	115%	80%	120%
Ammonia as N	2220598		<0.02	<0.02	NA	< 0.02	106%	70%	130%	99%	80%	120%	117%	70%	130%
Total Phosphorus	2222108		<0.02	<0.02	NA	< 0.02	101%	70%	130%	102%	80%	120%	105%	70%	130%
Total Organic Carbon	2217736	2217736	1.4	1.3	NA	< 0.5	92%	90%	110%	91%	90%	110%	90%	80%	120%
True Colour	2217736	2217736	<5	<5	NA	< 5	102%	90%	110%						
Turbidity	2217736	2217736	39.4	39.2	0.5%	< 0.5	101%	80%	120%						
Total Calcium	2213263		7.79	7.10	9.3%	< 0.05	102%	70%	130%	101%	80%	120%	98%	70%	130%
Total Magnesium	2213263		0.83	0.87	4.7%	< 0.05	108%	70%	130%	107%	80%	120%	105%	70%	130%
Total Potassium	2213263		0.31	0.08	NA	< 0.05	107%	70%	130%	103%	80%	120%	102%	70%	130%
Total Sodium	2213263		2.74	2.46	10.8%	< 0.05	106%	70%	130%	101%	80%	120%	104%	70%	130%
Total Antimony	2213263		<0.001	<0.001	NA	< 0.001	107%	70%	130%	105%	80%	120%	98%	70%	130%
Total Arsenic	2213263		<0.003	<0.003	NA	< 0.003	94%	70%	130%	104%	80%	120%	101%	70%	130%
Total Barium	2213263		0.015	0.015	0.0%	< 0.002	99%	70%	130%	100%	80%	120%	97%	70%	130%
Total Beryllium	2213263		<0.0005	<0.0005	NA	< 0.0005	100%	70%	130%	102%	80%	120%	95%	70%	130%
Total Boron	2213263		<0.010	<0.010	NA	< 0.010	100%	70%	130%	100%	80%	120%	95%	70%	130%
Total Cadmium	2213263		0.0001	0.0001	NA	< 0.0001	101%	70%	130%	101%	80%	120%	96%	70%	130%
Total Chromium	2213263		<0.003	<0.003	NA	< 0.003	100%	70%	130%	98%	80%	120%	98%	70%	130%
Total Cobalt	2213263		0.0038	0.0037	2.7%	< 0.0005	99%	70%	130%	104%	80%	120%	100%	70%	130%
Total Copper	2213263		0.001	0.002	NA	< 0.001	101%	70%	130%	102%	80%	120%	99%	70%	130%
Total Iron	2213263		0.308	0.336	8.7%	< 0.010	99%	70%	130%	101%	80%	120%	98%	70%	130%
Total Lead	2213263		<0.001	<0.001	NA	< 0.001	98%	70%	130%	100%	80%	120%	97%	70%	130%
Total Manganese	2213263		1.45	1.50	3.4%	< 0.002	98%	70%	130%	101%	80%	120%	95%	70%	130%
Total Molybdenum	2213263		<0.002	<0.002	NA	< 0.002	103%	70%	130%	104%	80%	120%	102%	70%	130%
Total Nickel	2213263		<0.003	<0.003	NA	< 0.003	100%	70%	130%	104%	80%	120%	100%	70%	130%
Total Selenium	2213263		<0.004	<0.004	NA	< 0.004	107%	70%	130%	107%	80%	120%	106%	70%	130%

## Quality Assurance

**CLIENT NAME:** GOLDER ASSOCIATES LTD.  
**PROJECT:** 20141301  
**SAMPLING SITE:**

**AGAT WORK ORDER:** 21T721685  
**ATTENTION TO:** Joel Gopaul  
**SAMPLED BY:**

### Water Analysis (Continued)

RPT Date: Mar 23, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	
Total Silver	2213263		<0.0001	<0.0001	NA	< 0.0001	103%	70%	130%	105%	80%	120%	100%	70%	130%	
Total Strontium	2213263		0.035	0.041	15.8%	< 0.005	99%	70%	130%	102%	80%	120%	103%	70%	130%	
Total Thallium	2213263		<0.0003	<0.0003	NA	< 0.0003	94%	70%	130%	105%	80%	120%	98%	70%	130%	
Total Tin	2213263		<0.002	<0.002	NA	< 0.002	101%	70%	130%	105%	80%	120%	98%	70%	130%	
Total Titanium	2213263		0.004	<0.002	NA	< 0.002	102%	70%	130%	109%	80%	120%	102%	70%	130%	
Total Tungsten	2213263		<0.010	<0.010	NA	< 0.010	97%	70%	130%	100%	80%	120%	95%	70%	130%	
Total Uranium	2213263		<0.002	<0.002	NA	< 0.002	103%	70%	130%	101%	80%	120%	101%	70%	130%	
Total Vanadium	2213263		<0.002	<0.002	NA	< 0.002	99%	70%	130%	104%	80%	120%	100%	70%	130%	
Total Zinc	2213263		<0.005	0.014	NA	< 0.005	103%	70%	130%	105%	80%	120%	110%	70%	130%	
Total Zirconium	2213263		<0.004	<0.004	NA	< 0.004	98%	70%	130%	100%	80%	120%	98%	70%	130%	
<b>Dissolved Al &amp; Hg</b>																
Aluminum-dissolved	2217740	2217740	<0.004	0.005	NA	< 0.004	107%	70%	130%	111%	80%	120%	93%	70%	130%	
Dissolved Mercury	2211353		< 0.0001	< 0.0001	NA	< 0.0001	102%	70%	130%	103%	80%	120%	99%	70%	130%	

Comments: NA signifies Not Applicable.  
 If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.  
 Matrix spike: Spike level < native concentration. Matrix spike acceptance limits do not apply.

Certified By: \_\_\_\_\_

*Yris Verastegui*

## Method Summary

**CLIENT NAME: GOLDER ASSOCIATES LTD.**
**AGAT WORK ORDER: 21T721685**
**PROJECT: 20141301**
**ATTENTION TO: Joel Gopaul**
**SAMPLING SITE:**
**SAMPLED BY:**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
<b>Water Analysis</b>			
Aluminum-dissolved	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Saturation pH (Calculated)		SM 2320 B	CALCULATION
Langelier Index (Calculated)		SM 2330B	CALCULATION
Hardness (as CaCO <sub>3</sub> ) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684, ON MOECC E3139, SM 2540C, D	BALANCE
Alkalinity (as CaCO <sub>3</sub> )	INOR-93-6000	SM 2320 B	PC TITRATE
Bicarbonate (as CaCO <sub>3</sub> )	INOR-93-6000	SM 2320 B	PC TITRATE
Carbonate (as CaCO <sub>3</sub> )	INOR-93-6000	SM 2320 B	PC TITRATE
Hydroxide (as CaCO <sub>3</sub> )	INOR-93-6000	SM 2320 B	PC TITRATE
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Bromide	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ortho Phosphate as P	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Reactive Silica	INOR-93-6070	QuickChem 10-114-27-1-A & SM 4500 Si-F	LACHAT FIA
Ammonia as N	INOR-93-6059	modified from SM 4500-NH <sub>3</sub> H	LACHAT FIA
Ammonia-Un-ionized (Calculated)		MOE REFERENCE, PWQOs Tab 2	CALCULATION
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Total Organic Carbon	INOR-93-6049	modified from SM 5310 B	SHIMADZU CARBON ANALYZER
True Colour	INOR-93-6046	SM 2120 B	SPECTROPHOTOMETER
Turbidity	INOR-93-6044	modified from SM 2130 B	NEPHELOMETER
Total Calcium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Magnesium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Potassium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Sodium	MET-93-6105	modified from EPA 6010D	ICP/OES
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Beryllium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS



## Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 21T721685

PROJECT: 20141301

ATTENTION TO: Joel Gopaul

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Strontium	INOR-93-6003	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Thallium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tin	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Titanium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tungsten	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Uranium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Vanadium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zirconium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS



1 MED

### Laboratory Use Only

Work Order #: 21T721685

Cooler Quantity: \_\_\_\_\_  
Arrival Temperatures: 1.7 | .8 | .8  
3.8 | 3.5 | 4.1  
Custody Seal Intact:  Yes  No  N/A  
Notes: FRESH ICE

## Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

### Report Information:

Company: Golder  
Contact: Joel Gopaul  
Address: 100 Scotia Crt  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Reports to be sent to:  
1. Email: Joel.Gopaul2@golder.com  
2. Email: Aaron Beard@golder.com

### Regulatory Requirements:

(Please check all applicable boxes)

- Regulation 153/04  Excess Soils R406  Sewer Use  
 Sanitary  Storm  
Table Indicate One Table Indicate One  
 Ind/Com  Res/Park  Agriculture  Regulation 558  Prov. Water Quality Objectives (PWQO)  
Soil Texture (Check One)  CCME  Other  
 Coarse  Fine Indicate One

### Turnaround Time (TAT) Required:

Regular TAT (Most Analysis)  5 to 7 Business Days

### Rush TAT (Rush Surcharges Apply)

- 3 Business Days  2 Business Days  Next Business Day

OR Date Required (Rush Surcharges May Apply): \_\_\_\_\_

Please provide prior notification for rush TAT  
\*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

### Project Information:

Project: 2041301  
Site Location: South Fergus  
Sampled By: AGB  
AGAT ID #: \_\_\_\_\_ PO: \_\_\_\_\_  
Please note: If quotation number is not provided, client will be billed full price for analysis.

### Is this submission for a Record of Site Condition?

- Yes  No

### Report Guideline on Certificate of Analysis

- Yes  No

### Invoice Information:

Company: Golder Bill To Same: Yes  No   
Contact: Joel Gopaul  
Address: \_\_\_\_\_  
Email: Joel.Gopaul2@golder.com

### Sample Matrix Legend

- B** Biota  
**GW** Ground Water  
**O** Oil  
**P** Paint  
**S** Soil  
**SD** Sediment  
**SW** Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y / N	Metals & Inorganics	Metals - <input type="checkbox"/> CrVI, <input type="checkbox"/> Hg, <input type="checkbox"/> HWSB	BTEX, F1-F4 PHCs	Analyze F4G if required <input type="checkbox"/> Yes <input type="checkbox"/> No	PAHs	Total PCBs	Aroclor	VOC	Landfill Disposal Characterization TCLP: <input type="checkbox"/> M&I <input type="checkbox"/> VOCs <input type="checkbox"/> ABNs <input type="checkbox"/> Biop <input type="checkbox"/> PCBs	Excess Soils SPLP Rainwater Leach	SPLP: <input type="checkbox"/> Metals <input type="checkbox"/> VOCs <input type="checkbox"/> SVOCs	Excess Soils Characterization Package	pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	Potentially Hazardous or High Concentration (Y/N)	
20-3	12/03/21	10:00 AM	7	GW	disg	N																
20-3-F		10:00 AM	3		dissoled Al, Hg	Y																
20-8-S		12:00 AM	7			N																
20-8-SF		12:00 AM	3		dissoled Al, Hg	Y																
20-10-S		4:00 PM	7			N																
20-10-SF		4:00 PM	3		dissoled Al, Hg	Y																

Samples Relinquished By (Print Name and Sign): <u>Aaron Beard (A Beard)</u>	Date: <u>14/03/21</u>	Time: <u>11:00</u>	Samples Received By (Print Name and Sign): <u>D. [Signature]</u>	Date: <u>03/15/21</u>	Time: <u>11:25</u>
Samples Relinquished By (Print Name and Sign): <u>[Signature]</u>	Date: <u>03/15/21</u>	Time: <u>2:00</u>	Samples Received By (Print Name and Sign): <u>[Signature]</u>	Date:	Time:
Samples Relinquished By (Print Name and Sign): <u>[Signature]</u>	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:

Page 1 of 1  
N: **T116062**





CLIENT NAME: GOLDER ASSOCIATES LTD.  
100 SCOTIA COURT  
WHITBY, ON L1N8Y6  
(905) 723-2727

ATTENTION TO: Joel Gopaul  
PROJECT: 20141301

AGAT WORK ORDER: 22T916870

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Jul 28, 2022

PAGES (INCLUDING COVER): 10

VERSION\*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

\*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



## Certificate of Analysis

AGAT WORK ORDER: 22T916870

PROJECT: 20141301

5835 COOPERS AVENUE  
MISSISSAUGA, ONTARIO  
CANADA L4Z 1Y2  
TEL (905)712-5100  
FAX (905)712-5122  
<http://www.agatlabs.com>

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLING SITE: South Furgus

SAMPLED BY: AGB

### Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2022-07-06

DATE REPORTED: 2022-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		20-4	20-8-S	20-10-S	
		G / S	RDL	4057067	4057078	RDL	4057079
Electrical Conductivity	µS/cm		2	771	645	2	1070
pH	pH Units	6.5-8.5	NA	7.83	7.87	NA	7.90
Saturation pH (Calculated)				6.90	6.76		6.85
Langelier Index (Calculated)				0.926	1.11		1.05
Hardness (as CaCO3) (Calculated)	mg/L		0.5	314	451	0.5	368
Total Dissolved Solids	mg/L		10	436	384	10	604
Alkalinity (as CaCO3)	mg/L		5	288	279	5	300
Bicarbonate (as CaCO3)	mg/L		5	288	279	5	300
Carbonate (as CaCO3)	mg/L		5	<5	<5	5	<5
Hydroxide (as CaCO3)	mg/L		5	<5	<5	5	<5
Fluoride	mg/L		0.05	<0.05	<0.05	0.05	<0.05
Chloride	mg/L		0.10	65.8	25.5	0.12	162
Nitrate as N	mg/L		0.05	3.29	0.25	0.05	1.26
Nitrite as N	mg/L		0.05	<0.05	<0.05	0.05	<0.05
Bromide	mg/L		0.05	<0.05	<0.05	0.05	<0.05
Sulphate	mg/L		0.10	18.7	40.2	0.10	7.48
Ortho Phosphate as P	mg/L		0.10	<0.10	<0.10	0.10	<0.10
Ammonia as N	mg/L		0.02	<0.02	0.02	0.02	<0.02
Ammonia-Un-ionized (Calculated)	mg/L	0.02	0.000002	<0.000002	0.000990	0.000002	<0.000002
Total Phosphorus	mg/L	*	0.02	0.02	0.03	0.02	<0.02
Total Organic Carbon	mg/L		0.5	1.0	1.4	0.5	1.1
True Colour	TCU		5.00	<5.00	<5.00	5.00	<5.00
Turbidity	NTU		0.5	8.9	246	0.5	0.7
Total Calcium	mg/L		0.20	106	127	0.20	100
Total Magnesium	mg/L		0.10	11.9	32.4	0.10	28.7
Total Potassium	mg/L		0.50	<0.50	0.68	0.50	<0.50
Total Sodium	mg/L		0.10	81.0	4.27	0.10	27.9
Aluminum-dissolved	mg/L	*	0.004	0.005	0.005	0.004	0.005
Total Antimony	mg/L	0.020	0.001	<0.001	<0.001	0.001	<0.001

Certified By:

*Yris Veraestegui*



## Certificate of Analysis

AGAT WORK ORDER: 22T916870

PROJECT: 20141301

5835 COOPERS AVENUE  
MISSISSAUGA, ONTARIO  
CANADA L4Z 1Y2  
TEL (905)712-5100  
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<http://www.agatlabs.com>

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLING SITE: South Furgus

SAMPLED BY: AGB

### Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2022-07-06

DATE REPORTED: 2022-07-28

Parameter	Unit	SAMPLE DESCRIPTION:		20-4	20-8-S	20-10-S	
		G / S	RDL	Water	Water	Water	
DATE SAMPLED:		2022-07-05	2022-07-05	2022-07-05	2022-07-05	2022-07-05	2022-07-05
		13:00	16:30	4057067	4057078	RDL	4057079
Total Arsenic	mg/L	0.1	0.003	<0.003	0.004	0.003	<0.003
Total Barium	mg/L		0.002	0.024	0.140	0.002	0.029
Total Beryllium	mg/L	*	0.001	<0.001	<0.001	0.001	<0.001
Total Boron	mg/L	0.2	0.010	0.048	0.036	0.010	0.041
Total Cadmium	mg/L	0.0002	0.0001	0.0001	<0.0001	0.0001	<0.0001
Total Chromium	mg/L		0.003	<0.003	0.006	0.003	<0.003
Total Cobalt	mg/L	0.0009	0.0005	<0.0005	0.0020	0.0005	<0.0005
Total Copper	mg/L	0.005	0.001	0.001	0.006	0.001	0.001
Total Iron	mg/L	0.3	0.010	<0.010	4.27	0.010	0.410
Total Lead	mg/L	*	0.001	<0.001	0.005	0.001	<0.001
Total Manganese	mg/L		0.002	<0.002	0.232	0.002	0.015
Dissolved Mercury	mg/L	0.0002	0.0001	<0.0001	<0.0001	0.0001	<0.0001
Total Molybdenum	mg/L	0.040	0.002	<0.002	<0.002	0.002	<0.002
Total Nickel	mg/L	0.025	0.003	<0.003	0.003	0.003	<0.003
Total Selenium	mg/L	0.1	0.002	<0.002	0.002	0.002	<0.002
Total Silver	mg/L	0.0001	0.0001	0.0001	<0.0001	0.0001	<0.0001
Total Strontium	mg/L		0.005	0.332	0.228	0.005	0.146
Total Thallium	mg/L	0.0003	0.0003	<0.0003	<0.0003	0.0003	<0.0003
Total Tin	mg/L		0.002	<0.002	<0.002	0.002	<0.002
Total Titanium	mg/L		0.010	<0.010	0.129	0.010	0.021
Total Tungsten	mg/L	0.030	0.010	<0.010	<0.010	0.010	<0.010
Total Uranium	mg/L	0.005	0.002	<0.002	<0.002	0.002	<0.002
Total Vanadium	mg/L	0.006	0.002	<0.002	0.007	0.002	<0.002
Total Zinc	mg/L	0.030	0.020	<0.020	0.060	0.020	<0.020
Total Zirconium	mg/L	0.004	0.004	<0.004	<0.004	0.004	<0.004
Lab Filtration Aluminum Dissolved				2022/7/7	2022/7/7		2022/7/7

Certified By:

*Yris Veraestegui*



# Certificate of Analysis

AGAT WORK ORDER: 22T916870

PROJECT: 20141301

5835 COOPERS AVENUE  
MISSISSAUGA, ONTARIO  
CANADA L4Z 1Y2  
TEL (905)712-5100  
FAX (905)712-5122  
<http://www.agatlabs.com>

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLING SITE: South Furgus

SAMPLED BY: AGB

## Water Quality Assessment - PWQO (mg/L)

DATE RECEIVED: 2022-07-06

DATE REPORTED: 2022-07-28

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to PWQO \* Variable - refer to guideline reference document  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

4057067-4057079 Diss.AI analysis completed on a lab filtered sample.  
Dilution required, RDL has been increased accordingly.  
Un-ionized Ammonia detection limit is a calculated RDL. The calculation of Un-ionized Ammonia is based on lab measured parameters (ammonia as N, pH and temperature). Values are reported as calculated.

Analysis performed at AGAT Toronto (unless marked by \*)

Certified By:



**Exceedance Summary**

AGAT WORK ORDER: 22T916870

PROJECT: 20141301

5835 COOPERS AVENUE  
 MISSISSAUGA, ONTARIO  
 CANADA L4Z 1Y2  
 TEL (905)712-5100  
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CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Joel Gopaul

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
4057078	20-8-S	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Cobalt	mg/L	0.0009	0.0020
4057078	20-8-S	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Copper	mg/L	0.005	0.006
4057078	20-8-S	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Iron	mg/L	0.3	4.27
4057078	20-8-S	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Vanadium	mg/L	0.006	0.007
4057078	20-8-S	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Zinc	mg/L	0.030	0.060
4057079	20-10-S	ON PWQO	Water Quality Assessment - PWQO (mg/L)	Total Iron	mg/L	0.3	0.410



## Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.  
 PROJECT: 20141301  
 SAMPLING SITE: South Furgus

AGAT WORK ORDER: 22T916870  
 ATTENTION TO: Joel Gopaul  
 SAMPLED BY: AGB

<b>Water Analysis</b>													
-----------------------	--	--	--	--	--	--	--	--	--	--	--	--	--

RPT Date: Jul 28, 2022			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Water Quality Assessment - PWQO (mg/L)															
Electrical Conductivity	4056352		136	133	2.2%	< 2	104%	90%	110%						
pH	4056352		6.93	6.89	0.6%	NA	102%	90%	110%						
Total Dissolved Solids	4056343		74	74	0.0%	< 10	96%	80%	120%						
Alkalinity (as CaCO3)	4056352		24	21	NA	< 5	90%	80%	120%						
Bicarbonate (as CaCO3)	4056352		24	21	NA	< 5	NA								
Carbonate (as CaCO3)	4056352		<5	<5	NA	< 5	NA								
Hydroxide (as CaCO3)	4056352		<5	<5	NA	< 5	NA								
Fluoride	4054678		<0.05	<0.05	NA	< 0.05	104%	70%	130%	108%	80%	120%	101%	70%	130%
Chloride	4054678		126	125	0.8%	< 0.10	101%	70%	130%	103%	80%	120%	NA	70%	130%
Nitrate as N	4054678		0.34	0.33	3.0%	< 0.05	97%	70%	130%	101%	80%	120%	100%	70%	130%
Nitrite as N	4054678		<0.05	<0.05	NA	< 0.05	93%	70%	130%	105%	80%	120%	102%	70%	130%
Bromide	4054678		<0.05	<0.05	NA	< 0.05	110%	70%	130%	100%	80%	120%	101%	70%	130%
Sulphate	4054678		100	100	0.0%	< 0.10	99%	70%	130%	101%	80%	120%	98%	70%	130%
Ortho Phosphate as P	4054678		<0.10	<0.10	NA	< 0.10	91%	70%	130%	104%	80%	120%	99%	70%	130%
Ammonia as N	4055609		0.16	0.16	0.0%	< 0.02	106%	70%	130%	102%	80%	120%	94%	70%	130%
Total Phosphorus	4060901		0.20	0.19	5.1%	< 0.02	99%	70%	130%	98%	80%	120%	NA	70%	130%
Total Organic Carbon	4057785		2.3	2.3	NA	< 0.5	99%	90%	110%	93%	90%	110%	89%	80%	120%
True Colour	4057785		115	110	4.4%	< 5	104%	90%	110%						
Turbidity	4055797		258	262	1.5%	< 0.5	102%	80%	120%						
Total Calcium	4061728		253	268	5.8%	< 0.20	106%	70%	130%	104%	80%	120%	92%	70%	130%
Total Magnesium	4061728		54.6	49.4	10.0%	< 0.10	99%	70%	130%	97%	80%	120%	87%	70%	130%
Total Potassium	4061728		46.1	50.0	8.1%	< 0.50	98%	70%	130%	96%	80%	120%	71%	70%	130%
Total Sodium	4061728		2100	2410	13.7%	< 0.10	104%	70%	130%	95%	80%	120%	NA	70%	130%
Aluminum-dissolved	4057067	4057067	0.005	0.005	NA	< 0.004	108%	70%	130%	103%	80%	120%	108%	70%	130%
Total Antimony	4061728		<0.001	<0.001	NA	< 0.001	99%	70%	130%	95%	80%	120%	100%	70%	130%
Total Arsenic	4061728		0.003	0.005	NA	< 0.003	93%	70%	130%	91%	80%	120%	91%	70%	130%
Total Barium	4061728		0.048	0.051	6.1%	< 0.002	100%	70%	130%	97%	80%	120%	104%	70%	130%
Total Beryllium	4061728		<0.001	<0.001	NA	< 0.001	100%	70%	130%	87%	80%	120%	78%	70%	130%
Total Boron	4061728		2.41	2.58	6.8%	< 0.010	100%	70%	130%	94%	80%	120%	84%	70%	130%
Total Cadmium	4061728		<0.0001	<0.0001	NA	< 0.0001	99%	70%	130%	94%	80%	120%	89%	70%	130%
Total Chromium	4061728		0.005	0.005	NA	< 0.003	103%	70%	130%	102%	80%	120%	102%	70%	130%
Total Cobalt	4061728		0.0020	0.0022	NA	< 0.0005	104%	70%	130%	93%	80%	120%	99%	70%	130%
Total Copper	4061728		0.015	0.016	6.5%	< 0.001	101%	70%	130%	99%	80%	120%	87%	70%	130%
Total Iron	4061728		5.12	5.94	14.8%	< 0.010	111%	70%	130%	101%	80%	120%	102%	70%	130%
Total Lead	4061728		0.002	0.002	NA	< 0.001	100%	70%	130%	93%	80%	120%	87%	70%	130%
Total Manganese	4061728		0.543	0.556	2.4%	< 0.002	101%	70%	130%	93%	80%	120%	89%	70%	130%
Dissolved Mercury	4057067	4057067	<0.0001	<0.0001	NA	< 0.0001	102%	70%	130%	100%	80%	120%	98%	70%	130%
Total Molybdenum	4061728		<0.002	<0.002	NA	< 0.002	100%	70%	130%	101%	80%	120%	106%	70%	130%
Total Nickel	4061728		0.003	0.003	NA	< 0.003	101%	70%	130%	89%	80%	120%	91%	70%	130%

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from [www.cala.ca](http://www.cala.ca) and/or [www.scc.ca](http://www.scc.ca). The tests in this report may not necessarily be included in the scope of accreditation. RPDs calculated using raw data. The RPD may not be reflective of duplicate values shown, due to rounding of final results.

Results relate only to the items tested. Results apply to samples as received.

## Quality Assurance

 CLIENT NAME: GOLDR ASSOCIATES LTD.  
 PROJECT: 20141301  
 SAMPLING SITE: South Furgus

 AGAT WORK ORDER: 22T916870  
 ATTENTION TO: Joel Gopaul  
 SAMPLED BY: AGB

### Water Analysis (Continued)

RPT Date: Jul 28, 2022			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	
Total Selenium	4061728		0.036	0.032	11.8%	< 0.002	101%	70%	130%	88%	80%	120%	87%	70%	130%	
Total Silver	4061728		0.0006	0.0005	18.2%	< 0.0001	100%	70%	130%	87%	80%	120%	86%	70%	130%	
Total Strontium	4061728		10.2	10.8	5.7%	< 0.005	104%	70%	130%	94%	80%	120%	74%	70%	130%	
Total Thallium	4061728		<0.0003	<0.0003	NA	< 0.0003	107%	70%	130%	96%	80%	120%	87%	70%	130%	
Total Tin	4061728		<0.002	<0.002	NA	< 0.002	104%	70%	130%	99%	80%	120%	101%	70%	130%	
Total Titanium	4061728		0.013	0.020	NA	< 0.010	109%	70%	130%	92%	80%	120%	119%	70%	130%	
Total Tungsten	4061728		<0.010	<0.010	NA	< 0.010	101%	70%	130%	98%	80%	120%	103%	70%	130%	
Total Uranium	4061728		<0.002	<0.002	NA	< 0.002	96%	70%	130%	93%	80%	120%	96%	70%	130%	
Total Vanadium	4061728		0.004	0.005	NA	< 0.002	103%	70%	130%	94%	80%	120%	104%	70%	130%	
Total Zinc	4061728		0.023	0.022	NA	< 0.020	99%	70%	130%	97%	80%	120%	92%	70%	130%	
Total Zirconium	4061728		<0.004	<0.004	NA	< 0.004	98%	70%	130%	100%	80%	120%	101%	70%	130%	

Comments: NA signifies Not Applicable.  
 If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.  
 Matrix spike: Spike level < native concentration. Matrix spike acceptance limits do not apply.

Certified By:



## Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 22T916870

PROJECT: 20141301

ATTENTION TO: Joel Gopaul

SAMPLING SITE: South Furgus

SAMPLED BY: AGB

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Saturation pH (Calculated)		SM 2320 B	CALCULATION
Langelier Index (Calculated)		SM 2330B	CALCULATION
Hardness (as CaCO <sub>3</sub> ) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684, ON MOECC E3139, SM 2540C, D	BALANCE
Alkalinity (as CaCO <sub>3</sub> )	INOR-93-6000	Modified from SM 2320 B	PC TITRATE
Bicarbonate (as CaCO <sub>3</sub> )	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Carbonate (as CaCO <sub>3</sub> )	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Hydroxide (as CaCO <sub>3</sub> )	INOR-93-6000	modified from SM 2320 B	PC TITRATE
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Bromide	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ortho Phosphate as P	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	modified from SM 4500-NH <sub>3</sub> H	LACHAT FIA
Ammonia-Un-ionized (Calculated)		MOE REFERENCE, PWQOs Tab 2	CALCULATION
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Total Organic Carbon	INOR-93-6049	modified from SM 5310 B	SHIMADZU CARBON ANALYZER
True Colour	INOR-93-6074	modified from SM 2120 B	LACHAT FIA
Turbidity	INOR-93-6044	modified from SM 2130 B	NEPHELOMETER
Total Calcium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Magnesium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Potassium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Sodium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Aluminum-dissolved	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Beryllium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS



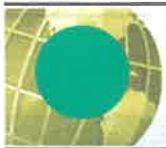


## Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.  
 PROJECT: 20141301  
 SAMPLING SITE: South Furgus

AGAT WORK ORDER: 22T916870  
 ATTENTION TO: Joel Gopaul  
 SAMPLED BY: AGB

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Dissolved Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Strontium	INOR-93-6003	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Thallium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tin	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Titanium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tungsten	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Uranium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Vanadium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zirconium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Lab Filtration Aluminum Dissolved	SR-78-9001		FILTRATION



### Laboratory Use Only

Work Order #: 22 T916870

Cooler Quantity: 1 large  
Arrival Temperatures: 6.2 16.9 7-1

Custody Seal Intact:  Yes  No  N/A  
Notes: Bagged Ice

## Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

### Report Information:

Company: Golder  
Contact: Joel Gopaul  
Address: 100 Scotia Cr  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Reports to be sent to:  
1. Email: Joel.Gopaul@golder.com  
2. Email: Aaron.Beard@golder.com

### Regulatory Requirements:

(Please check all applicable boxes)

Regulation 153/04  Excess Soils R406  Sewer Use  
 Ind/Com  Sanitary  Storm  
 Res/Park  Agriculture  Region  
 CCME  Prov. Water Quality Objectives (PWQO)  
 Other  
Soil Texture (Check One)  Coarse  Fine

### Turnaround Time (TAT) Required:

Regular TAT  5 to 7 Business Days  
Rush TAT (Rush Surcharges Apply)  
 3 Business Days  2 Business Days  Next Business Day  
OR Date Required (Rush Surcharges May Apply): \_\_\_\_\_

### Project Information:

Project: 20141301  
Site Location: South Fergus  
Sampled By: AGB  
AGAT Quote #: \_\_\_\_\_ PO: \_\_\_\_\_  
Please note: If quotation number is not provided, client will be billed full price for analysis.

### Is this submission for a Record of Site Condition?

Yes  No

### Report Guideline on Certificate of Analysis

Yes  No

Please provide prior notification for rush TAT  
\*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

### Invoice Information:

Company: Golder Bill To Same: Yes  No   
Contact: Joel Gopaul  
Address: \_\_\_\_\_  
Email: Joel.Gopaul@golder.com

### Sample Matrix Legend

**B** Biota  
**GW** Ground Water  
**O** Oil  
**P** Paint  
**S** Soil  
**SD** Sediment  
**SW** Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/Special Instructions	Y/N	Field Filtered - Metals, Hg, CrVI, DOC	Metals & Inorganics	Metals - CrVI, Hg, HWSB	BTEX, F1-F4 PHOS	PAHs	PCBs	VOC	Aroclors	Landfill Disposal Characterization TCLP: TCLP, M&I, VOCs, ABNS, B(a)P, PCBs	Excess Soils SPLP Rainwater Leach	SPLP: Metals, VOCs, SVOCs	Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Corrosivity: include Moisture, Sulphide	Potentially Hazardous or High Concentration (Y/N)	
20-4	05/07/22	13:00	10	GW	dissolved Al, Hg	Y															
20-85	05/07/22	16:30	10	GW	"	Y															
20-105	05/07/22	15:00	10	GW	"	Y															

Samples Relinquished By (Print Name and Sign): <u>Aaron Beard</u>	Date: <u>06/07/22</u>	Time: <u>9:00</u>	Samples Received By (Print Name and Sign): <u>Anthony D... D...</u>	Date: _____	Time: _____
Samples Relinquished By (Print Name and Sign): _____	Date: _____	Time: _____	Samples Received By (Print Name and Sign): _____	Date: _____	Time: _____
Samples Relinquished By (Print Name and Sign): _____	Date: _____	Time: _____	Samples Received By (Print Name and Sign): _____	Date: _____	Time: _____

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