Final Preliminary Hydrogeological Investigation

Upper West Side Draft Plan of Industrial Sub-Division
Twenty Road West,
Hamilton, Ontario

Client:
Corbett Land Strategies Inc.

Project Number:
BRM-00801363—B0

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1 Introduction

1.1 Project Description

EXP Services Inc. (EXP) was retained by Corbett Land Strategies Inc. to prepare a Preliminary Hydrogeological Investigation for the property located at Twenty Road West, Hamilton, Ontario (hereinafter referred to as the 'Site'). It is EXP's understanding that the subject lands occupy approximately 961 acres (388.9 ha) in the area bounded by Twenty Road West to the north, Upper James Street to the East, Dickenson Road West to the south, and by Glancaster Road to the West. Figure 1 presents the Site location plan.

The Preliminary Hydrogeological Investigation is required to evaluate the local hydrogeological setting at the Site and to provide recommendations regarding construction dewatering/depressurization in support of the proposed industrial development.

The current Preliminary Hydrogeological Investigation is completed in conjunction with a Preliminary Geotechnical Investigation (EXP, 2018) reported separately.

1.2 Project Objectives

The main objectives of the Preliminary Hydrogeological Investigation are to:

- Establish the local hydrogeological settings within proposed road alignment, SWM ponds and overall Site;
- Assess preliminary construction dewatering/depressurization;
- Asses groundwater quality; and
- Prepare a Preliminary Hydrogeological Investigation Report.

1.3 Scope of Work

To achieve the study objectives, EXP completed the following scope of work:

- Review available geological and hydrogeological information for the Site;
- Install five (5) nested (five (5) shallow and five (5) deep) monitoring well pairs to approximately 6 and 12 mbgs at the possible locations of the SWM ponds.
- Install four (4) intermediate monitoring wells to approximately 8 mbgs along the road alignment;
- Install eight (8) shallow monitoring wells to approximately 6 mbgs distributed across the Site;
- All wells will be installed with 50 mm diameter wells in geotechnical boreholes;
- Develop and conduct Single Well Response Tests (SWRTs) on all monitoring wells to evaluate hydraulic properties of the saturated soils at the Site;
- Complete two (2) rounds of groundwater level measurements in all monitoring wells;
- Collect one (1) groundwater sample from a shallow monitoring well for laboratory testing of the City of Hamilton Sanitary and Storm Sewer Use By-Law parameters, and general chemistry;
- Evaluate the information collected during the field investigation program, including borehole geological information, SWRT results, groundwater level measurements and groundwater water quality;

- Prepare site plans, cross sections, geological mapping, and groundwater contour mapping for the Site;
- Assess vertical hydraulic gradients between shallow and deep monitoring wells;
- Estimate construction dewatering flow rates for the proposed site plan configuration;
- Prepare a Preliminary Hydrogeological Investigation Report.

1.4 Review of Previous Reports

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

- ***Exp*** *(June 8, 2018). DRAFT Preliminary Geotechnical Investigation, Upper West Side Draft Plan of Industrial Sub-division, Twenty Road West, Hamilton Ontario.*

Relevant information from the referred study was reviewed and utilized for the current Preliminary Hydrogeological Investigation.

2 Hydrogeological Setting

2.1 Regional Setting

2.1.1 Regional Physiography

The Site is located between the Niagara Escarpment and Lake Erie, approximately 5.5 km south of the Niagara Escarpment and 9.0 km south of the Hamilton Harbor. The physiographic region is known as the Haldimand Clay Plain, and the physiographic landform is described as the Clay Plains (Chapman and Putnam, 2007). These clay plains were deposited during the time of Lake Warren (Chapman & Putnam, 2007), around 12,700 years before present. Although the area was all submerged in Lake Warren the underlying till was not all buried by stratified clay. The till comes to surface on the low ridges of the Fort Erie Moraine (Figure 2).

2.1.2 Regional Geology and Hydrogeology

The Site consists predominantly of fine-textured glaciolacustrine deposits. (Ministry of Northern Development and Mines, 2012). The surficial geology for the Site and surrounding areas is shown on Figure 3.

The bedrock in this region consists of dolostone of the Guelph Formation of Lower Silurian Age (Ontario Geological Survey, 2011). The dolostone is sucrosic, fossiliferous, locally biohermal; and locally bituminous (Eramosa Mb). Regions of carbonate rock were identified as susceptible to karstification, and were mapped as potential karst areas beneath the entire Site.

Regional groundwater flow across the area is expected to be generally directed to the north, towards Lake Ontario. However, the flow pattern in the bedrock aquifer is anticipated to be complex due to the influence of karst. Locally, shallow groundwater discharges into Twenty Mile Creek. A portion of the shallow groundwater is interpreted to seep downward into the regional aquifer system. Changes in topography and/or soils, as well as the presence of surface water features and/or existing subsurface infrastructure may influence the regional groundwater flow path. Fragmented recharge areas for the carbonate aquifers of the Niagara Escarpment are presently under investigation by Burt & Mulligan (2017) and Priebe at al. (2018).

2.1.3 Existing Water Well Survey

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

The MOECC WWR database indicated total of ninety-seven (97) WWRs in the 500 m zone. These included seven (7) records of wells reportedly located on-site and ninety (90) off-site well records. All the on-site well records are reported as domestic water supply wells, observation/monitoring wells, and abandoned or not used. The domestic wells were reportedly installed from 1949 to 1989, with water found at depths of between 5.1 and 29.4 m.

Reported depth to water (where available) ranged from approximately 2 to 42 mbgs.

It is anticipated that majority of properties in the area are provided with municipal water and sewer services. A well survey is recommended to very the status of the on and off-site water supply wells.

The locations of the MOECC WWRs within 500 m of the Site are shown on Figure 4. A summary of the available MOECC WWRs is included in Appendix A.

2.2 Site Setting

2.2.1 Site Topography

The Site is located within the jurisdiction of the City of Hamilton, at the southeastern fringe of the currently urbanized area, and is surrounded by agricultural fields. The grading of the Site gently slopes east-northeast towards Twenty Mile Creek, with elevations between 234 and 222 masl (borehole elevations). Just south of Dickinson Rd W lies the John C. Munro Hamilton International Airport.

2.2.2 Local Surface Water Features

The Site is located at the headwaters of the Upper Twenty Mile Creek. A series of unnamed, SW to NE striking, streams drain the Site. The flow direction is from a moraine ridge towards Twenty Mile Creek, which eventually discharges into Lake Ontario. In the central portion of the Site there are two smaller ponds along two streams. Twenty Mile Creek flows parallel to the Niagara Escarpment, and is located about 360 m east-northeast of the Site. Lake Ontario is located approximately 14 km northeast of the Site.

Within the Site, patches of MNR evaluated wetlands were delineated about 245 m NE of Dickenson Rd E, Niagara Peninsula Conservation Authority (2006). Several wooded areas were also mapped on-site. Off-site, the entire length of Twenty Mile Creek has been designated as a provincially significant wetland. This wetland is protected under the Greenbelt Act (2005) and it has been designated by the Ministry of Natural Resources as an area of high biodiversity for aquatic and related terrestrial functions. The Rymal Road Wetland Complex is a significant natural area north of the Site, and has been designated as a locally significant wetland.

2.2.3 Wellhead Protection Areas

The Site does not lie within delineated Wellhead Protection Areas (WHPAs). As shown in Figure 5. WHPAs were reviewed for the surrounding source water protection areas for rounding areas of Halton, Hamilton, Grand River and Niagara Conservation Authorities. Lynden well #1 is outside of Twenty Mile Creek watershed, and more than 15.0 km away/ east-northeast from the Site.

2.2.4 Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas (SGRAs) were reviewed for the surrounding source water protection areas for rounding areas of Halton, Hamilton, Grand River and Niagara Conservation Authorities (Figure 6). As seen in Figure 6, most of the Site lies within SGRAs with vulnerability scores of 4 and 6.

2.2.5 Local Geology and Hydrogeology

Based on the results of the Geotechnical Investigation (**exp** 2018) and the current Preliminary Hydrogeological Investigation, a brief description of the general surficial geology at the Site from top to

bottom, is summarized in the following sections. Borehole completion depths ranged between 6.6 and 12.7 mbgs during the current investigations conducted at the Site. The Preliminary Geotechnical and this Hydrogeological Investigations included a total of thirty-three (33) boreholes advanced at the Site.

A brief description of the soil profiles, in order of depth, follows:

Topsoil

Topsoil was encountered at all borehole locations. The topsoil thicknesses ranged from approximately 100 mm to 175 mm. It should be noted that the topsoil measurements were carried out at the borehole locations only and were found to be variable. A more detailed analysis (involving test pits) is recommended to accurately quantify the amount of topsoil to be removed for construction purposes. Consequently, topsoil quantities should not be established from the information provided at the borehole locations only.

Fill

Fill material consisting of silty clay or silt was encountered at Boreholes BH-02 to BH-04, BH-06 to BH-12, BH-14 and BH-15 below the surficial topsoil and extending to a depth of less than 1.0 m below grade. The material classified as fill may be reworked native soil which was disturbed during the agricultural operations at the Site. The fill was brown or dark brown, in a moist to very moist state, and generally noted to contain rootlets. The moisture content of the fill ranged from 21 to 32 percent of dry mass.

Silt to Sand

Native soils ranging in grain size from silt to silty sand to sand were encountered at all borehole locations. The silts and sands contained varying amounts of clay and gravel and were brown, typically becoming grey below depths of approximately 3 m to 5 m. Silt was encountered beneath the fill in BH-01 to BH-07, BH-09 to BH-11, BH-14 and BH15, underlain by silty sand in BH-01, BH-04 and BH-06; silt carried down to the termination depth of boreholes BH-03, BH-07, BH-08 and BH-10 to BH-14. Silty sand to sand was encountered beneath the fill in Borehole BH-13, in turn underlain by silt, and below silty clay in BH-05 and BH-15.

The soils were in a moist to wet state with moisture contents ranging from 9 to 25 percent of dry mass. Based on SPT N values ranging from 2 to greater than 100 blows per 305 mm of penetration, the soils were classified as very loose to very dense in compactness condition but were more typically in a compact to dense state.

Based on five (5) grain size analyses, the soils ranged from 35 to 86 percent silt, 4 to 63 percent sand, and 2 to 20 percent clay

Silty Clay

Native silty clay strata were encountered at BH-1, BH-2, BH-4, BH-5, BH-8, BH-9, BH-12, and BH-15 at widely varying depths and with variable thicknesses. The silty clay was generally noted to contain trace to some sand and occasional gravel with pockets or layers of sand and silt materials noted at Borehole BH-15. The silty clay was brown or grey and in a damp to wet state with moisture contents ranging from 11 to 32 percent of dry mass. Based on SPT N values ranging from 3 to 50 blows per 305 mm of penetration and undrained shear strengths from pocket penetrometer readings of 25 to greater than 225 kPa, the silty clay is classified as soft to hard in consistency but was more typically very stiff to hard.

Based on two (2) grain size analyses, the silty clay consisted of 53 to 69 percent silt, 25 to 26 percent clay, 5 to 18 percent sand, and 0 to 4 percent gravel. The silty clay was of low plasticity based on two (2) Atterberg Limits tests.

The borehole/monitoring well locations are shown on Figure 7. Geological cross-sections were generated based on the available borehole logs completed as part of the current investigations and shown on Figure 8 (Cross-Section A-A'), and Figure 9 (Cross-Section B-B'). Borehole logs used to generate the cross-sections are provided in Appendix B.

3 Background

3.1 Monitoring Well Details

As part of the current investigations, thirty-three (33) boreholes were advanced at the Site. Twenty-two (22) of which were completed with monitoring well installations (BH1, BH5, BH7, BH8, BH9, BH11, BH12, BH13, BH15, BH17, BH18, BH25, BH29S/D, BH30S/D, BH31S/D, BH32S/D and BH33S/D). All on-site wells were completed as 50 mm diameter monitoring wells to depths ranging from 6.1 to 12.7 mbgs. The monitoring wells have 3 m long screens and above ground monument protective casings.

The monitoring well locations are shown on Figure 4. The borehole logs for each monitoring well of this investigation are presented in Appendix B. A geodetic elevation survey was completed as part of exp's current investigation.

3.2 Water Level Monitoring

Static water levels were recorded on various dates in June 2018, for the current investigation. A summary of all water level monitoring data to date as it relates to the elevation survey is summarized in Appendix C.

The groundwater elevation in the shallow wells ranged from 221.36 masl (0.63 m bgs in BH/WW 32-S on June 14, 2018) to 234.96 masl (0.34 m bgs in BH/MW 25 on June 5, 2018).

The groundwater elevation in the deep/intermediate wells ranged from 221.26 masl (0.73 m bgs in BH/WW 32-D on June 14, 2018) to 237.15 masl (0.78 mbgs in BH/MW 1 on June 5, 2018).

The nested monitoring wells all indicated upward vertical gradients except for BH/MW 32-S/D and BH/MW 33-S/D.

Several monitoring wells had artesian conditions during the monitoring events, including BH/MW 11, BH/MW 13, BH/MW 18, BH/MW 29-S, BHMW 29-D, BH/MW 30-D, and BH/MW 31-D. These wells exhibited water levels up to 2.8 m above ground surface.

Figure 10 presents the interpreted shallow groundwater contour map for the overburden flow system as measured on June 13/14, 2018. Based on the water level measurements obtained, the inferred direction of shallow groundwater flow across the Site is interpreted to be easterly, towards the Upper Twenty Mile Creek.

Figure 11 depicts the deduced deep groundwater contour map for the deep aquifer flow system as measured on June 13/14, 2018. Based on the measured water levels, the inferred flow direction of deep groundwater across the Site is concluded to be east, also towards the Upper Twenty Mile Creek.

It should be noted that groundwater levels are subject to seasonal fluctuations and can vary in response to prevailing climate conditions; this may also affect the direction of shallow groundwater flow.

3.3 Hydraulic Conductivity Testing

Twenty-two (22) Single Well Response Tests (SWRTs) were completed during the current investigation. The SWRTs (rising and falling head tests) were completed at all monitoring wells beginning on June 13, 2018. The SWRTs were completed to estimate the hydraulic conductivity (K) of the soils at the well screen depths.

The static water level within each monitoring well was measured prior to the start of testing. In advance of performing SWRTs, each monitoring well underwent development to remove fines introduced into the screens following construction. The development process involved purging of the monitoring wells to induce the flow of fresh formation water through the screen. Each monitoring well was permitted to fully recover prior to performing SWRTs.

Hydraulic conductivity values were calculated from the SWRT data as per the Hvorslev's solution included in the AQTESOLV V.4.50.002 software package. The semi-log plots for normalized head versus time analytical results (h/h_0) and the standard operating procedures (SOP) for SWRTs are included in Appendix D.

A summary of the hydraulic conductivity (K) values estimated from the SWRTs are provided in Table 3-1.

Table 3-1: Summary of Hydraulic Conductivity Testing

Monitoring Well ID	Well Depth (mbgs)	Screened Interval (mbgs)	Formation Screened	Estimated Hydraulic Conductivity (m/s)
BH/MW 1	7.6	4.6 – 7.6	Silt	1.1×10^{-8}
BH/MW 5	6.1	4.6 – 6.1	Silt	6.2×10^{-7}
BH/MW 7	7.7	4.7 – 7.7	Silt	6.8×10^{-8}
BH/MW 8	8.1	5.1 – 8.1	Sandy Silt to Silty Sand, Silty Clay	7.3×10^{-8}
BH/MW 9	6.2	4.7 – 6.2	Silt	9.3×10^{-8}
BH/MW 11	8.1	6.7 – 8.1	Silty Sand to Sand	1.4×10^{-5}
BH/MW 12	6.1	4.6 – 6.1	Silt, Silty Sand to Sandy Silt	4.6×10^{-6}
BH/MW 13	6.1	4.6 – 6.1	Silt	1.8×10^{-8}
BH/MW 15	6.6	3.6 – 6.6	Silt, Silty Clay	4.1×10^{-8}
BH/MW 17	6.2	4.7 – 6.2	Silt	3.6×10^{-8}
BH/MW 18	6.2	4.7 – 6.2	Silty Sand to Sandy Silt	1.0×10^{-6}
BH/MW 25	6.2	4.7 – 6.2	Silt	1.8×10^{-6}
BH/MW 29-S	6.2	4.7 – 6.2	Sandy Silt to Sandy Silt	1.8×10^{-6}
BH/MW 29-D	12.2	10.7– 12.2	Silty Sand to Sandy Silt	2.4×10^{-5}
BH/MW 30-S	6.2	4.7 – 6.2	Silt	1.2×10^{-8}
BH/MW 30-D	12.2	10.7 – 12.2	Silty Sand to Sandy Silt	4.9×10^{-6}
BH/MW 31-S	6.2	4.7 – 6.2	Silty Clay	7.4×10^{-8}
BH/MW 31-D	10.3	8.8 – 10.3	Silty Clay, Silty Sand	1.3×10^{-6}
BH/MW 32-S	6.2	4.7 – 6.2	Silty Clay	9.1×10^{-8}
BH/MW 32-D	12.2	10.7 – 12.2	Silty Clay	5.5×10^{-8}
BH/MW 33-S	6.2	4.7 – 6.2	Silt	9.2×10^{-8}
BH/MW 33-D	12.2	10.7 – 12.2	Silty Sand	3.9×10^{-7}
			Highest K estimate	2.4×10^{-5}
			Geometric Mean Estimated of Sand, Silty Sand to Sandy Silt Deposits	3.8×10^{-6}

Monitoring Well ID	Well Depth (mbgs)	Screened Interval (mbgs)	Formation Screened	Estimated Hydraulic Conductivity (m/s)
Geometric Mean Estimated of Silt and Clay Deposits				7.8×10^{-8}

Note: Monitoring well installation details were obtained from the borehole logs (Appendix B).

SWRTs provide estimates of K for the geological formation in the immediate media zone surrounding the well screens. As shown in Table 3-1 the highest measured K estimate is 2.4×10^{-5} m/s and the geometric mean K value for the Sandy deposits is calculated as 3.8×10^{-6} m/s and for silts and clays 7.8×10^{-8} m/sec.

3.4 Groundwater Quality

To assess the suitability for discharge of pumped groundwater to the City of Hamilton's Sanitary and Strom Sewer during dewatering activities, one (1) groundwater sample was collected from monitoring well BH/MW29-D (artesian well) on June 14, 2018 using a peristaltic pump. Prior to collecting the sample, approximately three (3) standing well volumes of groundwater were purged from the well.

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

The laboratory CofA shows that all parameters were detected at concentrations below both the Sanitary and Storm Sewer Use By-Law criteria.

When compared to Provincial Water Quality Objectives (PWQO), the concentration of Total Iron was above the criteria. It is noted that the detection limits of certain semi-volatiles, metals and pesticides and herbicides were above the PWQO limits.

Analytical results are provided in Appendix E.

It should be noted that, during construction, it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed the By-Law limits. Therefore, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to storm sewer, if applicable. The specifications of the treatment system will need to be adjusted to the water quality by the treatment contractor/process engineer.

Approval to discharge water to municipal sewer system during construction will be required from the City of Hamilton prior to any discharge.

4 Preliminary Safe Excavation Depth (SED) Estimates

4.1 Methodology

The presence of confined/semi confined water bearing deposits underlying the silty clay, may cause, under certain conditions, basal heave or base instability during excavations. The potential for basal heave during excavation activities exists, if there is an insufficient weight or downward pressure from the overlying overburden onto the confined aquifer and granular interlayers. As a result, SEDs were estimated for the Site.

The SEDs at the Site were estimated as per the general guidelines provided in the Canadian Foundation Engineering Manual (CFEM), 4th Edition (2006). It is noted that the IMED is referred to as the Safe Excavation Depth (SED) in the CFEM (2006). The CFEM (2006) recommends maintaining a minimum of a 1.4 factor of safety when estimating the safe excavation depths in an area having base heave potential. Therefore, for estimating SEDs for the Site, a safety factor of 1.4 was used.

The SED equation is described as follows:

$$h = (F_s \times \gamma_\omega \times h_\omega)/\gamma_s$$

Where:

h: Remaining cover thickness above (confined) aquifer top (m)

Fs: Factor of Safety (1.4)

γ_ω: Unit weight of water (9.81 KN/m^3)

h_ω: Piezometric level above aquifer top (m)

γ_s: Unit weight of soil cover (21 KN/m^3)

The SEDs were estimated at each monitoring well location, for boreholes where granular deposits (sand, silts) and where pressurized conditions were observed, as shown in Appendix F. The SED ranged from ground surface to 2.4 mbgs. The safe excavation elevation at the BH locations ranged from 221.1 to 236.9 masl and SED contours are shown on Figure 12 enclosed. SED estimates should be revisited upon final design.

4.2 Safe Excavation Depth and Implications on Development

Although the site plan details were not available at the time of writing this report, it's our understanding that the that development includes a mixed-use commercial, employment blocks, construction of five (5) SWM ponds, and installation of underground services.

The following must be considered for the proposed development:

Temporary Excavation

Temporary excavations below the SED are feasible for service installations, provided the areas are depressurized during construction and backfilled to restore pre-development conditions (i.e. replacement of the confining cap) and potential settlement monitoring.

Permanent Excavation

Permanent excavations below the SED for the SWM ponds would require continuous depressurization of the underlying deposits. However, depressurization is not a suitable long-term solution. The SWM ponds should be constructed above the SED.

Permanent excavations below the SED for any underground structures (basements) would require continuous depressurization of the underlying deposits (or impermeable structures of sufficient weight). However, depressurization is not a suitable long-term solution. The basements should be constructed above the SED.

It should be noted that the SED at BH/MW18 and BHM 29-D are at ground surface. Consideration should be given to fill this area prior to any development.

5 Construction Dewatering Assessment

5.1 Construction Dewatering

Although the site plan details were not available at the time of writing this report, it's our understanding that the development will include mixed-use commercial, employment blocks, construction of five (5) SWM ponds, and installation of underground services.

The groundwater elevation in the shallow wells ranged from 221.36 masl (0.63 m bgs in BH/WW 32-S on June 14, 2018) to 234.96 masl (0.34 m bgs in BH/MW 25 on June 5, 2018).

The groundwater elevation in the deep/intermediate wells ranged from 221.26 masl (0.73 m bgs in BH/WW 32-D on June 14, 2018) to 237.15 masl (0.78 mbgs in BH/MW 1 on June 5, 2018).

Several monitoring wells had artesian conditions during the monitoring events, including BH/MW 11, BH/MW 13, BH/MW 18, BH/MW 29-S, BHMW 29-D, BH/MW 30-D, and BH/MW 31-D. These wells exhibited water levels up to 2.8 m above ground surface.

Artesian conditions recorded at the Site are expected to be associated with the silty sand layer encountered at numerous monitoring wells, that is confined by the overlying silty clay.

The main soil formations at the Site are silty sand/sandy silt and clayey silt/silty clay. The SWRT test results show that the hydraulic conductivity values for the shallow soil formations at the Site with the highest measured K estimate for sandy deposit is 2.4 $x10^{-5}$ m/s and the geometric mean K of sandy deposits is estimated as 7.8 x 10^{-8} m/s.

The soil types, groundwater elevations and estimated hydraulic conductivity values for the Site suggests that if the construction remains above the SED elevations, this would limit the dewatering effort. However, if construction is below the SED, construction dewatering will be required to depressurize the underlying aquifer to prevent basal heave.

Artesian groundwater conditions were encountered during the groundwater monitoring events at the Site. This may bring excavation depth restrictions, in addition to the groundwater management requirements during the construction phase of the project. During construction groundwater levels should be lowered to below the excavation bottom.

Based on the artesian conditions encountered and site, seasonal and continuous groundwater monitoring is recommended to support final designs. SED estimates and dewatering approaches should be revisited upon final design.

When site plan details become available, construction and long-term dewatering rates can be estimated. Due to the confined and artesian conditions we recommend keeping as much of the design and construction above the SED as possible, otherwise the underlying confined aquifer will need to be depressurized to limit the risk of basal heave.

6 Conclusions and Recommendations

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

- The Site is located between the Niagara Escarpment and Lake Erie, within a physiographic region known as the Haldimand Clay Plain, and a physiographic landform described as the Clay Plains (Chapman and Putnam, 2007).
- Regional groundwater flow across the area is expected to be generally directed to the north, towards Lake Ontario. However, the flow pattern in the bedrock aquifer is anticipated to be complex due to the influence of karst. Locally, shallow groundwater discharges into Twenty Mile Creek.
- It is anticipated that majority of properties in the area are provided with municipal water and sewer services. A well survey is recommended to very the status of the on and off-site water supply wells.
- The grading of the Site gently slopes east-northeast towards Twenty Mile Creek, with elevations between 234 and 222 masl.
- The Site is located at the headwaters of the Upper Twenty Mile Creek. A series of unnamed, SW to NE striking, streams drain the Site. The flow direction is from a moraine ridge towards Twenty Mile Creek, which eventually discharges into Lake Ontario. In the central portion of the Site there are two smaller ponds along two streams. Twenty Mile Creek flows parallel to the Niagara Escarpment, and is located about 360 m east-northeast of the Site. Lake Ontario is located approximately 14 km northeast of the Site.
- Within the Site, patches of MNR evaluated wetlands were delineated about 245 m NE of Dickenson Rd E, Niagara Peninsula Conservation Authority (2006). Several wooded areas were also mapped on-site. Off-site, the entire length of Twenty Mile Creek has been designated as a provincially significant wetland. This wetland is protected under the Greenbelt Act (2005) and it has been designated by the Ministry of Natural Resources as an area of high biodiversity for aquatic and related terrestrial functions. The Rymal Road Wetland Complex is a significant natural area north of the Site, and has been designated as a locally significant wetland.
- The Site does not lie within delineated Wellhead Protection Areas (WHPAs).
- Significant Groundwater Recharge Areas (SGRAs) were reviewed for the surrounding source water protection areas for rounding areas of Halton, Hamilton, Grand River and Niagara Conservation Authorities (Figure 6). As seen in Figure 6, most of the Site lies within SGRAs with vulnerability scores of 4 and 6. In light of artesian conditions in certain areas of the site, these areas are not likely Significant Groundwater Recharge Areas.
- The groundwater elevation in the shallow wells ranged from 221.36 masl (0.63 m bgs in BH/WW 32-S on June 14, 2018) to 234.96 masl (0.34 m bgs in BH/MW 25 on June 5, 2018).
- The groundwater elevation in the deep/intermediate wells ranged from 221.26 masl (0.73 m bgs in BH/WW 32-D on June 14, 2018) to 237.15 masl (0.78 mbgs in BH/MW 1 on June 5, 2018). Seasonal and continuous groundwater level monitoring is recommended.

- The nested monitoring wells all indicated upward vertical gradients except for BH/MW 32-S/D and BH/MW 33-S/D.
- Seven (7) monitoring wells had artisian conditions during the monitoring events, including BH/MW 11, BH/MW 13, BH/MW 18, BH/MW 29-S, BHMW 29-D, BH/MW 30-D, and BH/MW 31-D. These wells exhibited water levels up to 2.8 m above ground surface.
- It is expected that groundwater in the silty sand bed encountered at depth is confined.
- The highest measured K estimate is 2.4 $x10^{-5}$ m/s and the geometric mean K value for the sandy deposit is 3.8 x 10^{-6} m/s and for the silt and clay deposits 7.8 x 10^{-8} m/sec.
- The laboratory CofA shows that all parameters were detected at concentrations below both the Sanitary and Storm Sewer Use By-Law criteria.
- When compared to Provincial Water Quality Objectives (PWQO), the concentration of Total Iron was above the criteria. It is noted that the detection limits of certain semi-volatiles, metals and pesticides and herbicides were above the PWQO limits.
- Due to the confined and artisan conditions we recommend keeping as much of the design and construction above the SED as possible, otherwise the underlying aquifer will need to be depressurized to limit the risk of basal heave. The SED at BH/MW 18 and BHM 29-D are at ground surface. Consideration should be given to fill this area prior to any development. SED estimates should be revisited upon final design.
- Once design details are available, construction dewatering flow rates and potential impact can be evaluated.

7 Limitations

This report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the study area. The conclusions and recommendations presented within this report reflect Site conditions existing at the time of the assessment. **exp** must be contacted immediately if any unforeseen Site conditions are experienced during the dewatering activities. This will allow **exp** to review the new findings and provide appropriate recommendations to allow the construction to proceed in a timely and cost effective manner.

Our undertaking at **exp**, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience/engineering profession. No other warranty or representation, either expressed or implied, is included or intended in this report.

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We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact this office.

Sincerely,

EXP Services Inc.

Ryan Smith, M.Sc., P. Geo
Senior Hydrogeologist
Environmental Services

Reinhard Zapata, PH.D, P. Geo
Senior Hydrogeologist
Environmental Services

Francois Chartier, M.Sc., P. Geo
Head of Hydrogeology Group
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8 References

Burt, A.K. and Mulligan, R.P.M (2017). Late Glacial Ontario Lobe Ice on the Niagara Peninsula: How far did it go? Joint 52nd Northeastern Annual Section / 51st North-Central Annual Section Meeting – 2017. Paper No. 45-3.

Chapman, L.J., and Putnam D.F. (2007); The Physiography of Southern Ontario; Ontario Geological Survey, Miscellaneous Release – Data 228 ISBN 978-1-4249-5158-1

Ministry of Northern Development and Mines (May, 2012). OGS Earth. Retrieved from http://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth.

Ontario Geological Survey; Bedrock Geology of Ontario, South Sheet; OGS Map 2544; 1:1,000,000; 1991

Hydrogeological Assessment Submissions, Conservation Authority Guidelines for Development Applications, June 2013 Cashman and Preene (2013) Groundwater Lowering in Construction, 2nd Edition.

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

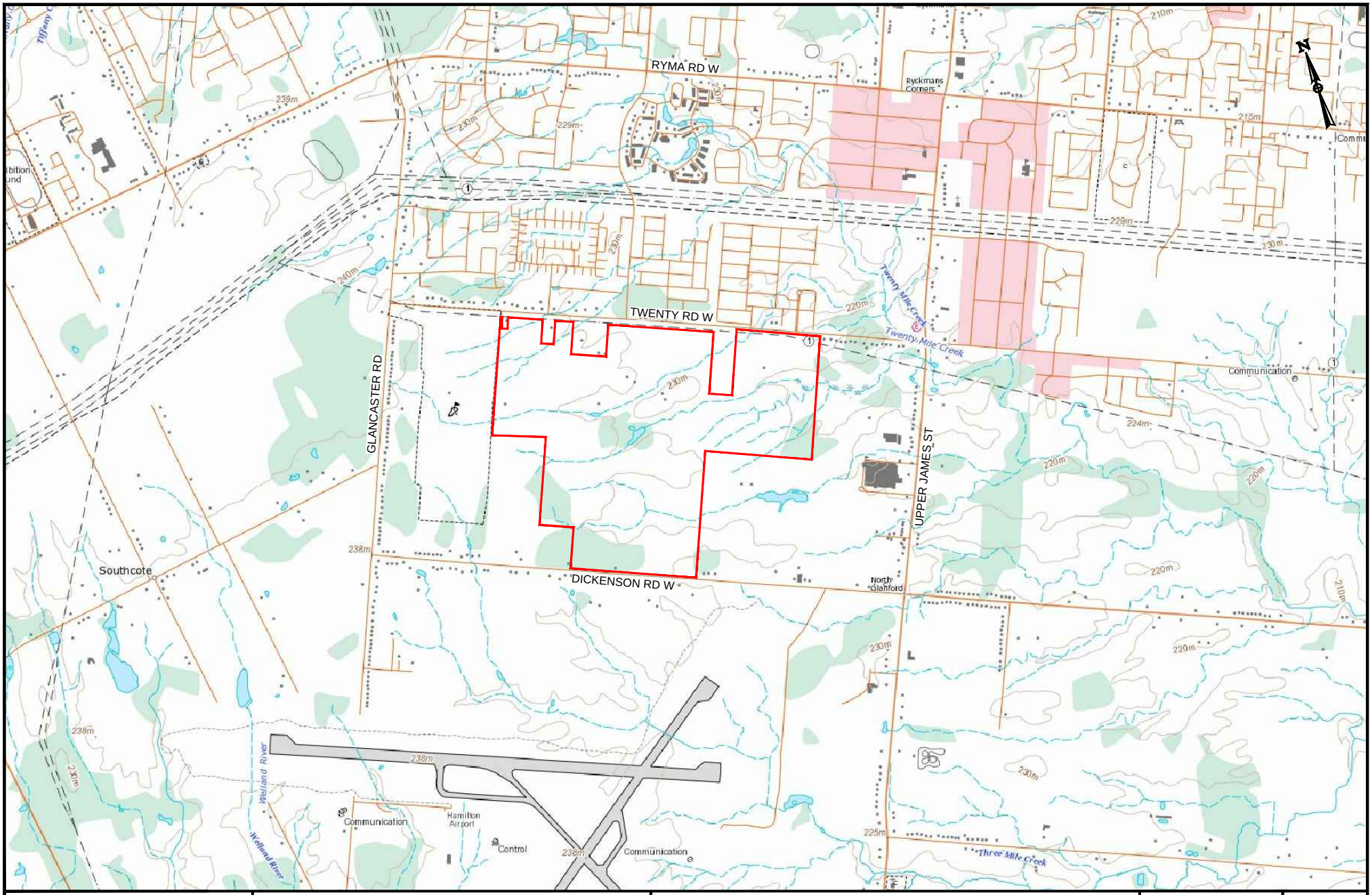
Ontario Ministry of the Environment (April, 2008). Technical Guidance Document for Hydrogeological Studies in Support of Category 3 Applications for Permit to Take Water.

Priebe, E.H; Frape, S.K.; Jackson, R.E.; Rudolph, D.L.; Burt, A.K. (2018). Chemical and isotopic evidence of fragmented recharge areas for the carbonate aquifers of the Niagara Escarpment. In Russell, H A J; Ford, D; Priebe, E H; Holysh, S; (2018). Regional-scale groundwater geoscience in southern Ontario: an Ontario Geological Survey, Geological Survey of Canada, and Conservation Ontario geoscientists open house, Geological Survey of Canada, Open File 8363.

Somerville, S. H. (1986). Control of Groundwater for Temporary Works. Construction Industry Research and Information Association.

Exp Services Inc. (June 8, 2018). DRAFT Preliminary Geotechnical Investigation, Upper West Side Draft Plan of Industrial Sub-division, Twenty Road West, Hamilton Ontario.

Figures



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LEGEND:

APPROXIMATE SITE BOUNDARY

SCALE

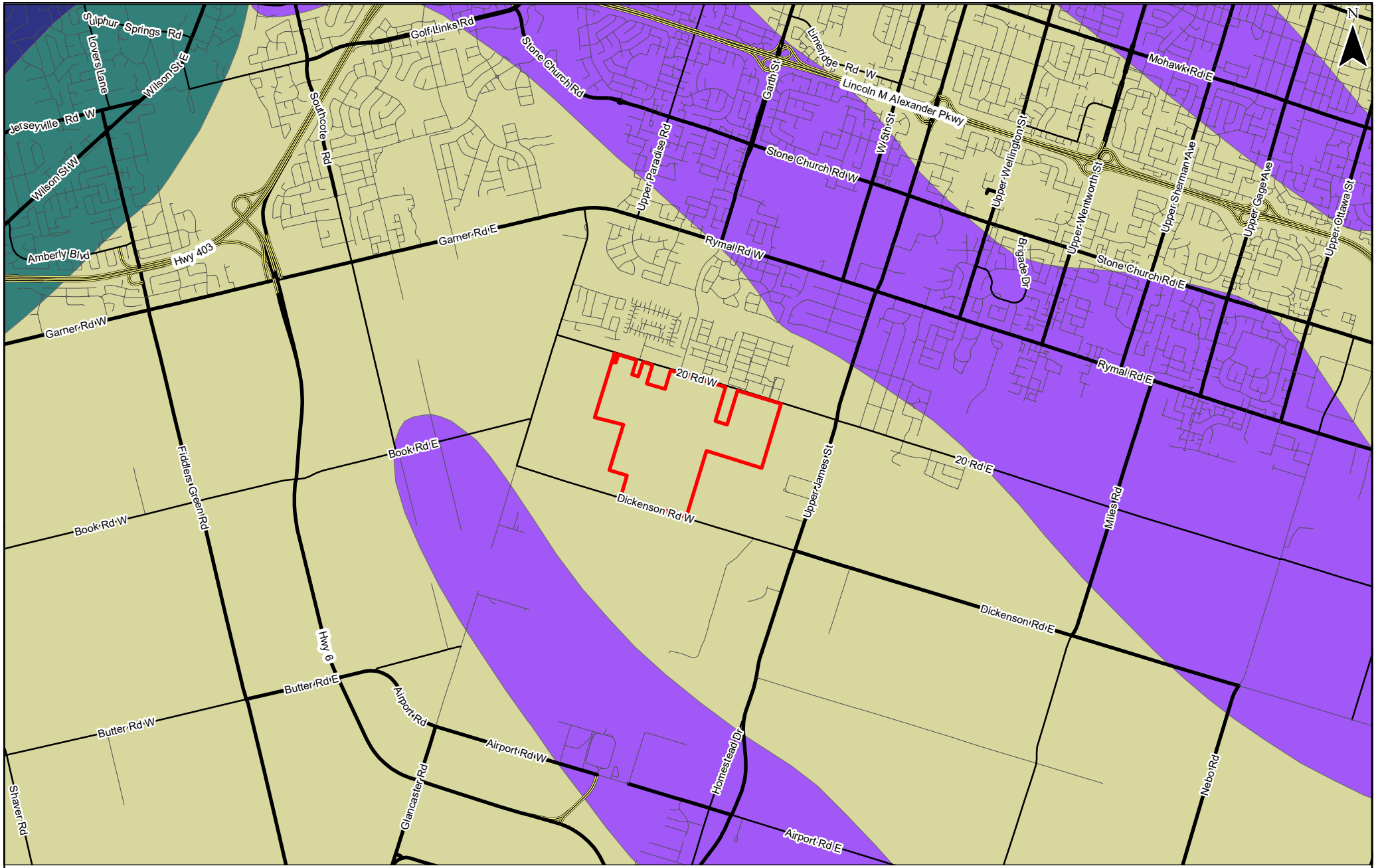
300 0 300 600 900 1200 1500 m

TITLE AND LOCATION:

SITE LOCATION PLAN

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
TWENTY ROAD WEST,
HAMILTON, ONTARIO

PROJECT NO.:	DWN.:
BRM-00801363-B0	AS
SCALE:	CK:
AS NOTED	RS
DATE:	FIG. NO.:
JUNE 2018	1



Legend

Approximate Site Boundary | Escarpments | Till Moraines
Clay Plains | Kame Moraines

0 500 1,000 2,000 3,000 4,000 5,000 m

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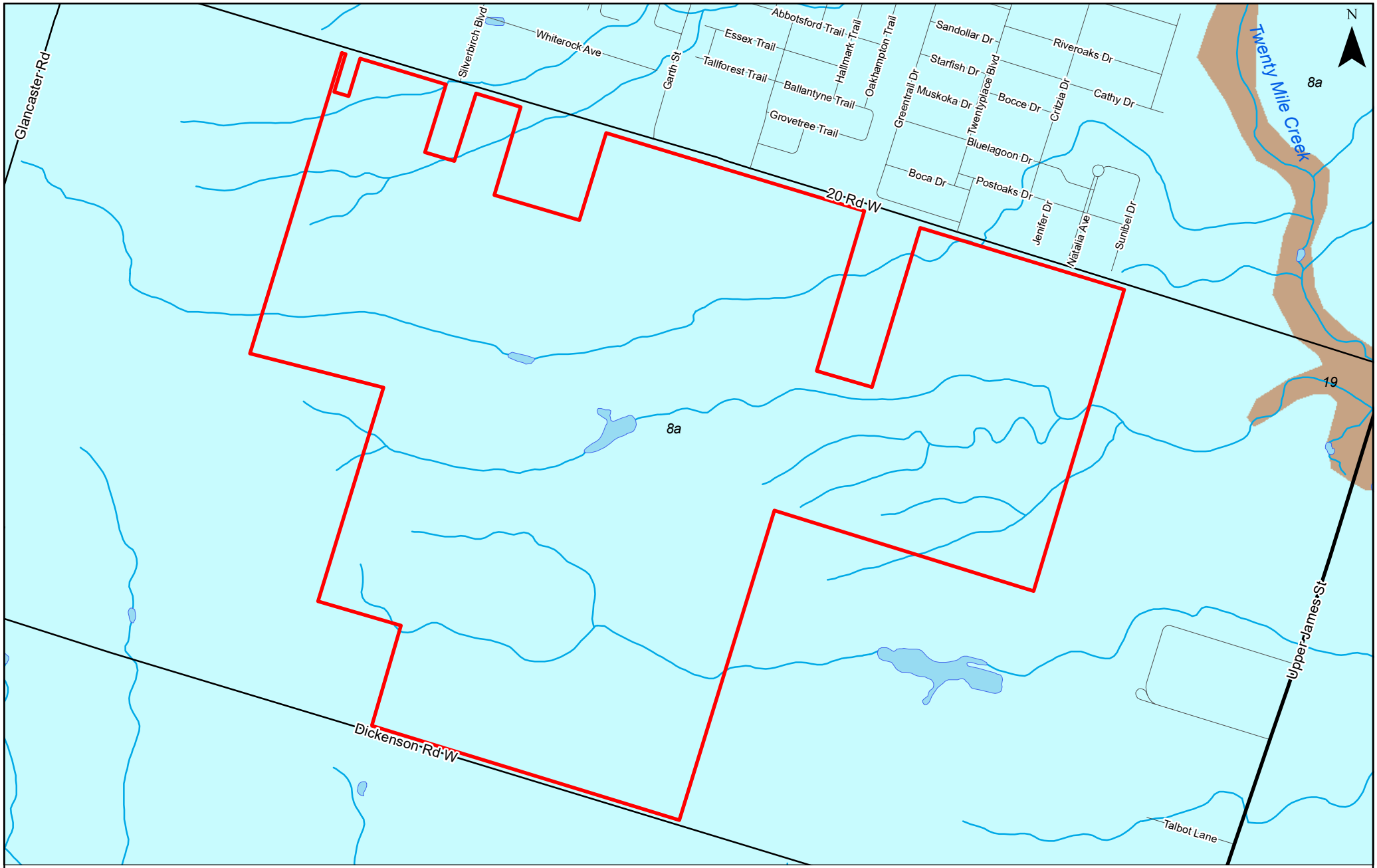
PROJECT TITLE:
PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
PROPOSED GLANBROOK INDUSTRIAL PARK
TWENTY ROAD WEST
HAMILTON, ONTARIO

DRAWING TITLE:
REGIONAL
PHYSIOGRAPHY

PROJECT No.: BRM-00801363-B0	DWN: AC
SCALE: AS NOTED	CHKD: RS
DATE: FEBRUARY 2018	DWG. No.: 2



Legend

Approximate Site Boundary

8a: Fine-textured glaciolacustrine deposits

19: Modern alluvial deposits

0 100 200 400 600 800 1,000 m

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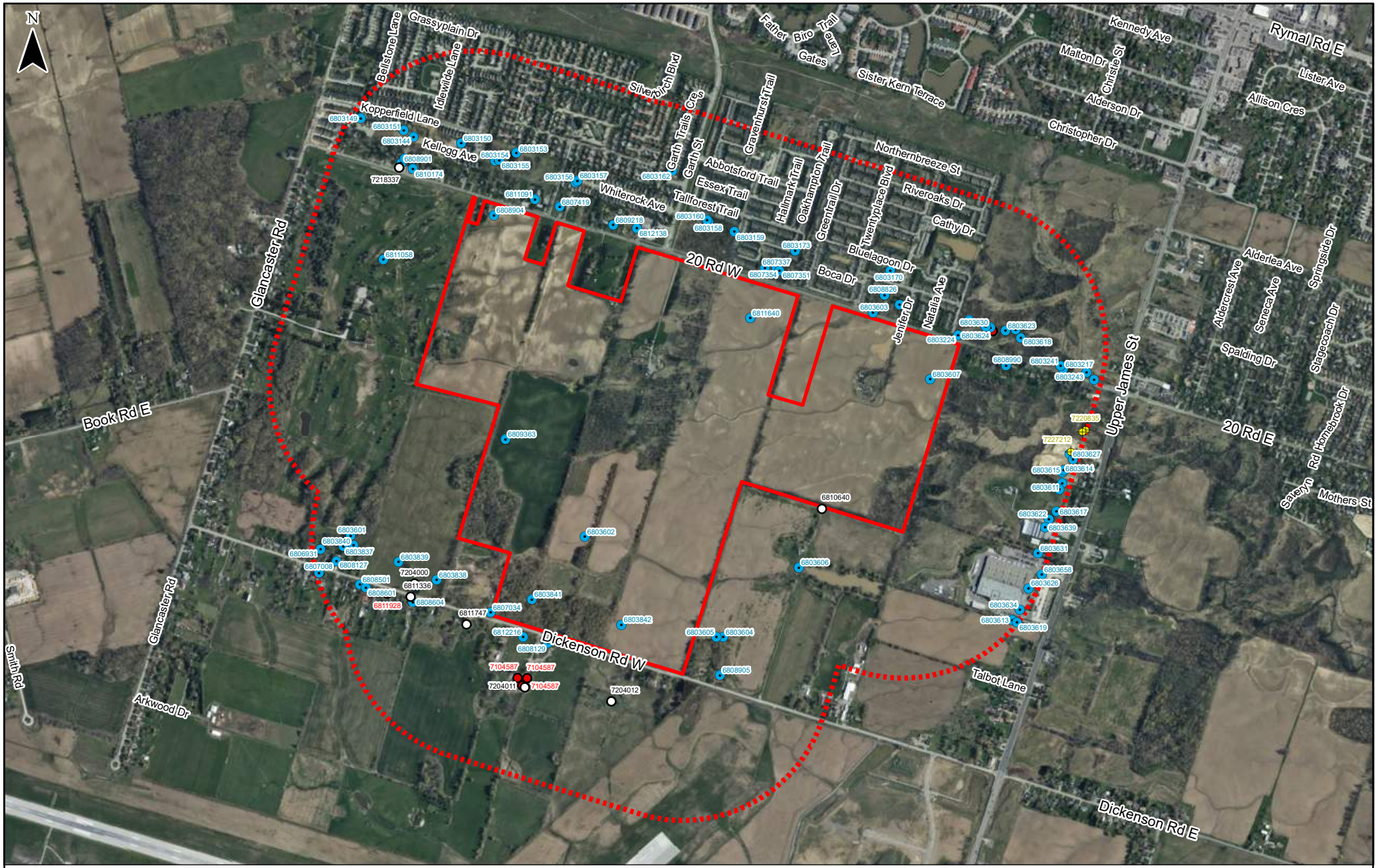
PROPOSED GLANBROOK INDUSTRIAL PARK
TWENTY ROAD WEST
HAMILTON, ONTARIO

DRAWING TITLE:

SURFICIAL GEOLOGY

PROJECT No.: BRM-00801363-B0	DWN: AC
SCALE: AS NOTED	CHKD: RS
DATE: FEBRUARY 2018	DWG. No.: 3



Legend

- Approximate Site Boundary
- 500 m Zone
- Water Supply Well
- Monitoring Well / Test Hole
- Abandoned Well
- Unclassified / Unfinished Well

0 150 300 600 900 1,200 1,500 m

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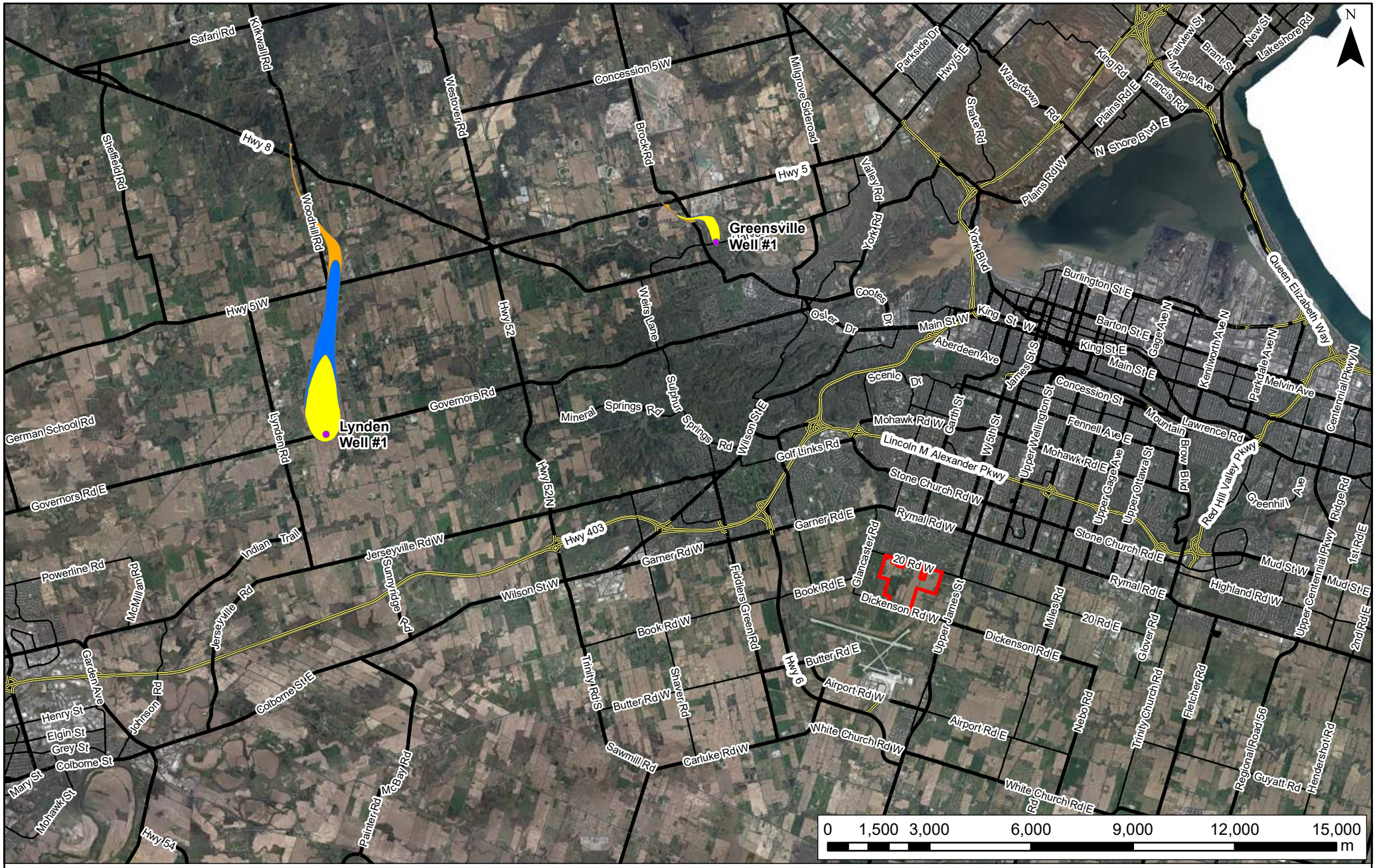
PROPOSED GLANBROOK INDUSTRIAL PARK
TWENTY ROAD WEST
HAMILTON, ONTARIO

DRAWING TITLE:
MOECC WATER WELL RECORDS MAP

PROJECT No.: BRM-00801363-B0	DWN: AC
SCALE: AS NOTED	CHKD: RS
DATE: FEBRUARY 2018	DWG. No.: 4



Legend

- Approximate Site Boundary
- WHPA-A (100 m Zone)
- WHPA-B (0 - 2 Year Zone)
- WHPA-C(2 -5 Year Zone)
- WHPA-D (20 - 25 Year Zone)

Data Sources:
1. Chapter 13 - City of Hamilton (Lynden), Grand River Source Protection Plan. Ministry of the Environment and Climate Change, 2016.
2. Assessment Report for the Hamilton Region Source Protecion Area - Version 2.7. Halton-Hamilton Source Protection Staff, 2015.

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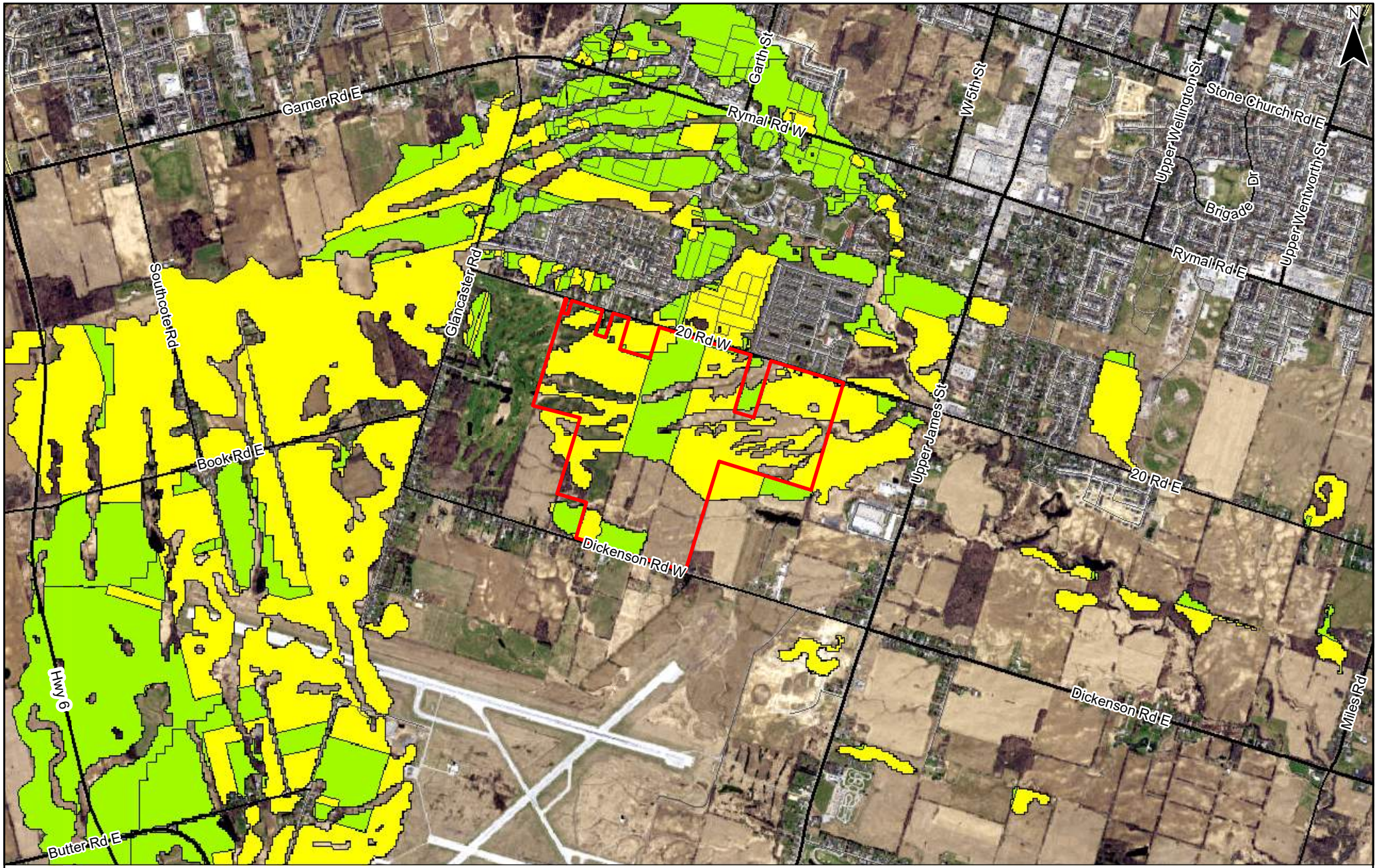
PROPOSED GLANBROOK INDUSTRIAL PARK
TWENTY ROAD WEST
HAMILTON, ONTARIO

DRAWING TITLE:

WELL HEAD
PROTECTION AREAS

PROJECT No.: BRM-00801363-B0	DWN: AC
SCALE: AS NOTED	CHKD: RS
DATE: FEBRUARY 2018	DWG. No.: 5



Data Source: Source Water Protection Atlas - Significant Groundwater Recharge Area (SGRA). Ministry of the Environment and Climate Change, 2017.

Legend

Significant Groundwater Recharge Area

- Approximate Site Boundary
- Vulnerability Score = 4
- Vulnerability Score = 6

0 300 600 1,200 1,800 2,400 3,000 m

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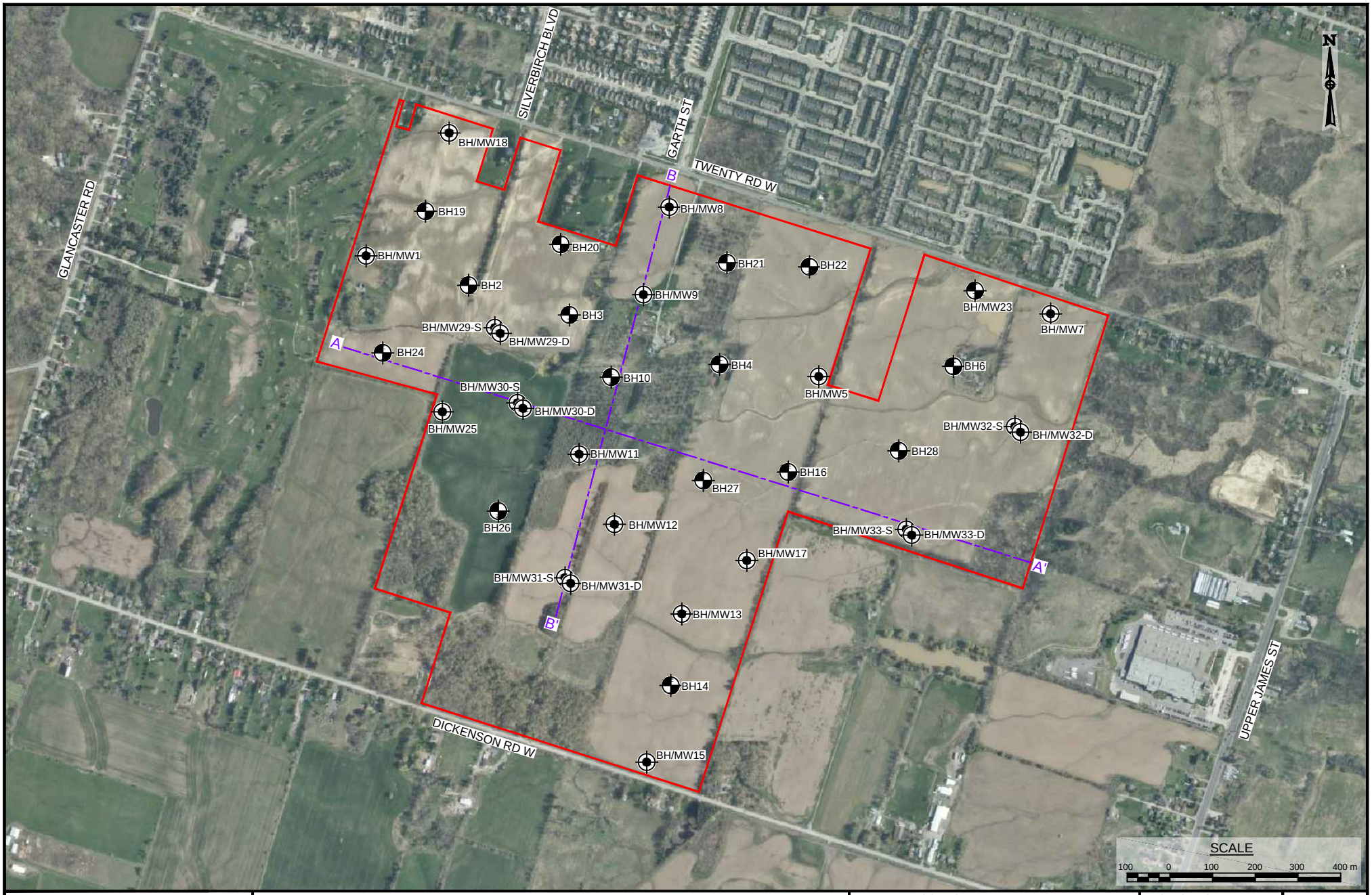
PROPOSED GLANBROOK INDUSTRIAL PARK
TWENTY ROAD WEST
HAMILTON, ONTARIO

DRAWING TITLE:

SIGNIFICANT GROUNDWATER RECHARGE AREAS

PROJECT No.: BRM-00801363-B0	DWN: AC
SCALE: AS NOTED	CHKD: RS
DATE: FEBRUARY 2018	DWG. No.: 6



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LEGEND:

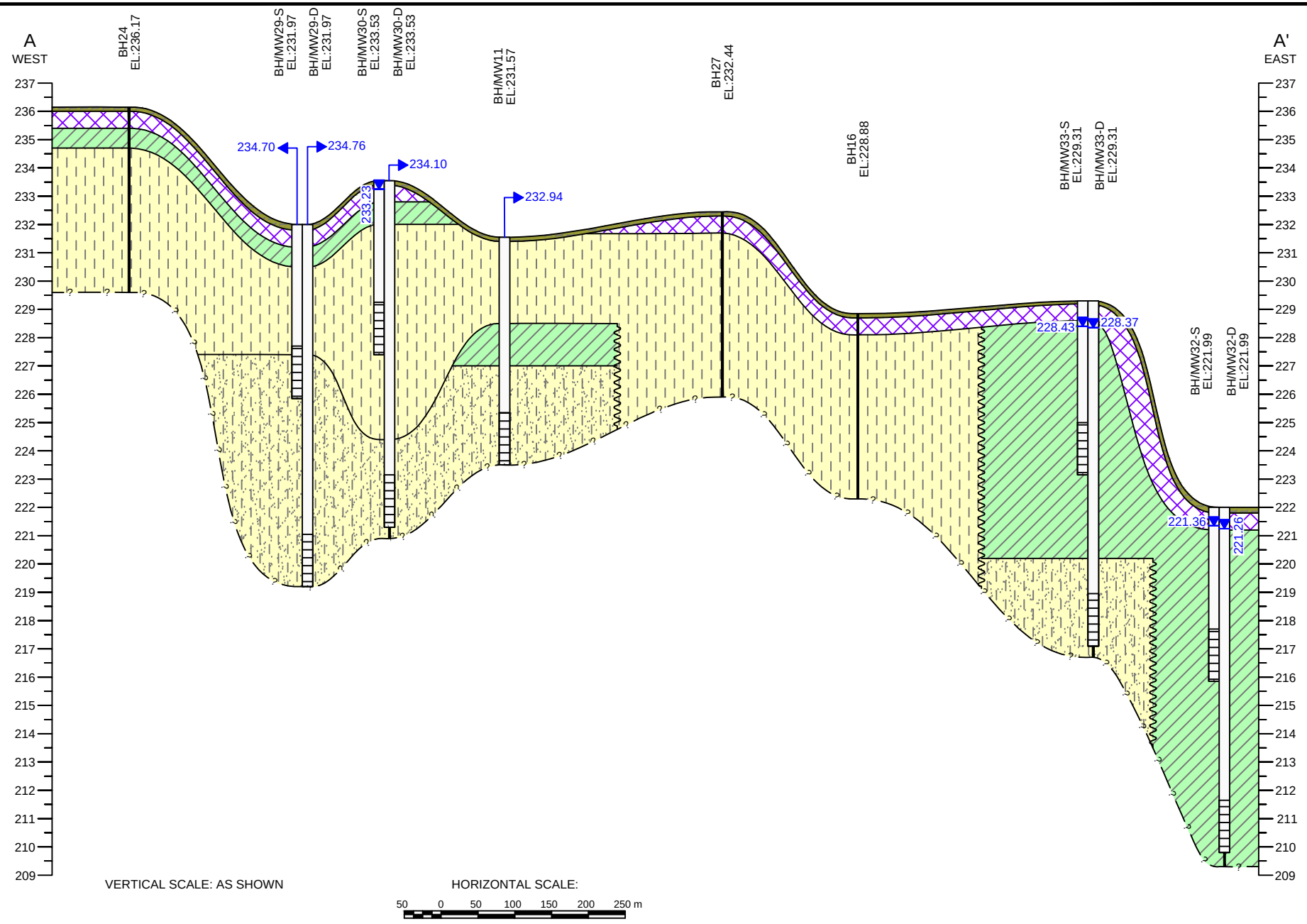
- APPROXIMATE SITE BOUNDARY
- BOREHOLE LOCATION (EXP, 2018)
- BOREHOLE / MONITORING WELL LOCATION (EXP, 2018)

TITLE AND LOCATION:

BOREHOLE / MONITORING WELL LOCATION PLAN

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
TWENTY ROAD WEST,
HAMILTON, ONTARIO

PROJECT NO.:	DWN.:
BRM-00801363-B0	AS
SCALE: AS NOTED	CK: RS
DATE: JUNE 2018	FIG. NO.: 7



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LEGEND:

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

GROUNDWATER ELEVATION AS MEASURED ON JUNE13 & 14, 2018

TITLE AND LOCATION:

CROSS SECTION A-A'

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
TWENTY ROAD WEST,
HAMILTON, ONTARIO

PROJECT NO.:	DWN.:
BRM-00801363-B0	AS
SCALE: AS NOTED	CK: RS
DATE: JUNE 2018	FIG. NO.: 8

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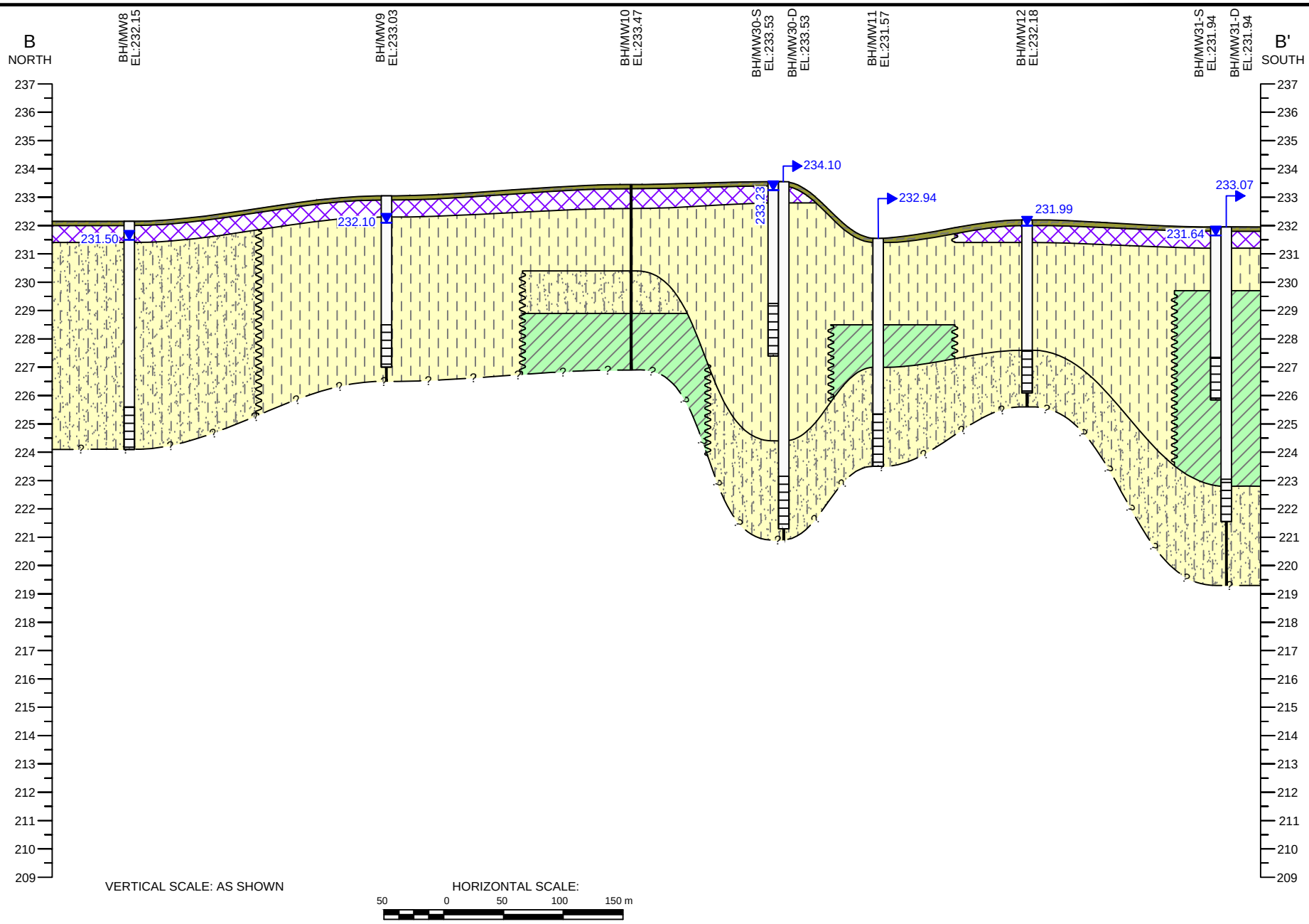

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LEGEND:

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

GROUNDWATER ELEVATION AS MEASURED ON JUNE13 & 14, 2018

TITLE AND LOCATION:

CROSS SECTION B-B'

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
TWENTY ROAD WEST,
HAMILTON, ONTARIO

PROJECT NO.:	DWN.:
BRM-00801363-B0	AS
SCALE: AS NOTED	CK: RS
DATE: JUNE 2018	FIG. NO.: 9

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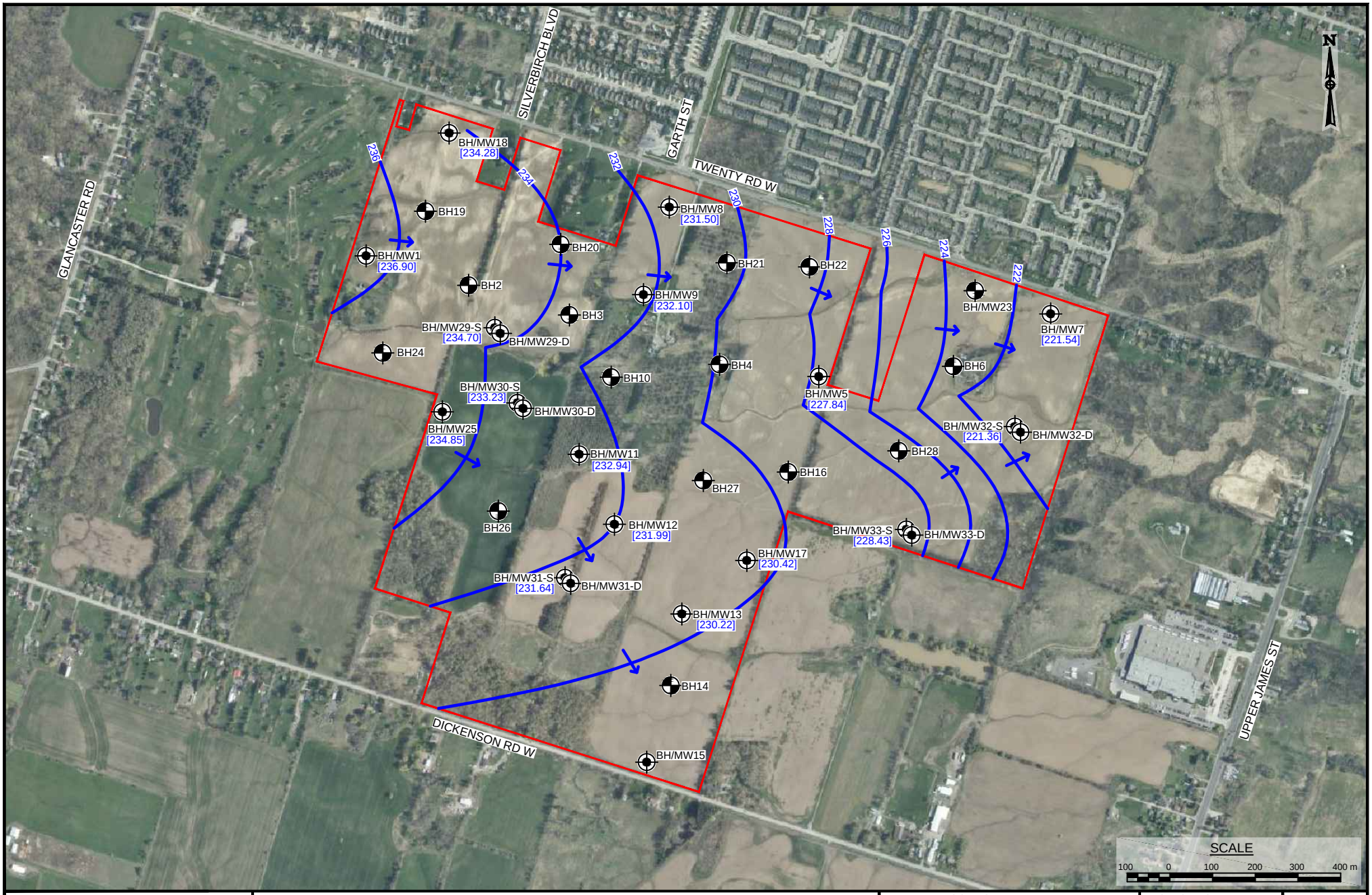

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LEGEND:

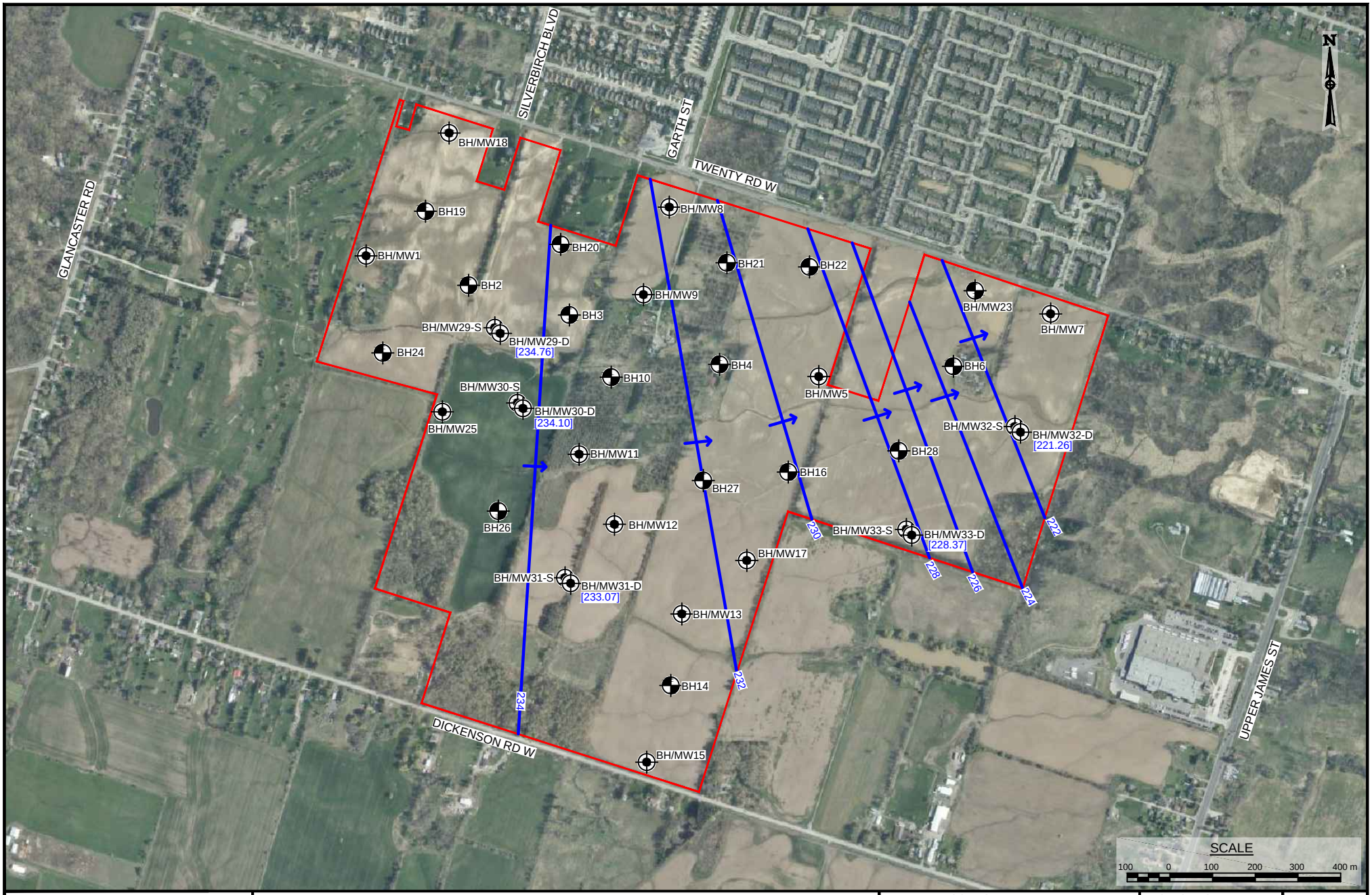
- APPROXIMATE SITE BOUNDARY
- BOREHOLE LOCATION (EXP, 2018)
- BOREHOLE / MONITORING WELL LOCATION (EXP, 2018)
- SHALLOW GROUNDWATER CONTOURS
- [XX.XX] GROUNDWATER ELEVATION AS MEASURED ON JUNE13 & 14, 2018
- GROUNDWATER FLOW DIRECTION

TITLE AND LOCATION:

SHALLOW GROUNDWATER CONTOURS

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
TWENTY ROAD WEST,
HAMILTON, ONTARIO

PROJECT NO.:	DWN.:
BRM-00801363-B0	AS
SCALE: AS NOTED	CK: RS
DATE: JUNE 2018	FIG. NO.: 10



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LEGEND:

- APPROXIMATE SITE BOUNDARY
- BOREHOLE LOCATION (EXP, 2018)
- BOREHOLE / MONITORING WELL LOCATION (EXP, 2018)
- DEEP GROUNDWATER CONTOURS
- [XX.XX] GROUNDWATER ELEVATION AS MEASURED ON JUNE13 & 14, 2018
- GROUNDWATER FLOW DIRECTION

TITLE AND LOCATION:

DEEP GROUNDWATER CONTOURS

PRELIMINARY HYDROGEOLOGICAL INVESTIGATION
TWENTY ROAD WEST,
HAMILTON, ONTARIO

PROJECT NO.:	DWN.:
BRM-00801363-B0	AS
SCALE:	CK:
AS NOTED	RS
DATE:	FIG. NO.:
JUNE 2018	11

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233.53 m — Ground Elevation (m asl)

0.1 m — Safe Excavation Elevation (m) / Safe Excavation Depth (m bgs)

0 90 180 270 360 450 m

TITLE AND LOCATION:

SAFE EXCAVATION ELEVATION
Preliminary Hydrogeological Investigation
Twenty Road West
Hamilton, Ontario

PROJECT No.: BRM-00801363-B0	DWN: EE
SCALE: AS NOTED	CHKD: RS
DATE: JUNE 2018	FIG. No.: 12

Appendix A:
Available MOECC WWR Summary Table

On-Site													
BORE_HOLE_	WELL_ID	DATE	EAST83	NORTH83	ELEVATION (m ASL)	LOCATION ACCURACY	STREET	CITY	DISTANCE TO SITE CENTROID (m)	WATER FOUND	1st USE	2nd USE	FINAL STATUS
10481063	6803602	6/21/1966	587680	4782126	233.5	margin of error : 100 m - 300 m			449	95 ft	Livestock	Domestic	Water Supply
10481068	6803607	8/27/1949	588858	4782664	224.3	unknown UTM			943	66 ft	Domestic		Water Supply
10481302	6803841	10/19/1953	587499	4781912	237.6	unknown UTM			728		Domestic		Water Supply
10481303	6803842	9/15/1965	587805	4781825	235.3	margin of error : 100 m - 300 m			685	96 ft	Domestic		Water Supply
10486258	6808904	7/18/1974	587371	4783224	235.5	margin of error : 30 m - 100 m			915	20 ft	Domestic		Water Supply
10486709	6809363	4/10/1976	587410	4782459	235.1	margin of error : 30 m - 100 m			521	97 ft	Domestic		Water Supply
10488954	6811640	3/6/1989	588244	4782872	229.8	margin of error : 100 m - 300 m			488	17 ft	Domestic		Water Supply
Off-Site													
BORE_HOLE_	WELL_ID	DATE	EAST83	NORTH83	ELEVATION (m ASL)	LOCATION ACCURACY	STREET	CITY	DISTANCE TO SITE CENTROID (m)	WATER FOUND	1st USE	2nd USE	FINAL STATUS
10480605	6803144	9/25/1957	587096	4783492	237.5	unknown UTM			1297	90 ft	Domestic		Water Supply
10480610	6803149	9/19/1960	586917	4783555	238.6	margin of error : 100 m - 300 m			1463	113 ft	Domestic		Water Supply
10480611	6803150	9/25/1965	587259	4783470	234.0	margin of error : 100 m - 300 m			1180	38 ft	Domestic		Water Supply
10480612	6803151	5/4/1966	587063	4783515	239.2	margin of error : 100 m - 300 m			1335	36 ft	Domestic		Water Supply
10480614	6803153	9/13/1952	587447	4783438	231.6	unknown UTM			1056	70 ft	Domestic		Water Supply
10480615	6803154	9/15/1953	587374	4783410	230.6	unknown UTM			1067	90 ft	Domestic		Water Supply
10480616	6803155	9/21/1953	587389	4783412	230.7	unknown UTM			1061	82 ft	Domestic		Water Supply
10480617	6803156	11/30/1957	587648	4783337	231.4	unknown UTM			884	109 ft	Domestic		Water Supply
10480618	6803157	7/31/1959	587655	4783342	231.2	margin of error : 100 m - 300 m			887	116 ft	Domestic		Water Supply
10480619	6803158	2/23/1955	588102	4783203	229.9	unknown UTM			725	80 ft	Domestic		Water Supply
10480620	6803159	5/11/1955	588190	4783168	229.9	unknown UTM			718	100 ft	Domestic		Water Supply
10480621	6803160	5/1/1956	588097	4783208	229.8	unknown UTM			728	100 ft	Domestic		Water Supply
10480623	6803162	1/26/1957	587979	4783376	226.9	unknown UTM			878	75 ft	Domestic		Water Supply
10480631	6803170	2/2/1954	588722	4783033	221.2	unknown UTM			956	94 ft	Domestic		Water Supply
10480634	6803173	7/27/1964	588398	4783103	224.9	margin of error : 100 m - 300 m			764	80 ft	Domestic		Water Supply
10480678	6803217	3/26/1955	589311	4782698	220.2	unknown UTM			1396	108 ft	Domestic		Water Supply
10480685	6803224	10/7/1955	588953	4782813	221.2	unknown UTM			1070	108 ft	Domestic		Water Supply
10480702	6803241	9/16/1957	589303	4782709	220.3	unknown UTM			1389	62 ft	Domestic		Water Supply
10480704	6803243	3/5/1958	589391	4782687	217.8	unknown UTM			1473	78 ft	Domestic		Water Supply
10481062	6803601	11/12/1964	586882	4782130	238.9	margin of error : 100 m - 300 m			1111	115 ft	Domestic		Water Supply
10481064	6803603	11/10/1954	588662	4782890	222.5	unknown UTM			830	100 ft	Livestock	Domestic	Water Supply
10481065	6803604	10/8/1956	588152	4781783	230.1	unknown UTM			750	120 ft	Domestic		Water Supply
10481066	6803605	5/22/1958	588129	4781783	230.2	unknown UTM			743	86 ft	Domestic		Water Supply
10481067	6803606	5/29/1967	588410	4782021	227.1	margin of error : 100 m - 300 m			678	15 ft	Domestic		Water Supply
10481072	6803611	10/18/1954	589308	4782309	222.9	unknown UTM			1391	58 ft	Domestic		Water Supply
10481074	6803613	6/17/1955	589138	4781842	222.4	unknown UTM			1375	100 ft	Domestic		Water Supply
10481075	6803614	6/24/1955	589308	4782346	222.0	unknown UTM			1387	56 ft	Domestic		Water Supply
10481076	6803615	7/26/1955	589313	4782354	221.7	unknown UTM			1391	56 ft	Domestic		Water Supply
10481077	6803616	8/20/1955	589298	4782288	223.4	unknown UTM			1385	58 ft	Domestic		Water Supply
10481078	6803617	10/26/1955	589288	4782213	223.2	unknown UTM			1388	41 ft	Domestic		Water Supply
10481079	6803618	3/26/1957	589166	4782805	219.6	unknown UTM			1274	55 ft	Domestic		Water Supply
10481080	6803619	5/21/1957	589153	4781834	222.8	unknown UTM			1392	65 ft	Domestic		Water Supply
10481082	6803621	1/25/1958	589417	4782662	217.9	unknown UTM			1496	71 ft	Domestic		Water Supply
10481083	6803622	4/24/1958	589263	4782186	222.9	unknown UTM			1370	50 ft	Domestic		Water Supply
10481084	6803623	5/20/1958	589114	4782830	220.1	unknown UTM			1230	70 ft	Domestic		Water Supply
10481085	6803624	5/23/1958	589071	4782828	220.1	unknown UTM			1188	56 ft	Domestic		Water Supply
10481086	6803625	7/10/1958	589071	4782828	220.1	unknown UTM			1188	0 ft	Not Used		Abandoned-Quality
10481087	6803626	7/24/1958	589193	4781950	220.3	margin of error : 100 m - 300 m			1378	84 ft	Domestic		Water Supply
10481088	6803627	8/8/1958	589333	4782409	220.2	margin of error : 100 m - 300 m			1406	82 ft	Domestic		Water Supply

10481090	6803629	8/15/1958	589345	4782391	220.3	margin of error : 100 m - 300 m			1420	86 ft	Domestic	Water Supply
10481091	6803630	8/20/1958	589063	4782840	220.1	margin of error : 100 m - 300 m			1184	77 ft	Domestic	Water Supply
10481092	6803631	1/15/1959	589225	4782070	220.5	margin of error : 100 m - 300 m			1365	62 ft	Domestic	Water Supply
10481093	6803632	3/2/1959	588991	4782865	220.6	margin of error : 100 m - 300 m			1123	76 ft	Domestic	Water Supply
10481094	6803633	3/9/1959	589048	4782843	220.1	margin of error : 100 m - 300 m			1170	70 ft	Domestic	Water Supply
10481095	6803634	5/7/1960	589163	4781877	221.4	margin of error : 100 m - 300 m			1381	60 ft	Domestic	Water Supply
10481097	6803636	3/15/1961	589149	4782833	220.2	margin of error : 100 m - 300 m			1264	68 ft	Domestic	Water Supply
10481100	6803639	8/14/1963	589250	4782158	222.3	margin of error : 100 m - 300 m			1364	15 ft	Domestic	Water Supply
10481119	6803658	5/5/1962	589238	4781997	220.2	margin of error : 100 m - 300 m			1401	32 ft	Domestic	Water Supply
10481298	6803837	7/16/1956	586857	4782094	239.0	unknown UTM			1147	110 ft	Domestic	Water Supply
10481299	6803838	7/21/1956	587175	4781979	237.2	unknown UTM			916	140 ft	Domestic	Water Supply
10481300	6803839	8/27/1956	587045	4782040	237.9	unknown UTM			997	127 ft	Domestic	Water Supply
10481301	6803840	1/20/1965	586892	4782097	238.8	margin of error : 100 m - 300 m			1113	119 ft	Domestic	Water Supply
10484370	6806931	2/19/1968	586779	4782083	240.0	margin of error : 30 m - 100 m			1223	24 ft	Domestic	Water Supply
10484444	6807008	2/20/1969	586774	4782003	240.0	margin of error : 30 m - 100 m			1258	30 ft	Domestic	Water Supply
10484470	6807034	2/24/1969	587359	4781868	237.7	margin of error : 30 m - 100 m			851	44 ft	Domestic	Water Supply
10484758	6807337	10/9/1969	588334	4783043	226.9	margin of error : 30 m - 100 m			678	80 ft	Domestic	Water Supply
10484771	6807351	8/20/1969	588344	4783033	226.8	margin of error : 30 m - 100 m			676	25 ft	Domestic	Water Supply
10484774	6807354	9/6/1969	588294	4783043	227.8	margin of error : 30 m - 100 m			655	40 ft	Domestic	Water Supply
10484836	6807419	10/8/1969	587594	4783253	231.6	margin of error : 30 m - 100 m			825	20 ft	Domestic	Water Supply
10485508	6808127	6/23/1972	586834	4782043	239.1	margin of error : 30 m - 100 m			1187	30 ft	Domestic	Water Supply
10485510	6808129	6/23/1972	587554	4781763	235.4	margin of error : 30 m - 100 m			826	50 ft	Domestic	Water Supply
10485831	6808463	5/30/1973	588753	4782918	223.1	margin of error : 30 m - 100 m			924	5 ft	Domestic	Water Supply
10485868	6808501	7/13/1973	586914	4781963	237.6	margin of error : 30 m - 100 m			1148	35 ft	Domestic	Water Supply
10485967	6808601	9/6/1973	586934	4781953	237.4	margin of error : 30 m - 100 m			1135	37 ft	Domestic	Water Supply
10485970	6808604	9/4/1973	587094	4781903	236.3	margin of error : 30 m - 100 m			1026	48 ft	Domestic	Water Supply
10486186	6808826	6/13/1974	588702	4782951	221.7	margin of error : 30 m - 100 m			895	20 ft	Domestic	Water Supply
10486256	6808901	7/23/1974	587054	4783403	240.0	margin of error : 30 m - 100 m			1259	8 ft	Domestic	Water Supply
10486259	6808905	7/25/1974	588141	4781653	229.8	margin of error : 30 m - 100 m			872	30 ft	Domestic	Water Supply
10486343	6808990	10/15/1974	589116	4782711	221.0	margin of error : 30 m - 100 m			1205	15 ft	Domestic	Water Supply
10486420	6809067	1/3/1975	587066	4783419	239.3	margin of error : 30 m - 100 m			1262	15 ft	Domestic	Water Supply
10486569	6809218	7/30/1975	587777	4783191	230.2	margin of error : 30 m - 100 m			709	33 ft	Domestic	Water Supply
10487503	6810174	8/7/1980	587094	4783383	240.0	margin of error : 30 m - 100 m			1216	10 ft	Domestic	Water Supply
10487964	6810640	1/13/1983	588489	4782221	227.6	unknown UTM			625	47 ft	Domestic	
10488374	6811058	7/4/1986	586993	4783073	240.2	margin of error : 100 m - 300 m			1099	15 ft	Domestic	Water Supply
10488406	6811091	11/20/1986	587510	4783279	234.9	margin of error : 100 m - 300 m			886	15 ft	Domestic	Water Supply
10488651	6811336	9/14/1987	587087	4781920	236.5	margin of error : 100 m - 300 m			1023	110 ft	Domestic	
10489061	6811747	7/27/1989	587277	4781826	235.6	margin of error : 100 m - 300 m			938	93 ft	Domestic	
10489242	6811928	7/11/1990	587007	4781931	236.8	margin of error : 100 m - 300 m			1084	135 ft	Not Used	Observation Wells
10489452	6812138	10/21/1991	587858	4783180	228.2	margin of error : 100 m - 300 m			685	15 ft	Domestic	Water Supply
10489530	6812216	5/25/1992	587471	4781784	236.7	margin of error : 100 m - 300 m			850	8 ft	Domestic	Water Supply
1001582819	7104587	11/28/2007	587484	4781642	235.1	margin of error : 100 m - 300 m	9541 DICKENSON RD.	GLANBROOK	966	4.5 m	Not Used	Test Hole
1002665442	7104587	11/28/2007	587452	4781643	235.2	margin of error : 100 m - 300 m	9541 DICKENSON RD.	GLANBROOK	980	4.5 m	Not Used	Test Hole
1002665451	7104587	11/28/2007	587468	4781617	235.0	margin of error : 100 m - 300 m	9541 DICKENSON RD.	GLANBROOK	996	4.5 m	Not Used	Test Hole
1004725346	7218337	7/2/2013	587048	4783386	240.2	margin of error : 30 m - 100 m	9844 20 RD WEST	Hamilton	1251	0 ft		
1004779785	7220835	2/20/2014	589388	4782490	220.1	margin of error : 30 m - 100 m	2012 UPPER JAMES ST	Hamilton	1458	0 ft	Monitoring	Observation Wells
1005122978	7227212	7/18/2014	589338	4782416	220.1	margin of error : 30 m - 100 m	2012 UPPER JAMES	HAMILTON	1410	0 ft	Monitoring	Observation Wells
1005122981	7227213	7/18/2014	589377	4782484	220.1	margin of error : 30 m - 100 m	2012 UPPER JAMES	HAMILTON	1447	0 ft	Monitoring	Observation Wells
1004382883	7204000	4/23/2013	587100	4781965	237.1	margin of error : 30 m - 100 m			987			
1004383792	7204011	4/24/2013	587476	4781611	235.0	margin of error : 30 m - 100 m			997			
1004383795	7204012	4/24/2013	587771	4781563	234.2	margin of error : 30 m - 100 m			949			

Appendix B: Borehole Logs

Log of Borehole BH-01

Project No. HAM-00801363-A0 | Drawing No. 3

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

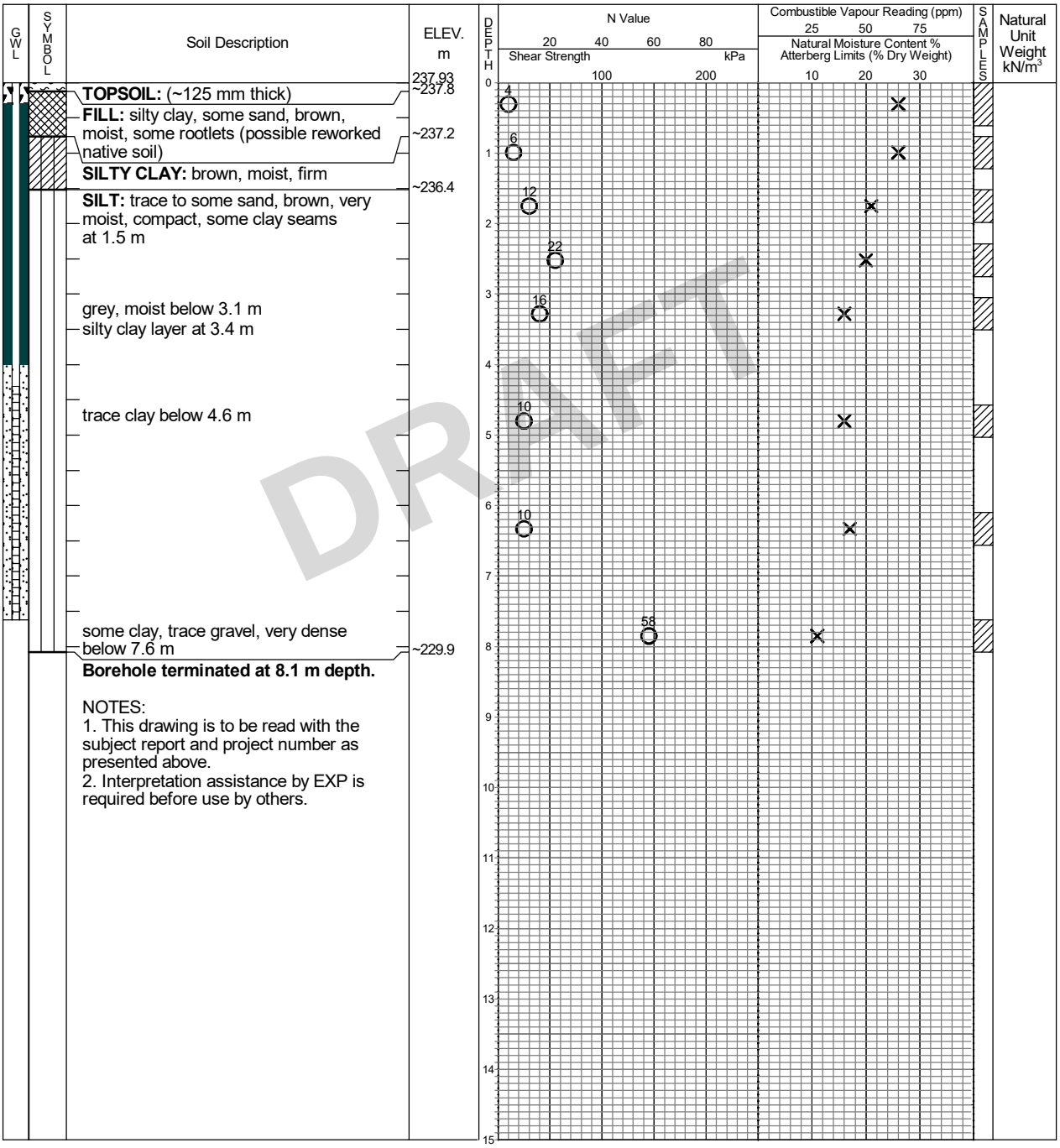
Date Drilled: March 27, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.22 bgs	no cave
June 5, 2018	0.78 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-02

Project No. HAM-00801363-A0 | Drawing No. 4

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

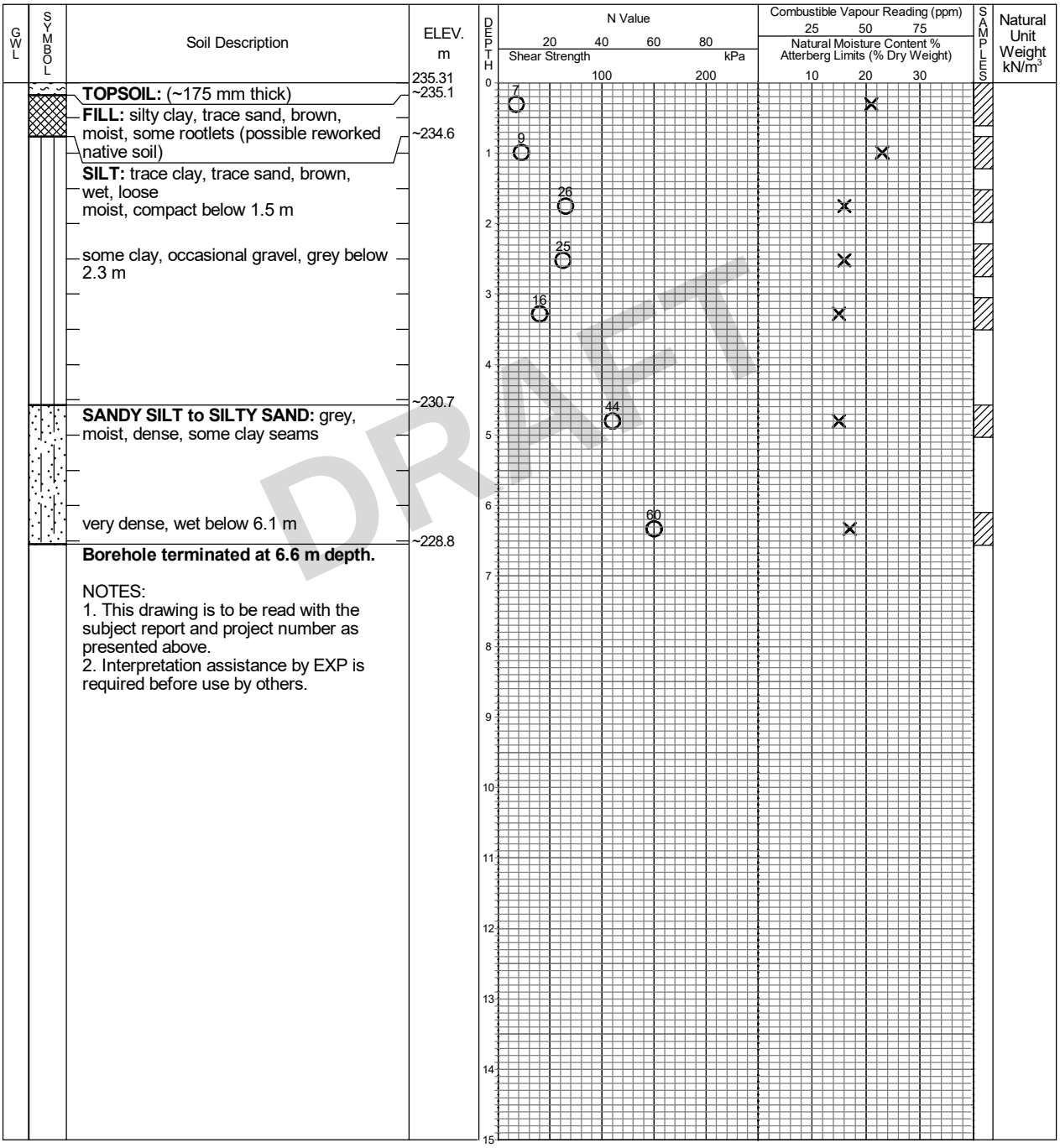
Date Drilled: March 27, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.83 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-03

Project No. HAM-00801363-A0 Drawing No. 5

Project: Proposed Glanbrook Industrial Subdivision Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

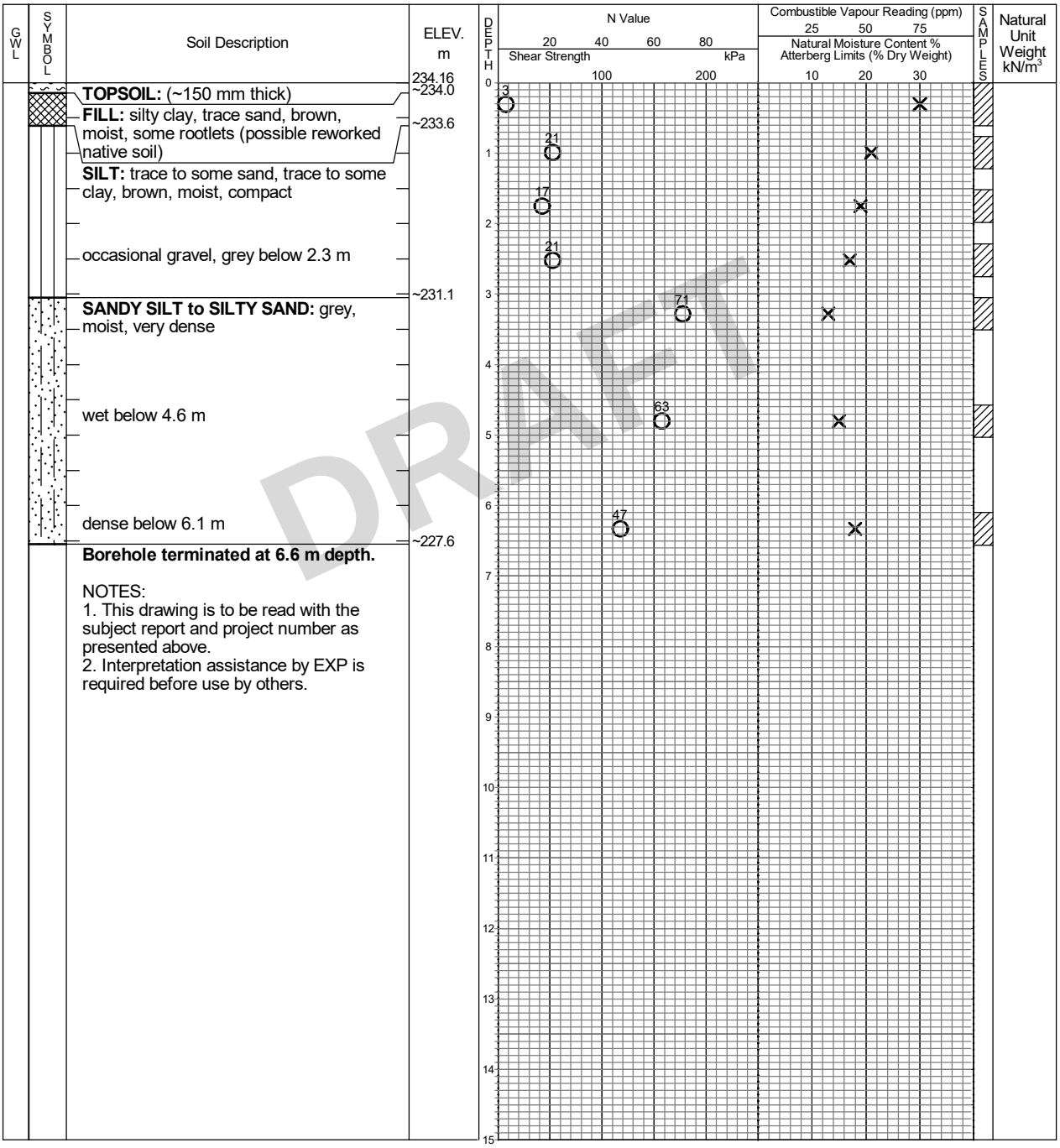
Date Drilled: March 28, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	6.05 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-04

Project No. HAM-00801363-A0 | Drawing No. 6

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

Date Drilled: April 3, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			230.70
		TOPSOIL: (~150 mm thick)	~230.6
		SILTY CLAY: brown, moist, firm, rootlets	~229.9
		SILT: some clay, trace sand, brown, moist, compact	
		dense below 2.3 m	
		trace clay, trace to some sand, occasional gravel, very dense below 3.1 m	
		grey below 4.6 m	
		SILTY SAND: grey, wet, very dense	~224.6
		Borehole terminated at 6.6 m depth.	~224.2

NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

DEPTH | N Value (20 40 60 80) | Shear Strength (100 200 kPa) | Combustible Vapour Reading (ppm) (25 50 75) | Natural Moisture Content % Atterberg Limits (% Dry Weight) (10 20 30) | SAMPLES | Natural Unit Weight kN/m³

N Value: 6, 22, 22, 38, 62, 67, 55

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.79 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-05

Project No. HAM-00801363-A0 | Drawing No. 7

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

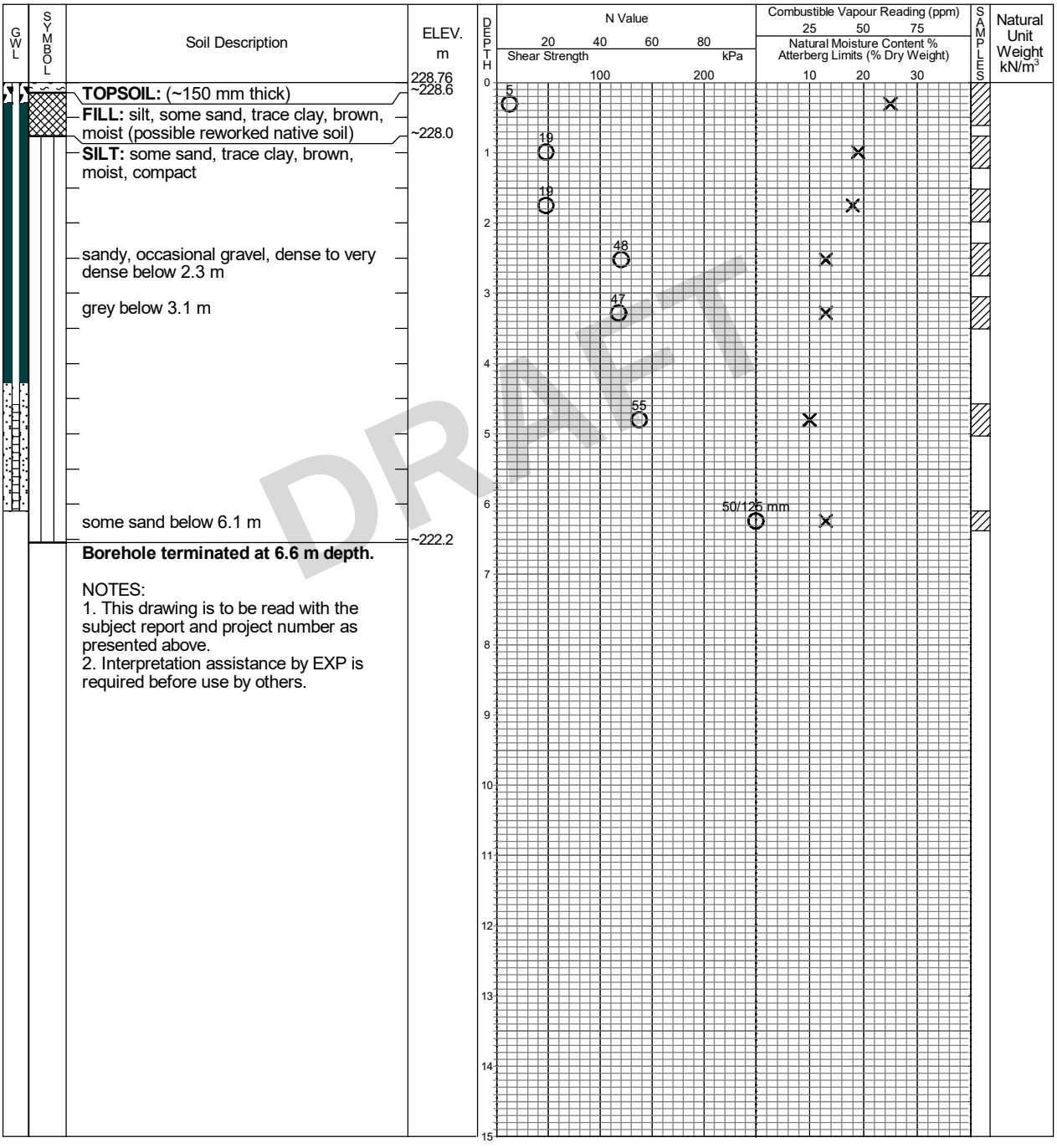
Date Drilled: April 18, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	4.91 bgs	no cave
June 5, 2018	0.73 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-06

Project No. HAM-00801363-A0 | Drawing No. 8

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

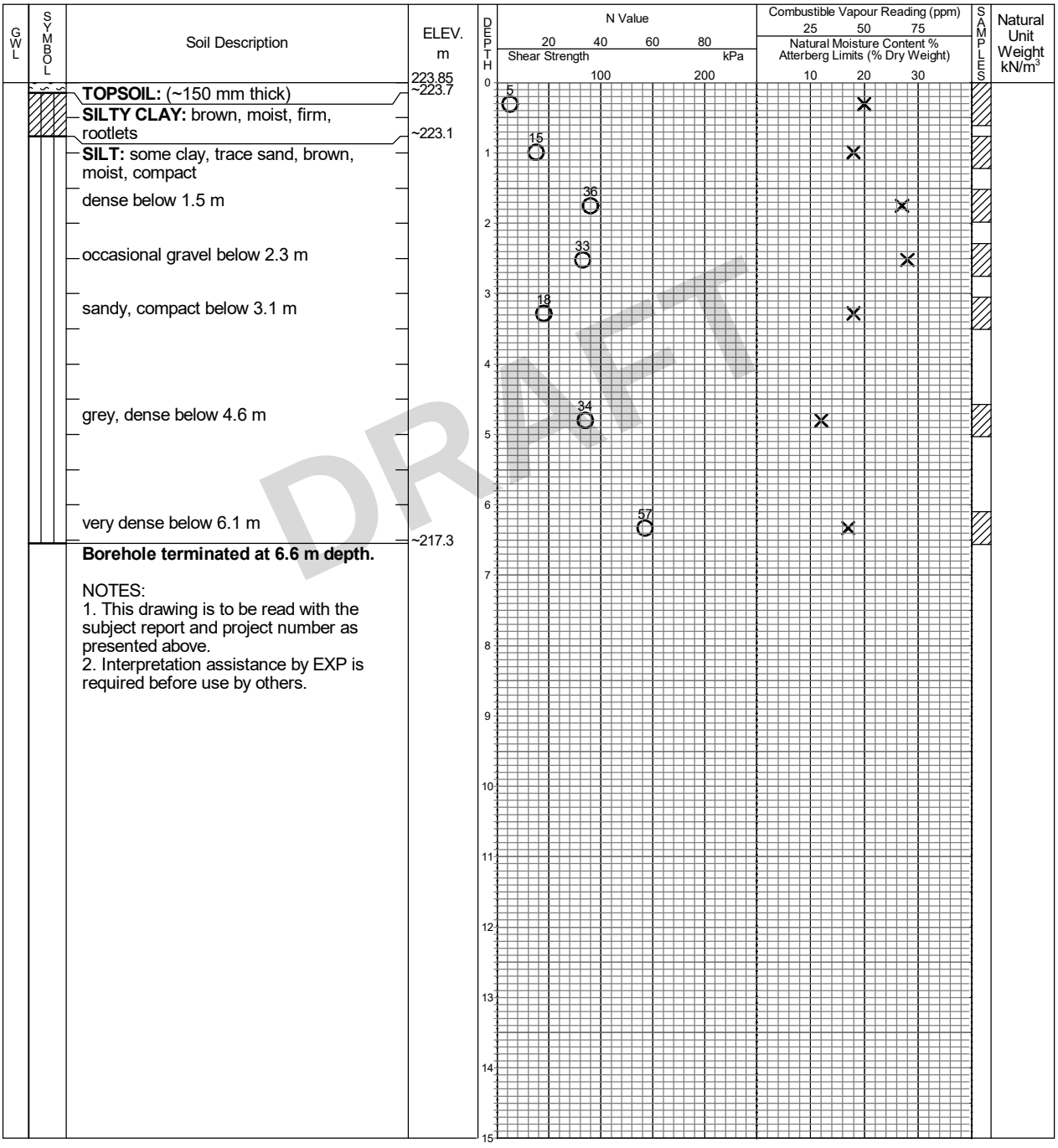
Date Drilled: April 3, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.84 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-07

Project No. HAM-00801363-A0 | Drawing No. 9

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

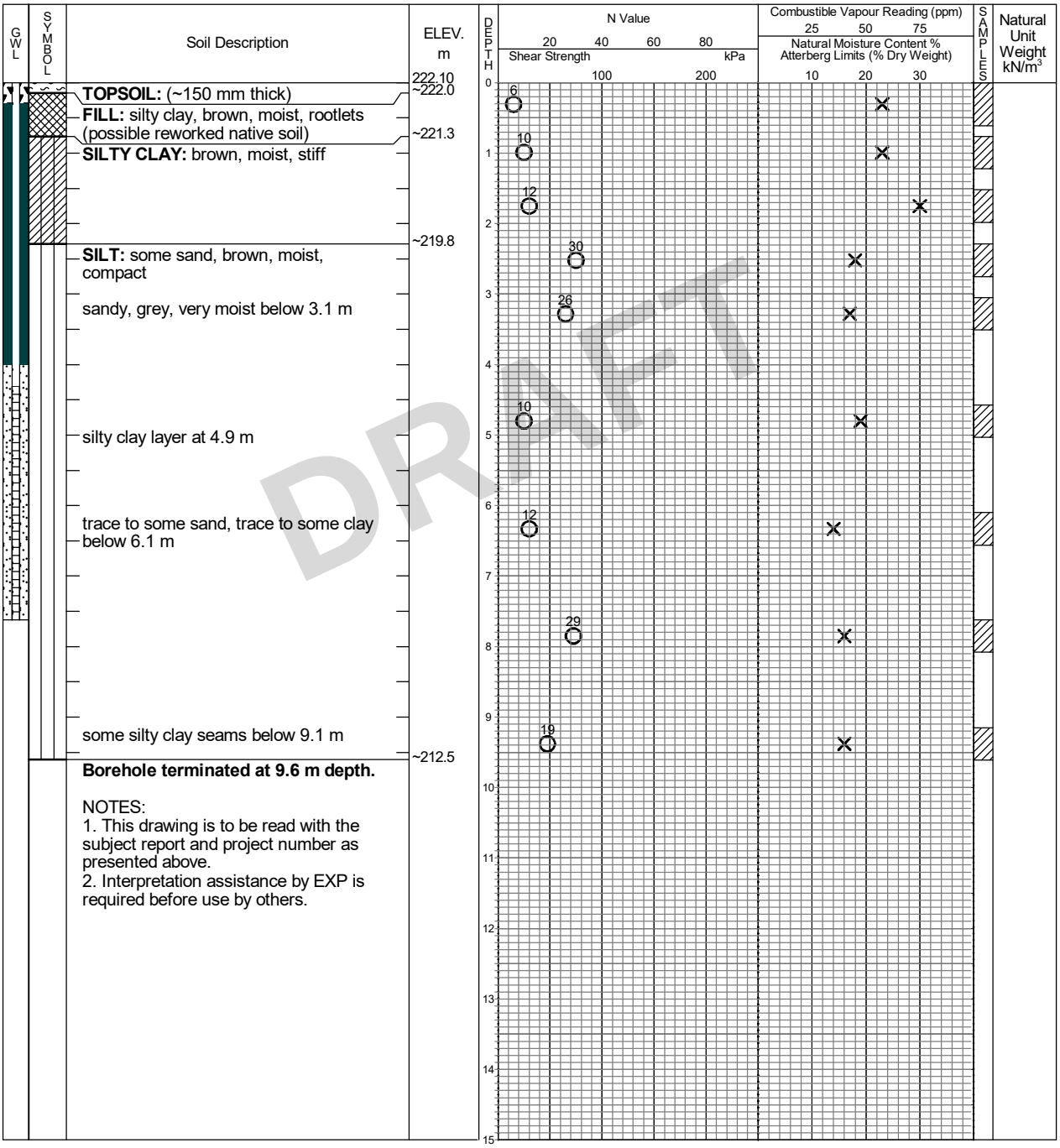
Date Drilled: May 9, 2018

Drill Type: CME-55 Track Mount. Hollow Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	9.21 bgs	no cave
June 4, 2018	0.27 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-08

Project No. HAM-00801363-A0 | Drawing No. 10

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

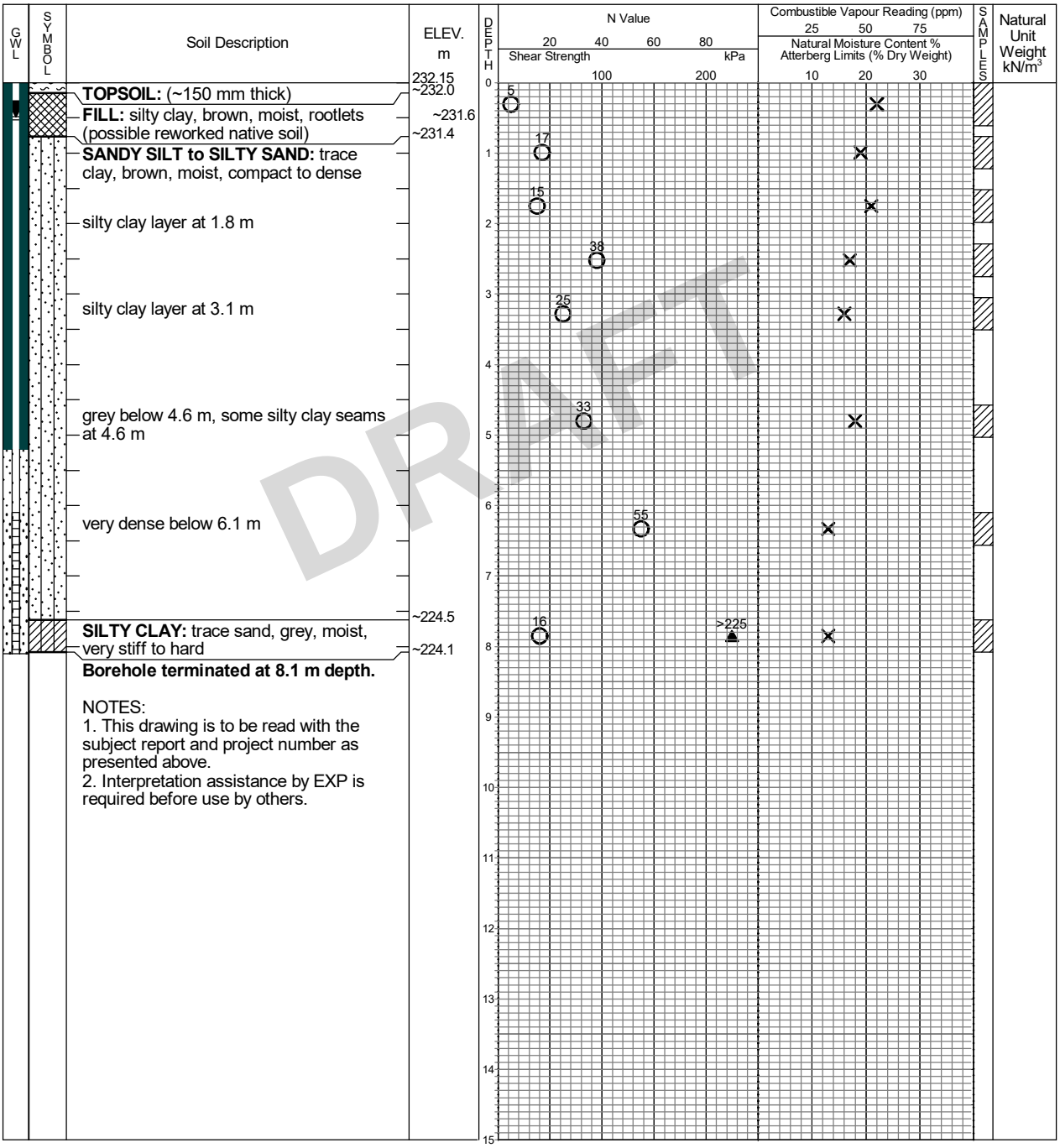
Date Drilled: May 11, 2018

Drill Type: CME-55 Track Mount. Hollow Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	7.61 bgs	no cave
June 4, 2018	0.53 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-09

Project No. HAM-00801363-A0 Drawing No. 11

Project: Proposed Glanbrook Industrial Subdivision Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

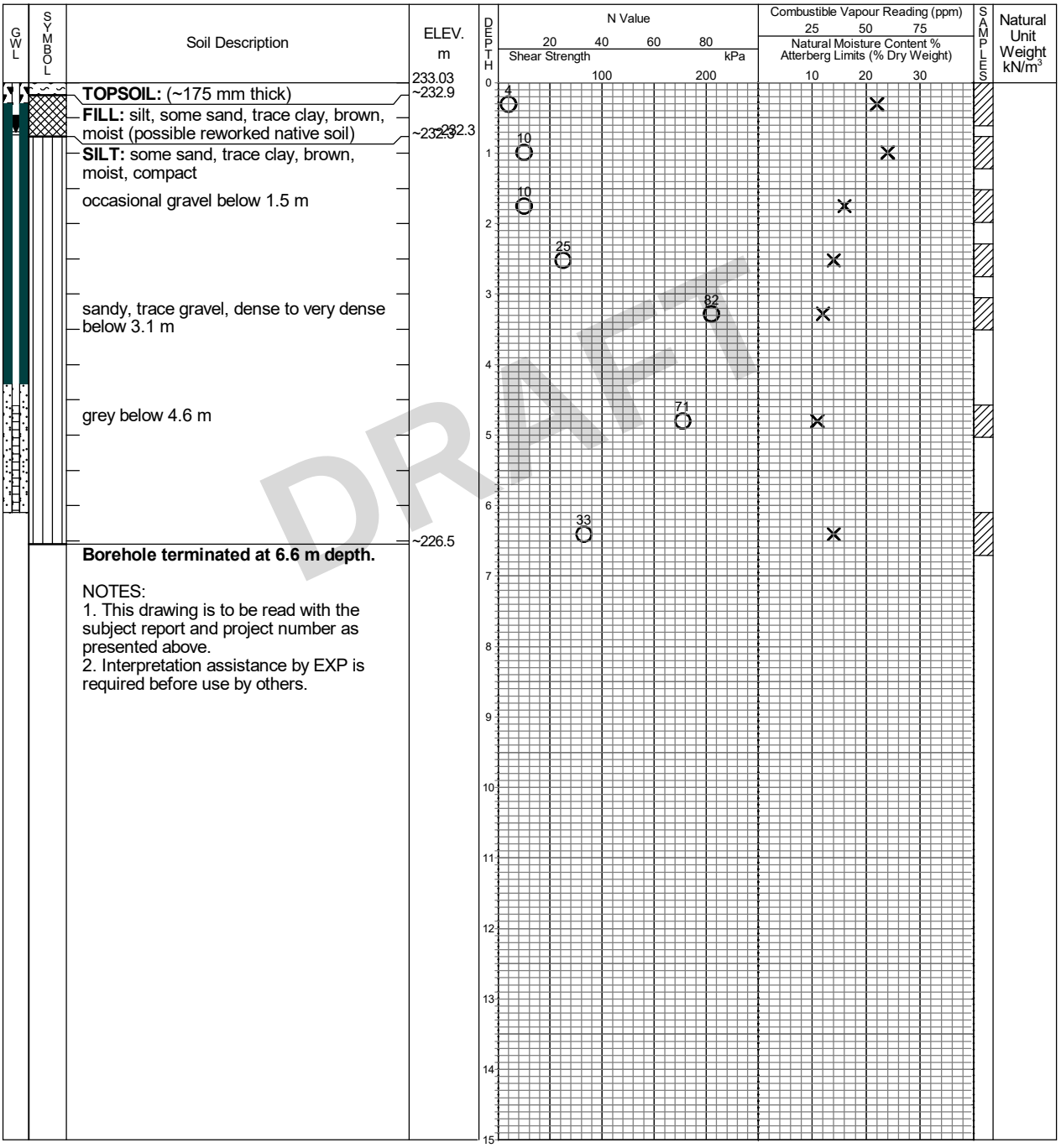
Date Drilled: April 18, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	4.63 bgs	no cave
June 4, 2018	0.74 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-10

Project No. HAM-00801363-A0 | Drawing No. 12

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

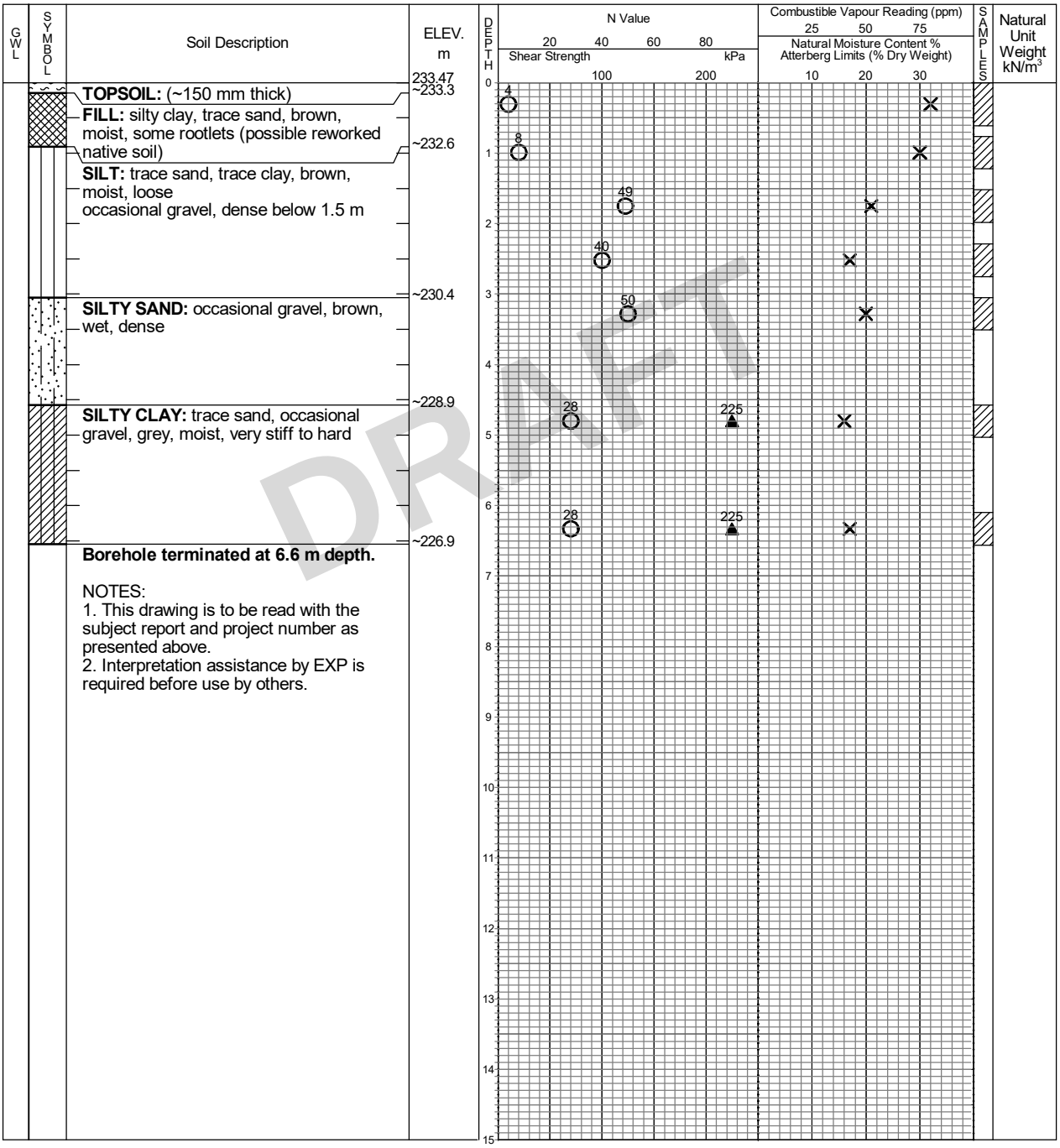
Date Drilled: March 29, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	dry	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-11

Project No. HAM-00801363-A0 | Drawing No. 13

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

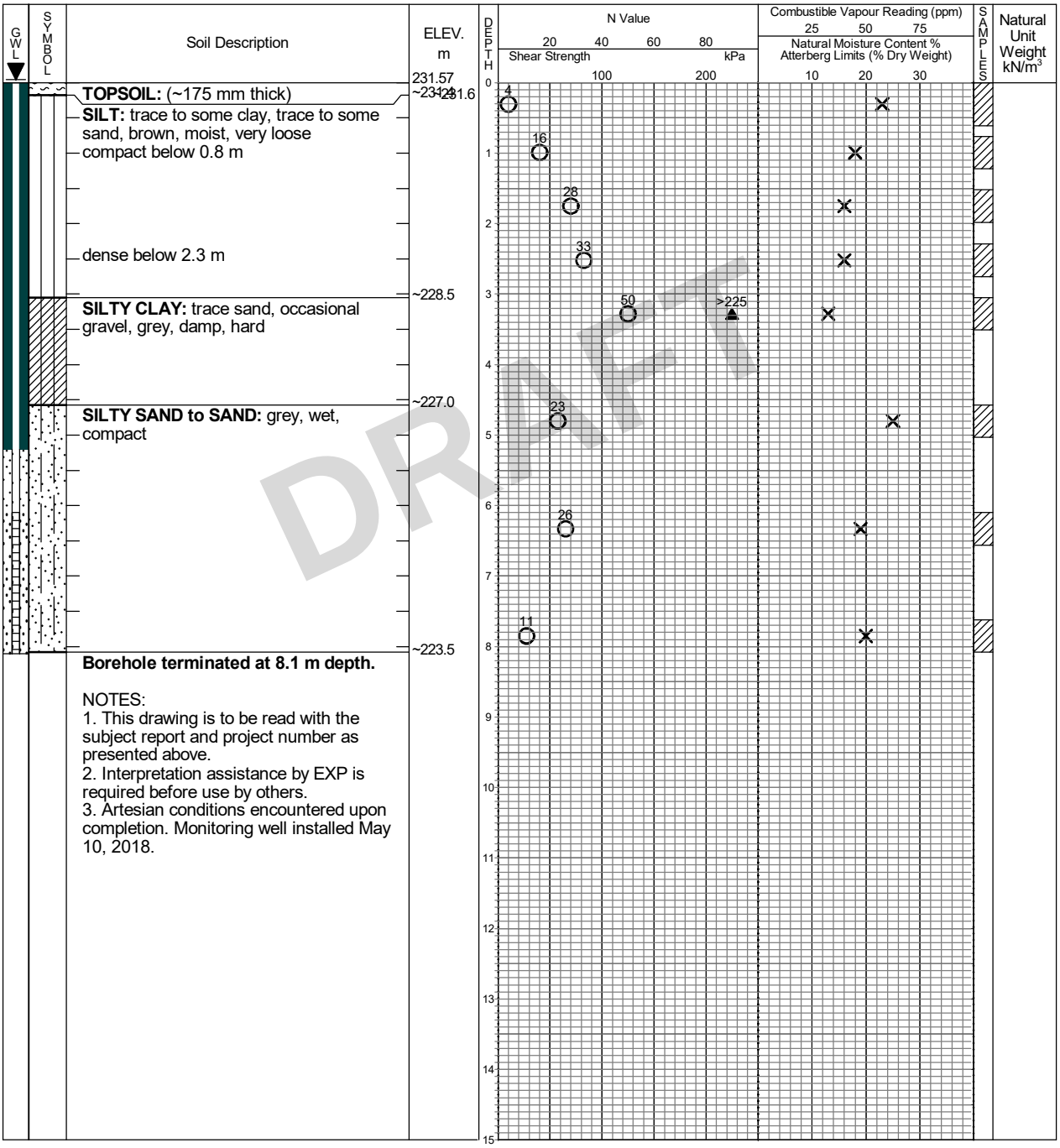
Date Drilled: March 29, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.
3. Artesian conditions encountered upon completion. Monitoring well installed May 10, 2018.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	ags	6.70
May 10, 2018	ags	--
June 5, 2018	1.20 ags	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-12

Project No. HAM-00801363-A0 | Drawing No. 14

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

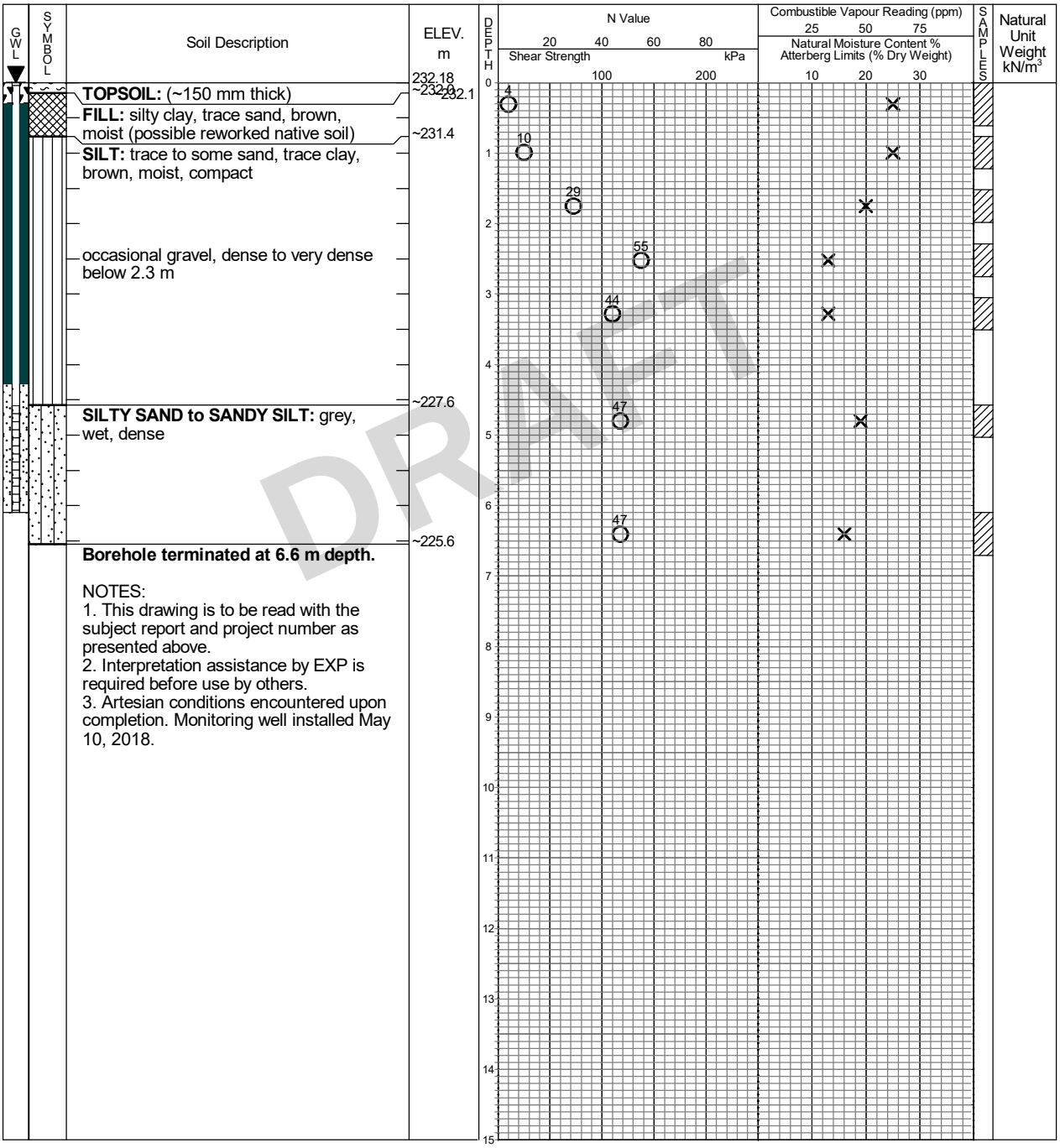
Date Drilled: April 17, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.
3. Artesian conditions encountered upon completion. Monitoring well installed May 10, 2018.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	ags	3.70
May 10, 2018	ags	--
June 5, 2018	0.04 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-13

Project No. HAM-00801363-A0 | Drawing No. 15

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

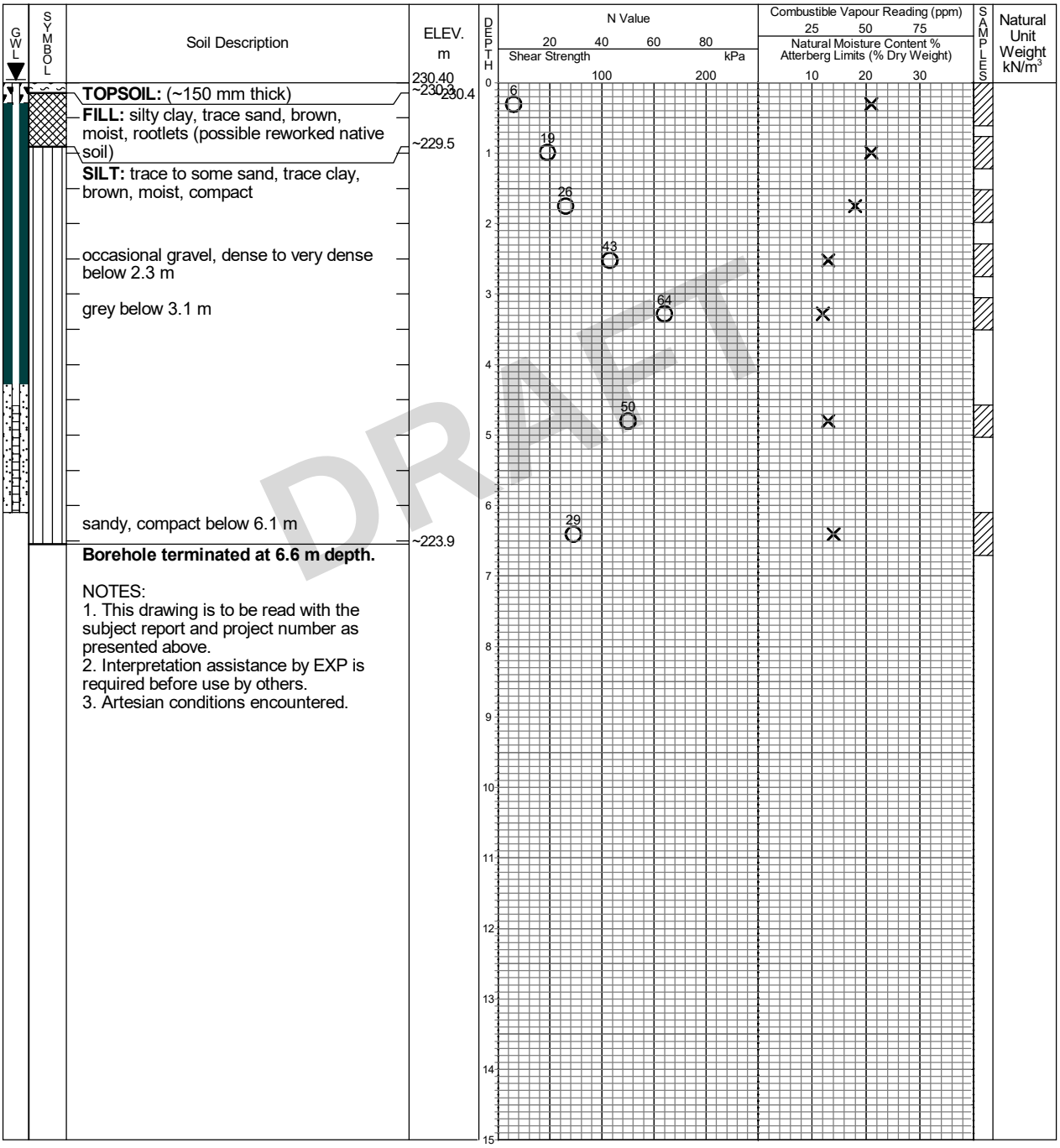
Date Drilled: April 17, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.
3. Artesian conditions encountered.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	dry	no cave
June 5, 2018	0.19 ags	

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-14

Project No. HAM-00801363-A0 | Drawing No. 16

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

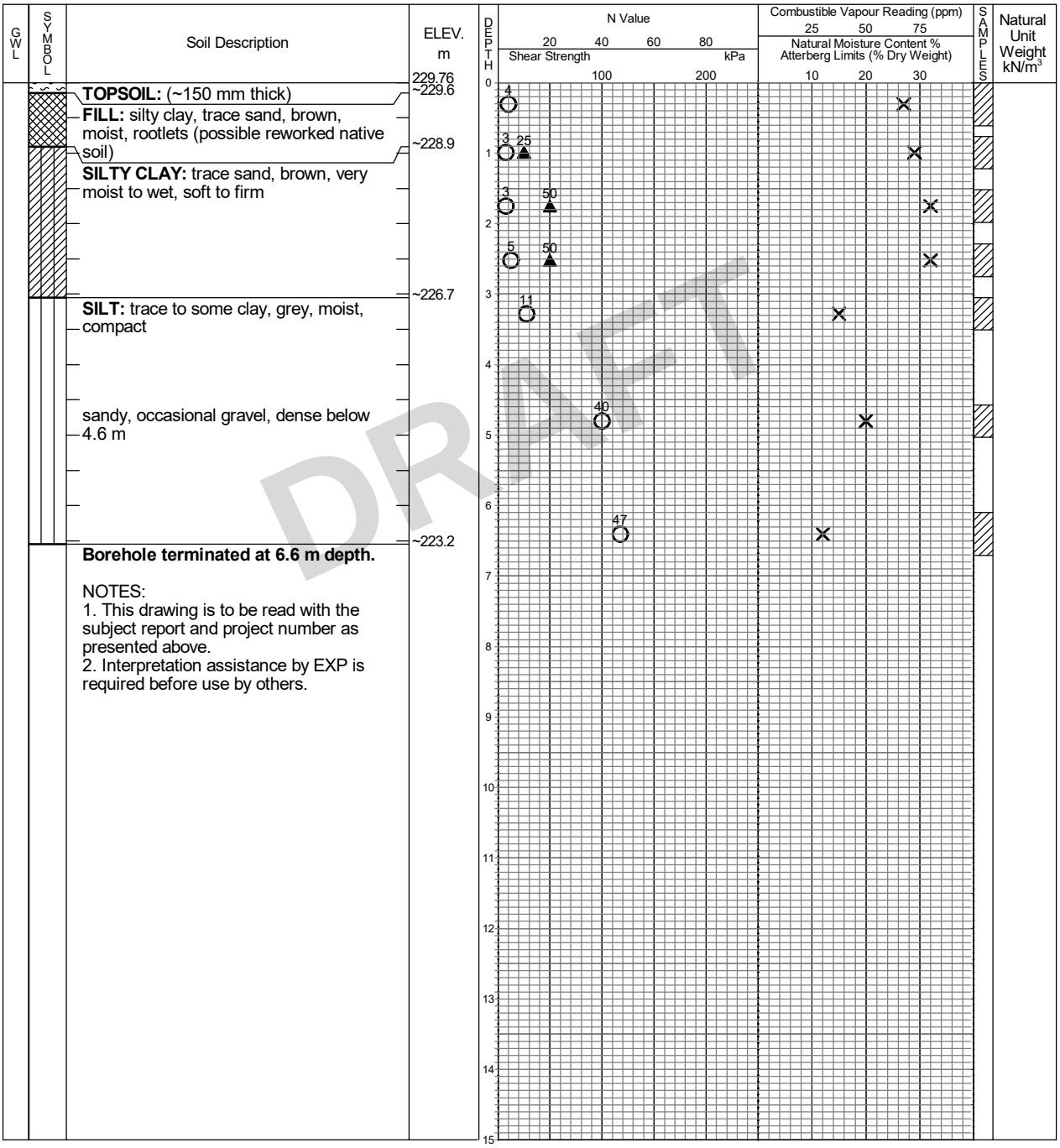
Date Drilled: April 17, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	N/A	0.9 (bridged)

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-15

Project No. HAM-00801363-A0 | Drawing No. 17

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

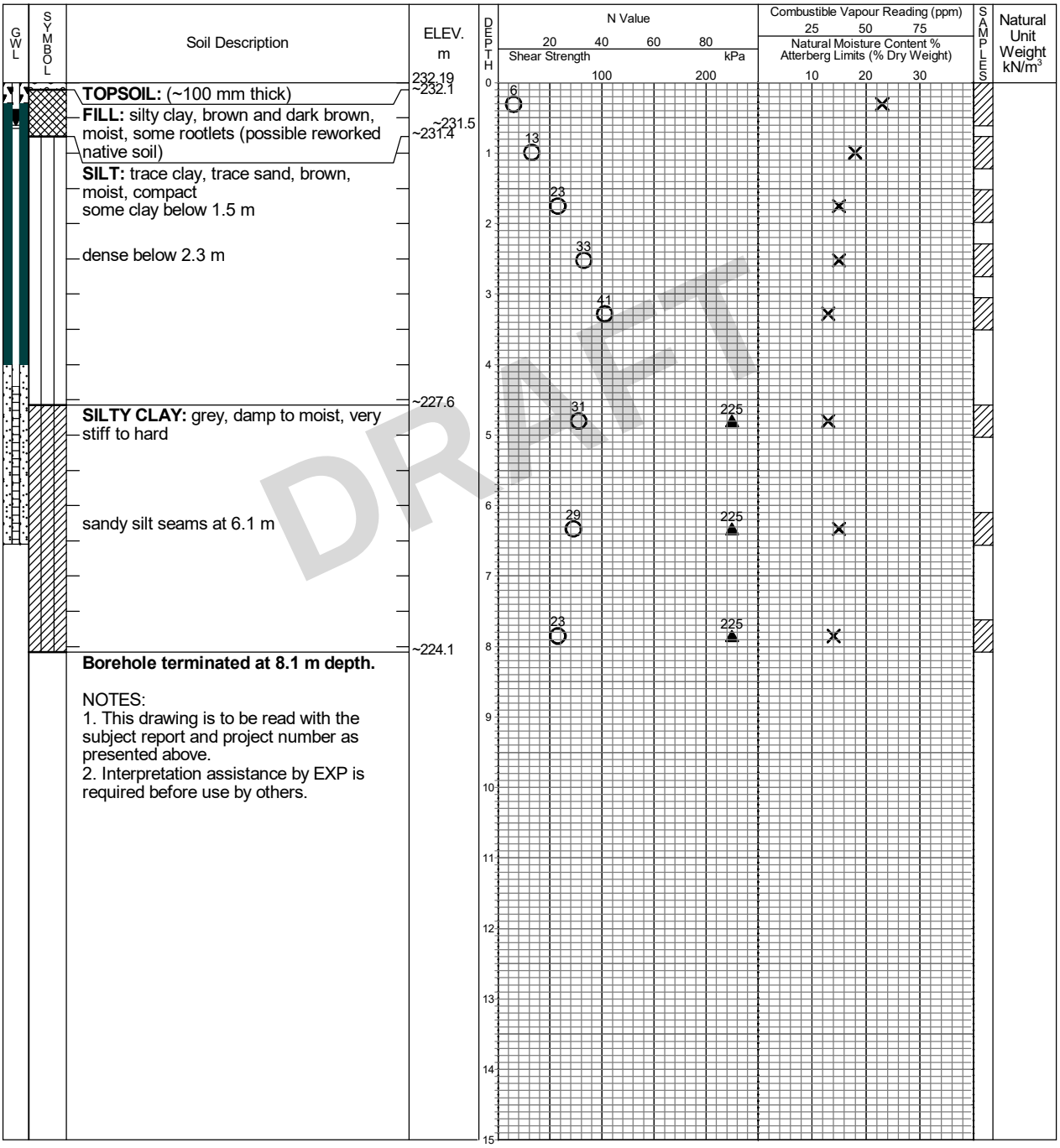
Date Drilled: March 26, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	dry	no cave
Mar. 27	1.59 bgs	--
June 4, 2018	0.65 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-16

Project No. HAM-00801363-A0 | Drawing No. 18

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

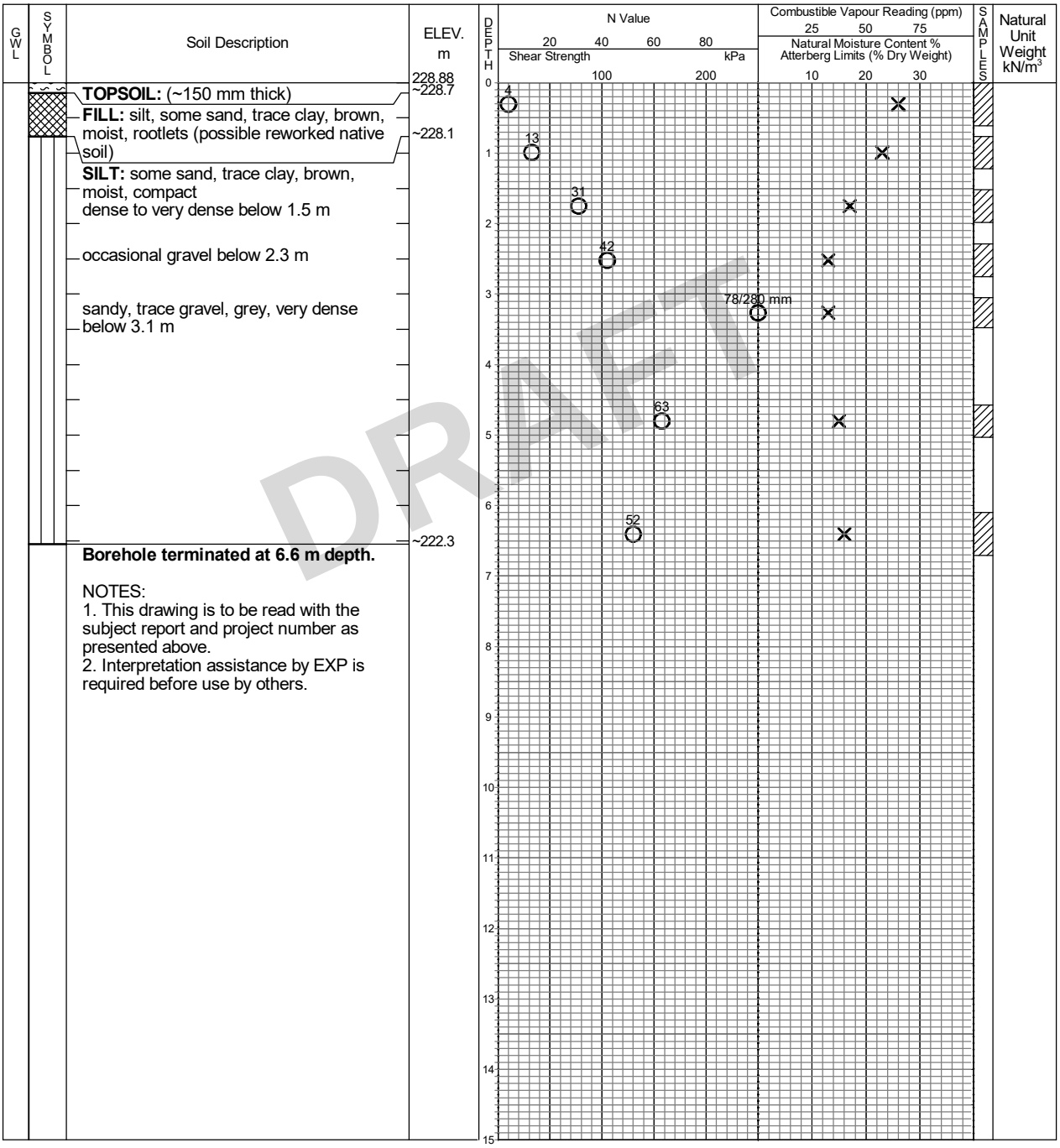
Date Drilled: April 17, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.80 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-17

Project No. HAM-00801363-A0 | Drawing No. 19

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

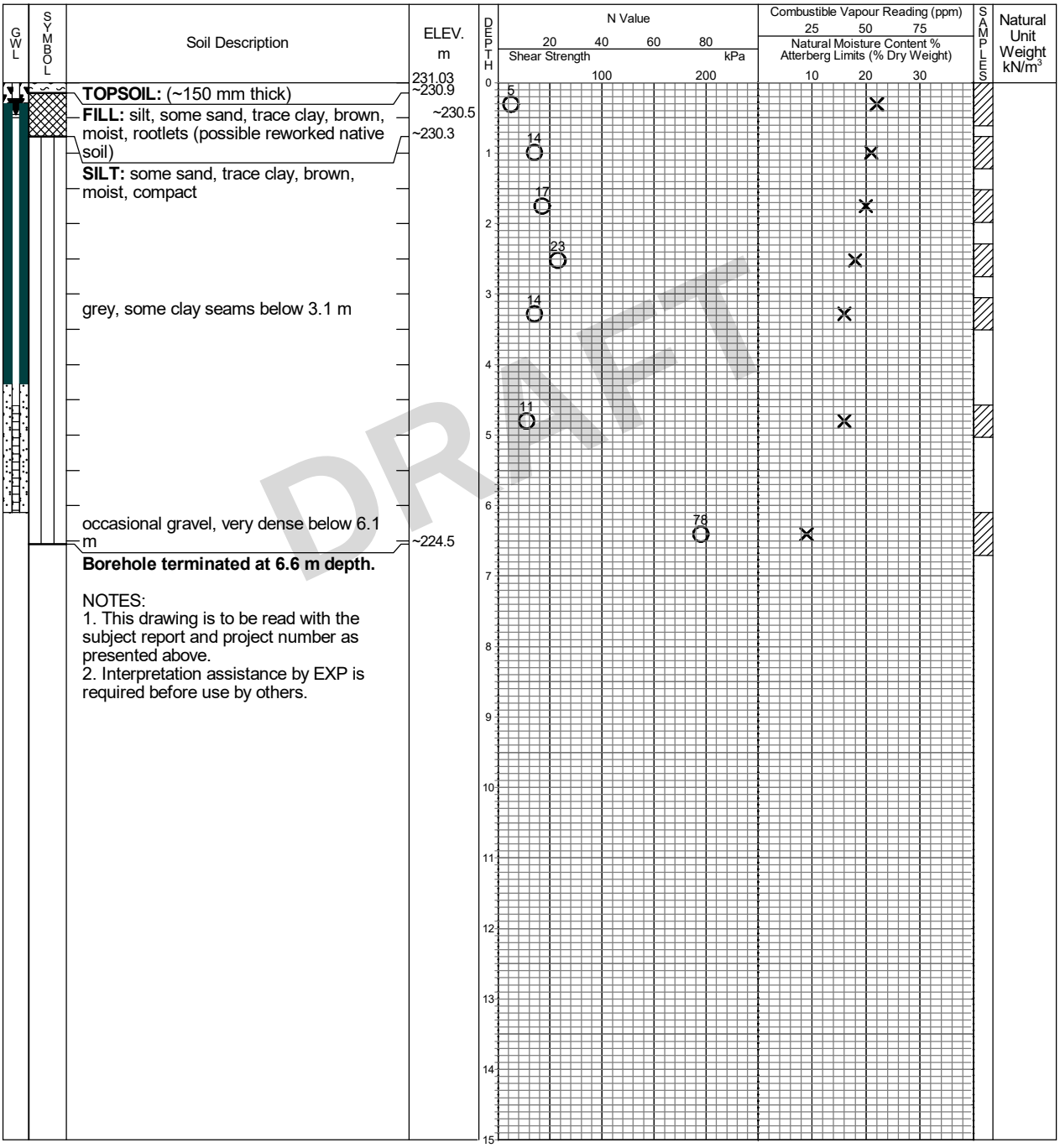
Date Drilled: April 17, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



TOPSOIL: (~150 mm thick)

FILL: silt, some sand, trace clay, brown, moist, rootlets (possible reworked native soil)

SILT: some sand, trace clay, brown, moist, compact

grey, some clay seams below 3.1 m

occasional gravel, very dense below 6.1 m

Borehole terminated at 6.6 m depth.

NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion June 5, 2018	dry 0.50 bgs	no cave --

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-18

Project No. HAM-00801363-A0 | Drawing No. 20

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

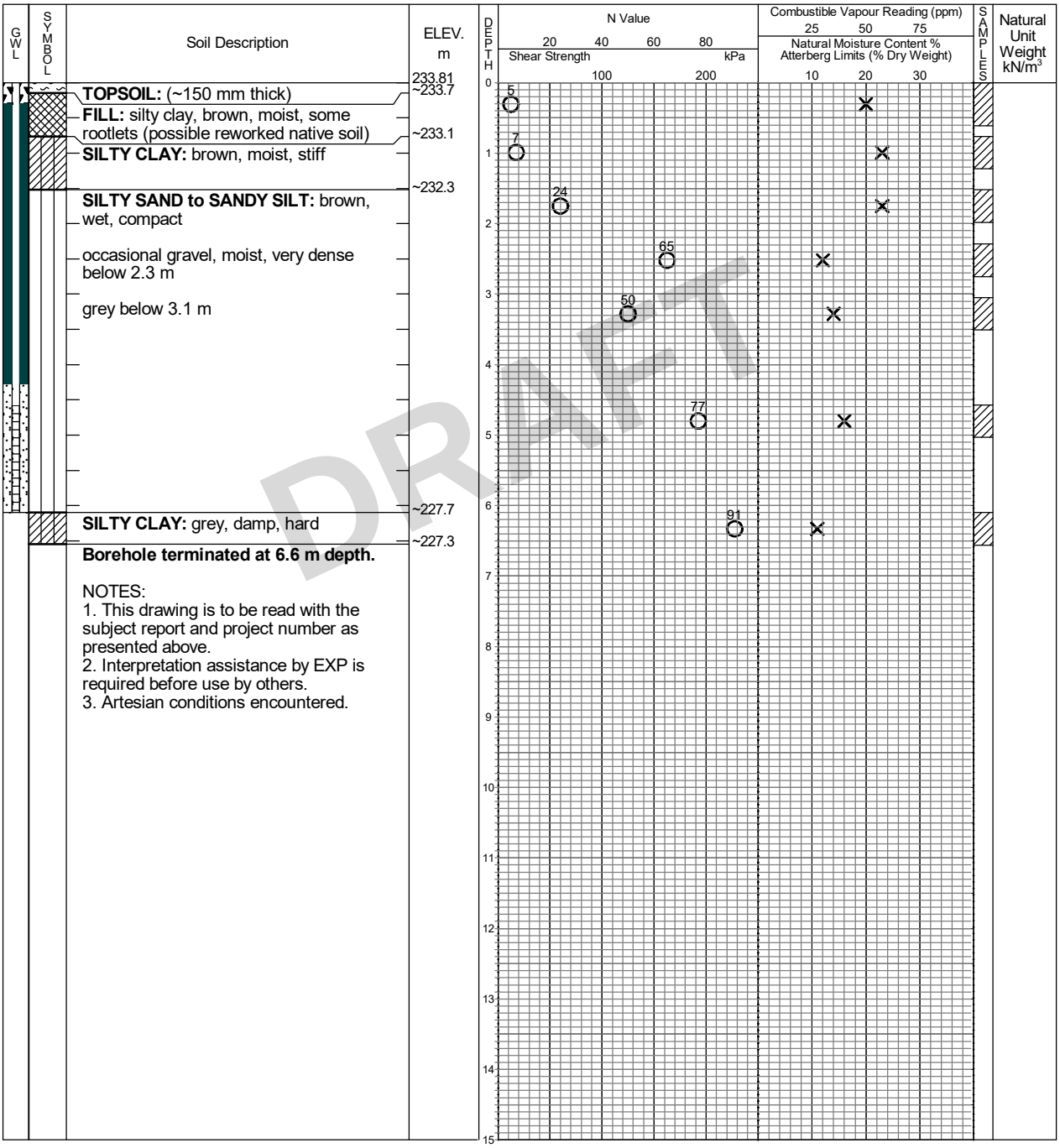
Date Drilled: March 28, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.
3. Artesian conditions encountered.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.3 bgs	no cave
June 4, 2018	0.85 ags	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-19

Project No. HAM-00801363-A0 | Drawing No. 21

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

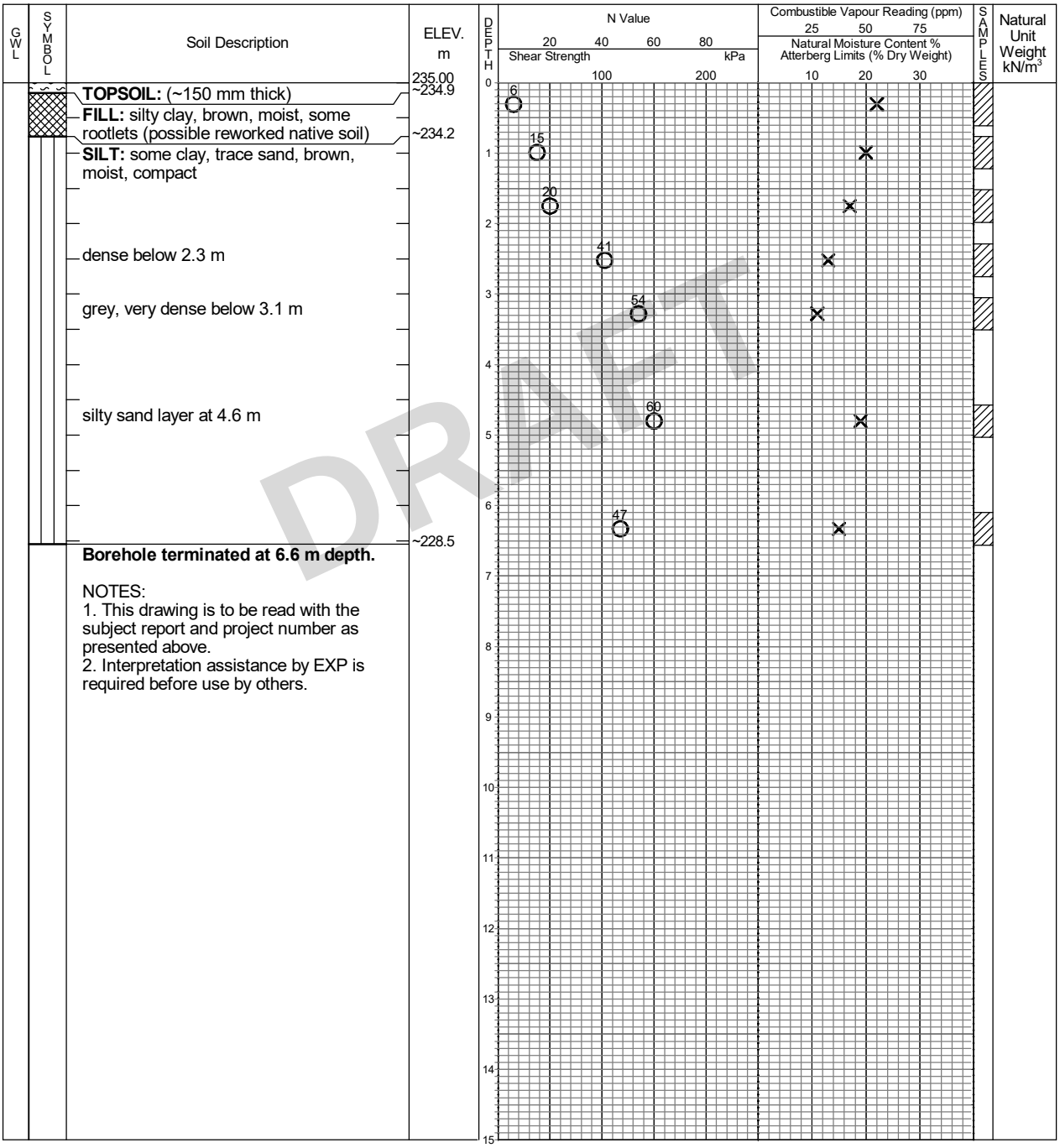
Date Drilled: March 28, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	dry	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-20

Project No. HAM-00801363-A0 | Drawing No. 22

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

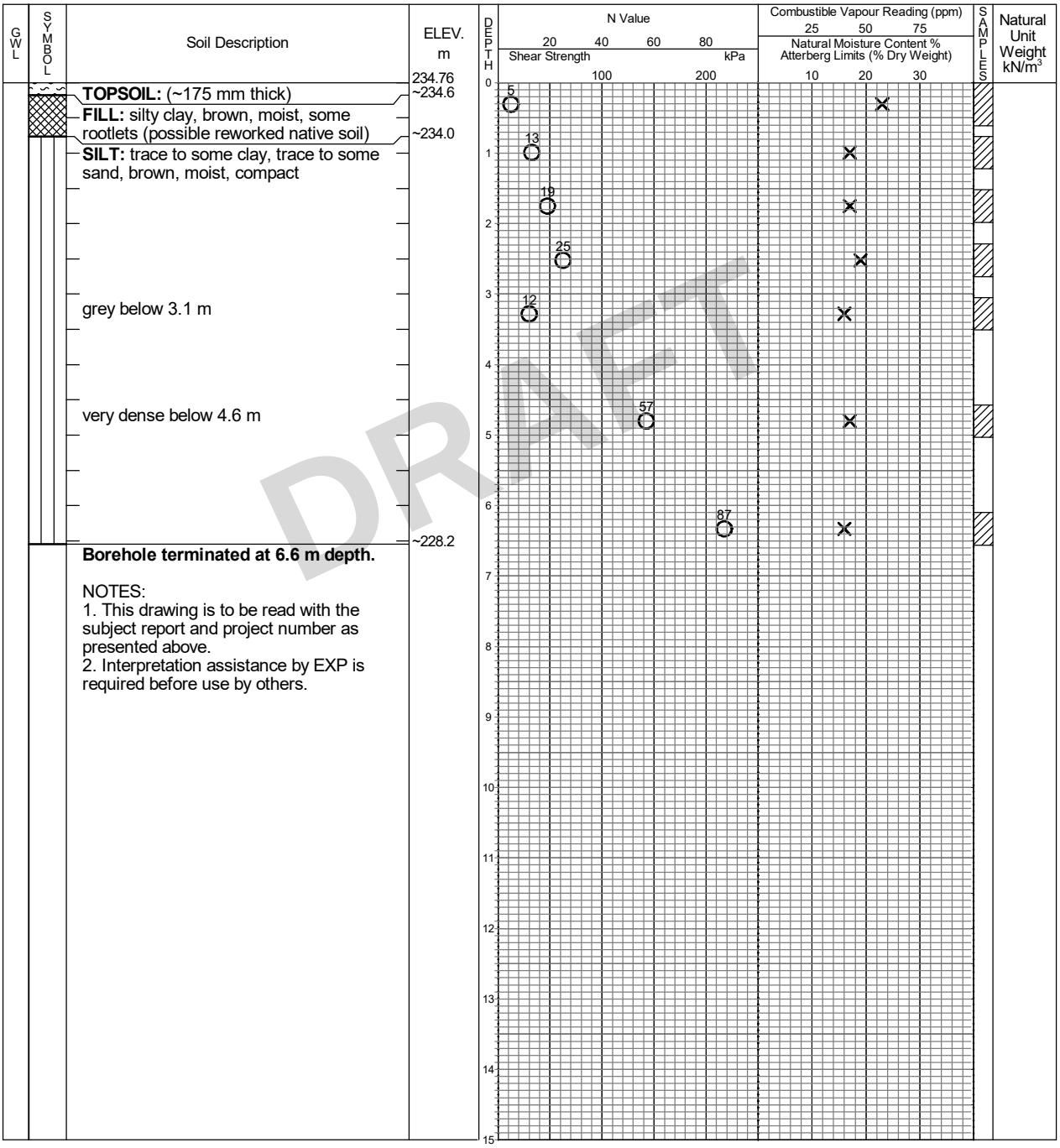
Date Drilled: March 28, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	dry	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-21

Project No. HAM-00801363-A0 | Drawing No. 23

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

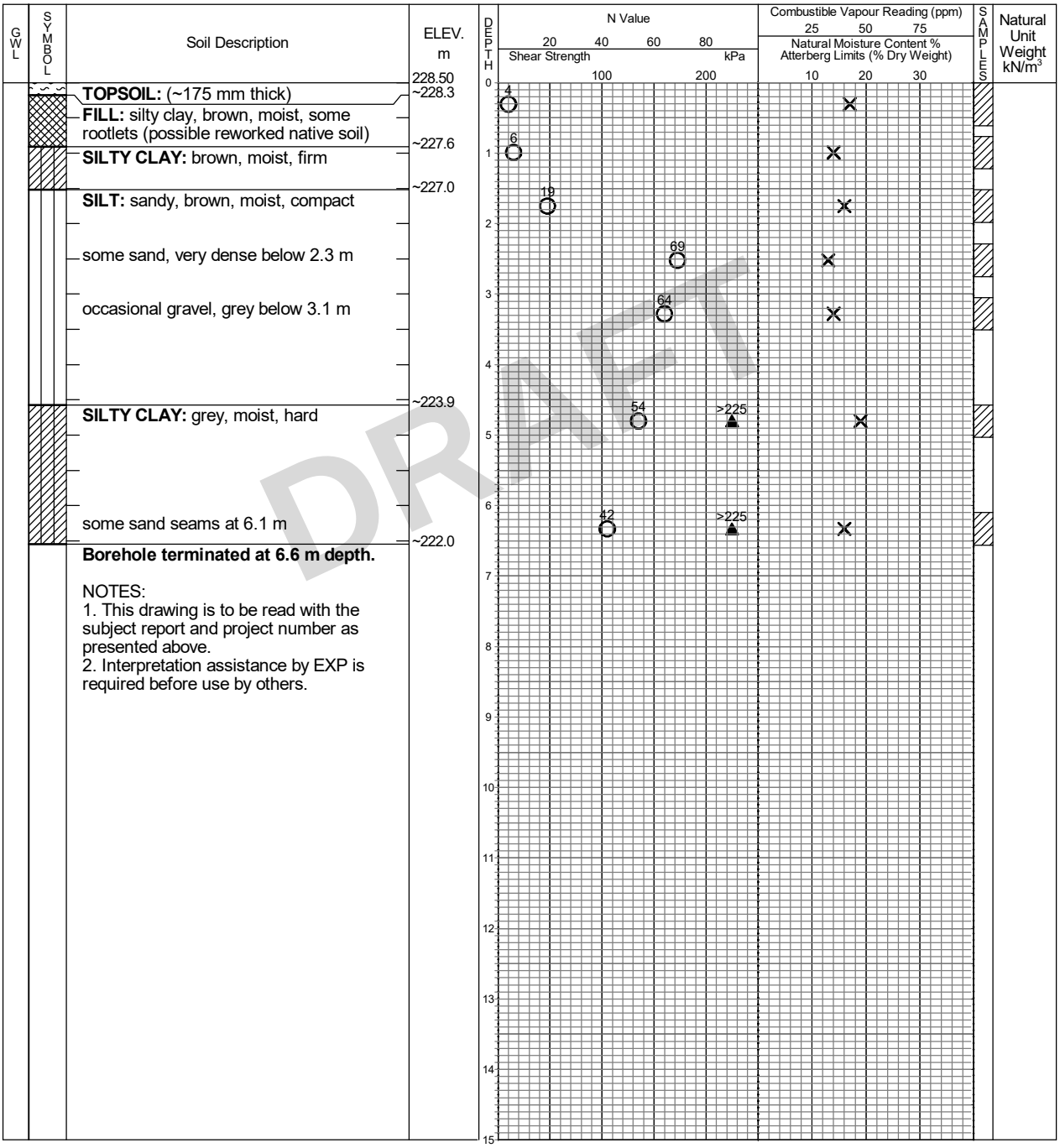
Date Drilled: April 3, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.51 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-22

Project No. HAM-00801363-A0 Drawing No. 24

Project: Proposed Glanbrook Industrial Subdivision Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

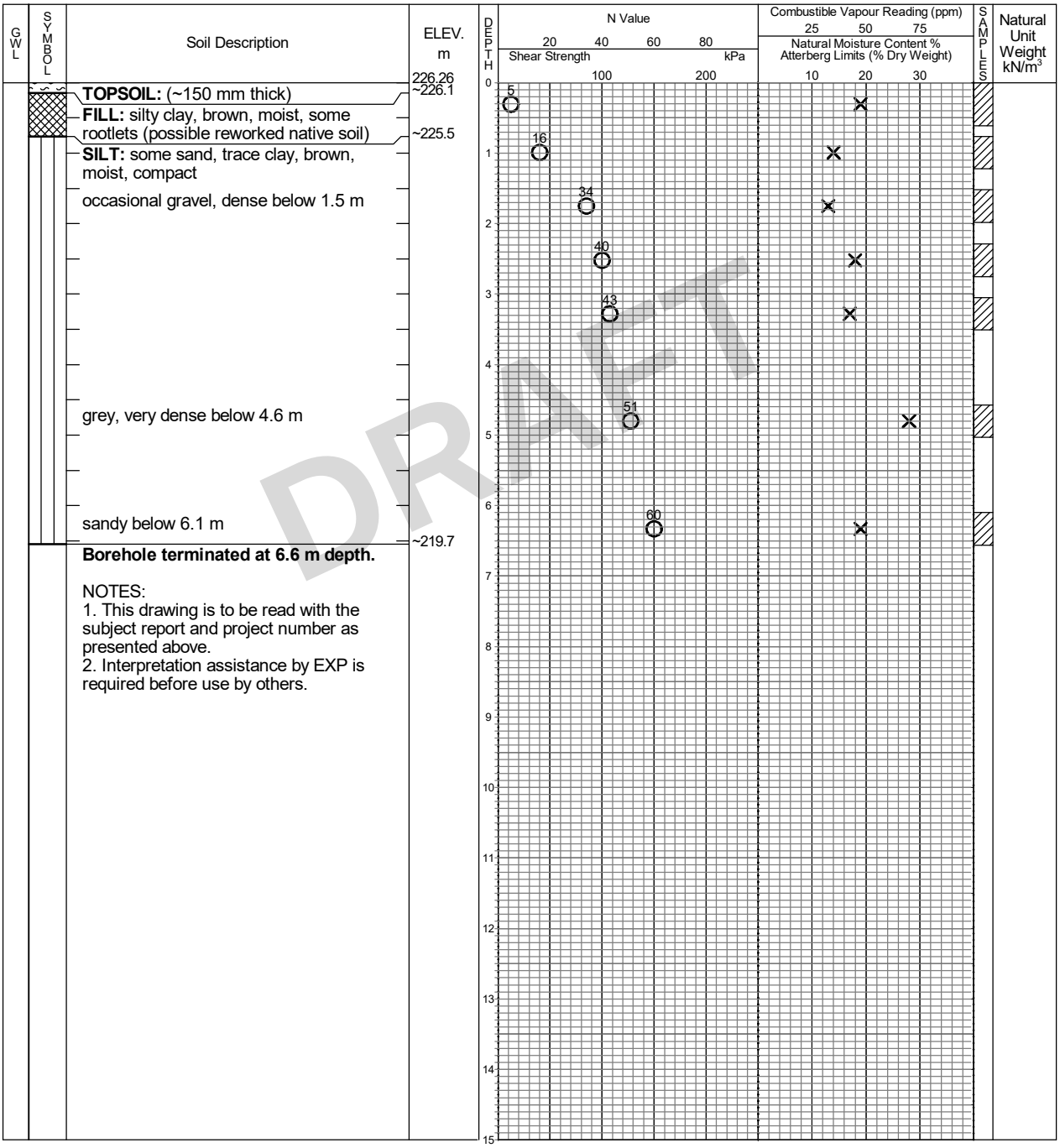
Date Drilled: April 3, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.90 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-23

Project No. HAM-00801363-A0 Drawing No. 25

Project: Proposed Glanbrook Industrial Subdivision Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

Date Drilled: April 18, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m
			223.80
		TOPSOIL: (~150 mm thick)	~223.7
		FILL: silt, some sand, trace clay, brown, moist (possible reworked native soil)	~223.0
		SILT: some sand, trace clay, brown, moist, compact	
		occasional gravel below 1.5 m	
		grey, dense below 2.3 m	
		sandy below 3.1 m	
		very moist below 4.6 m	
		Borehole terminated at 6.6 m depth.	~217.3

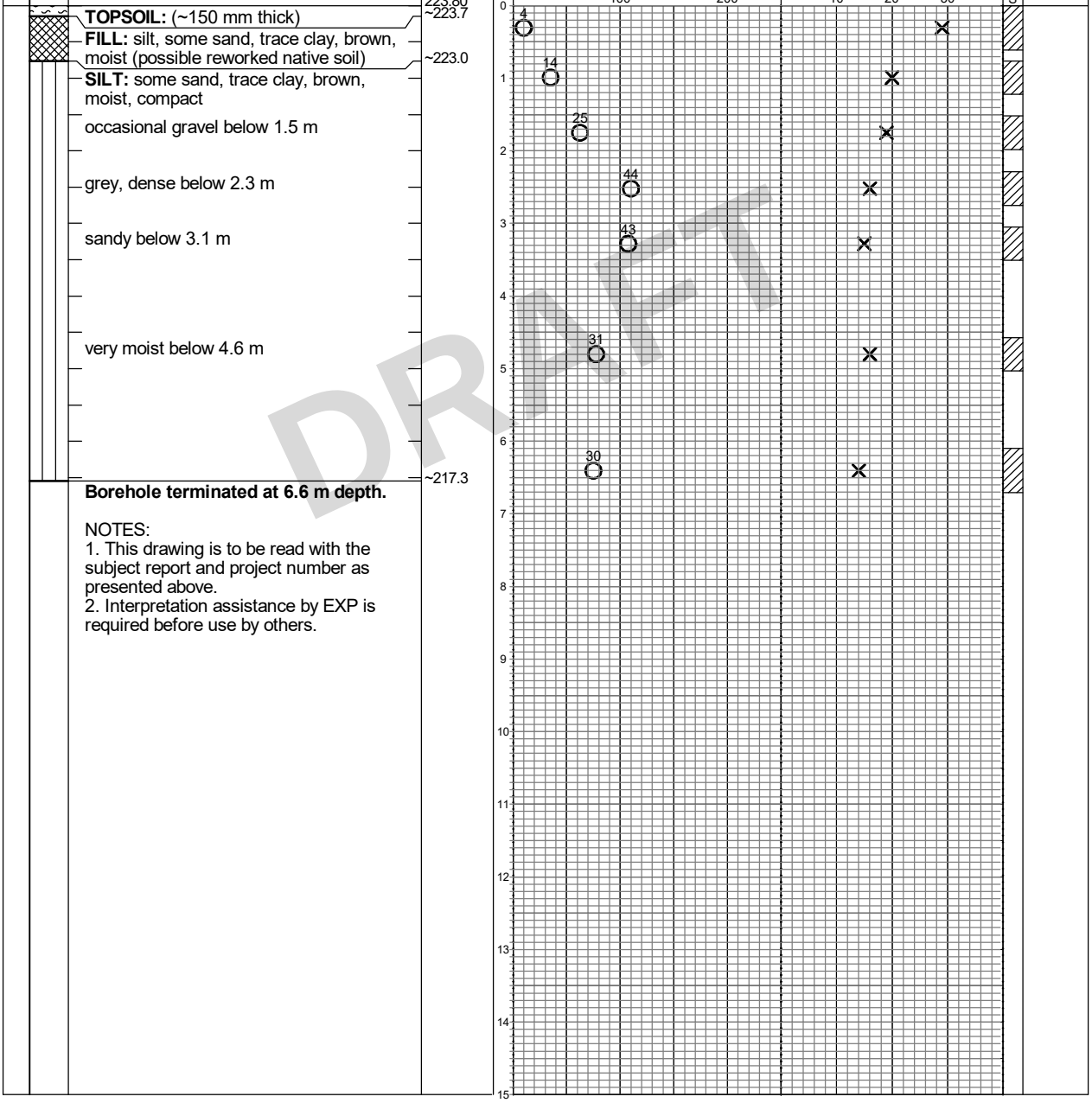
NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

DEPTH

N Value: 20 40 60 80
Shear Strength kPa: 100 200
Combustible Vapour Reading (ppm): 25 50 75
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

SAMPLES

Natural Unit Weight kN/m³



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.21 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-24

Project No. HAM-00801363-A0 | Drawing No. 26

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

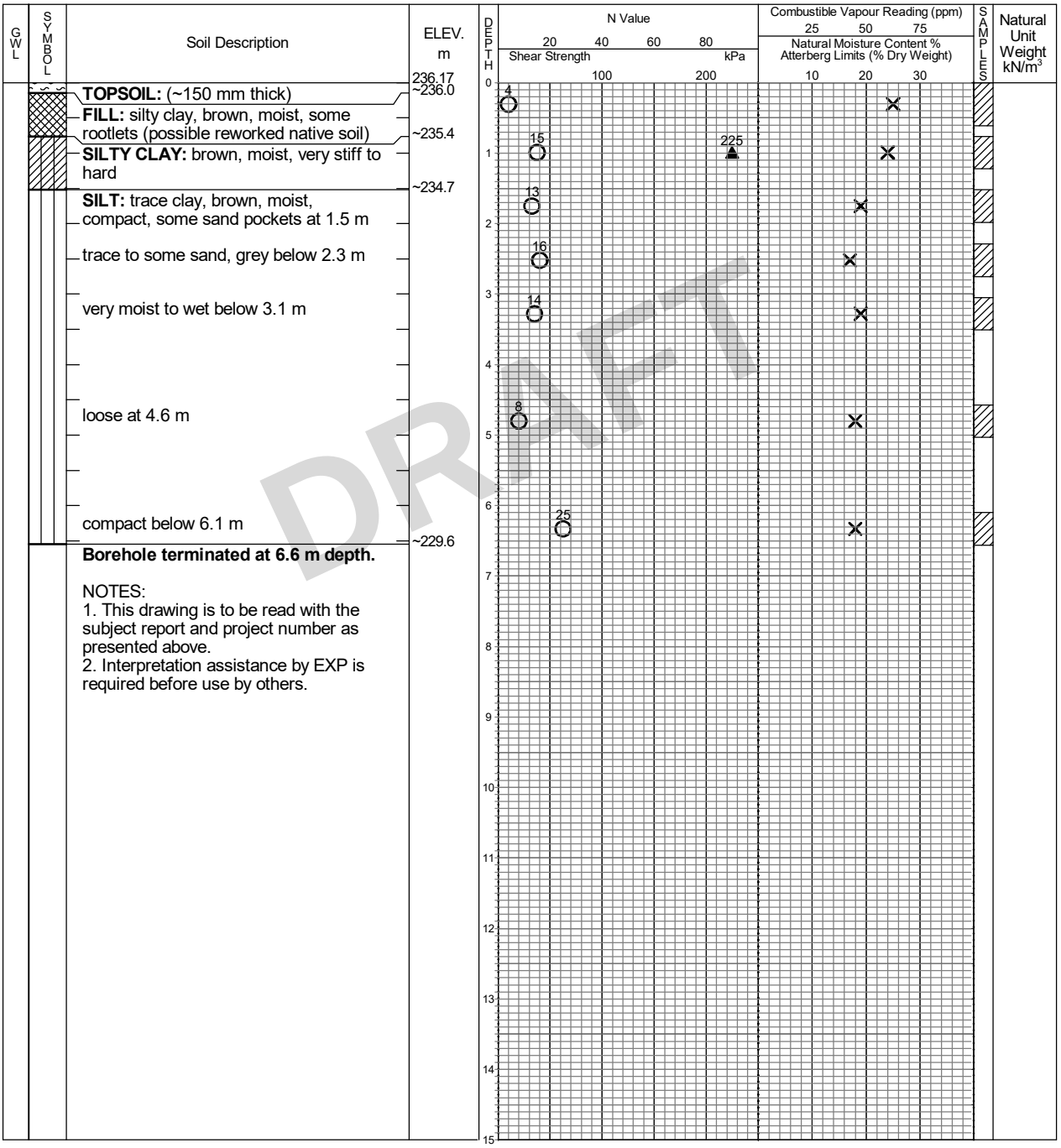
Date Drilled: March 26, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.52 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-25

Project No. HAM-00801363-A0 Drawing No. 27

Project: Proposed Glanbrook Industrial Subdivision Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

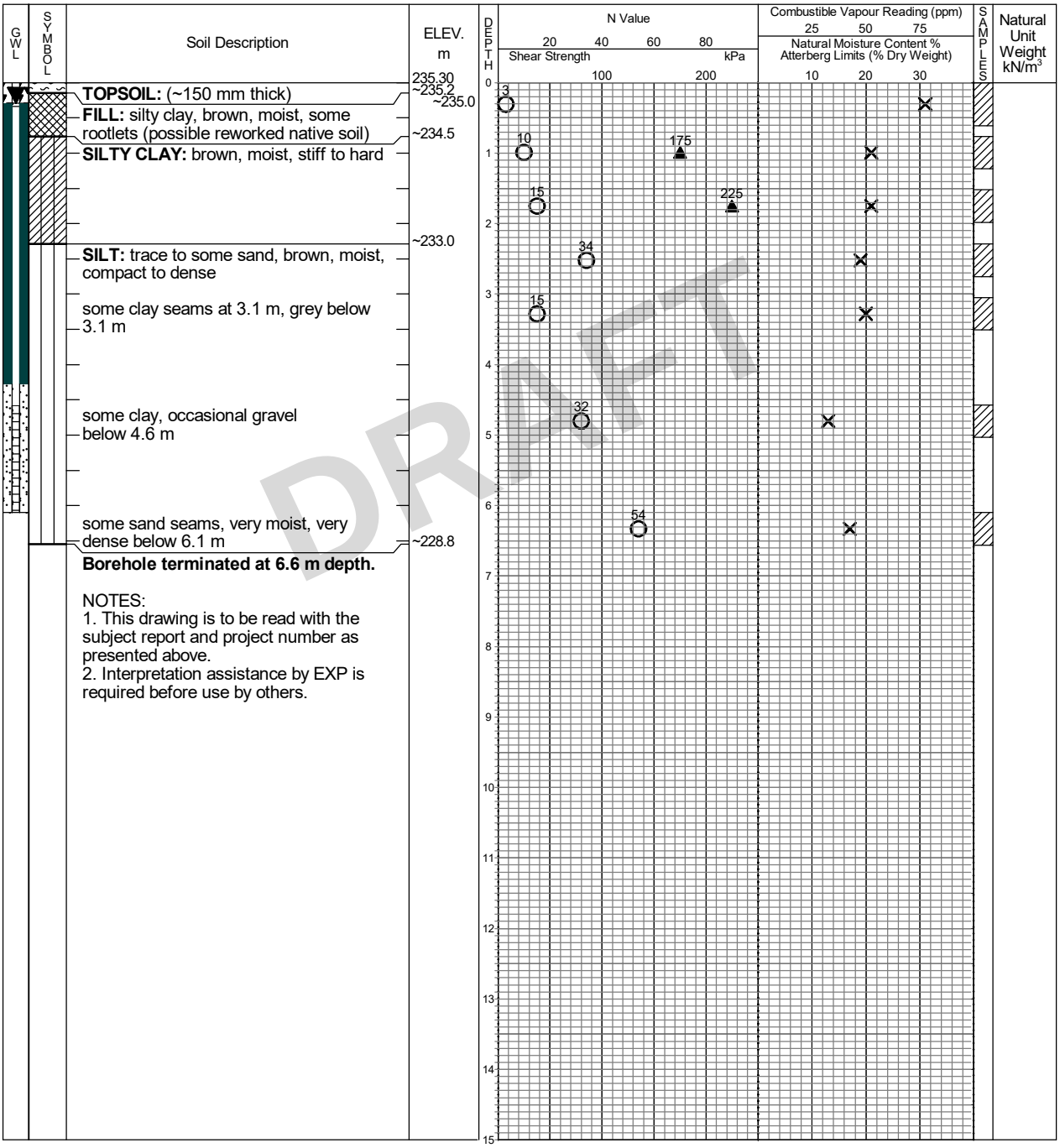
Date Drilled: March 27, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.81 bgs	no cave
June 5, 2018	0.34 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-26

Project No. HAM-00801363-A0 | Drawing No. 28

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

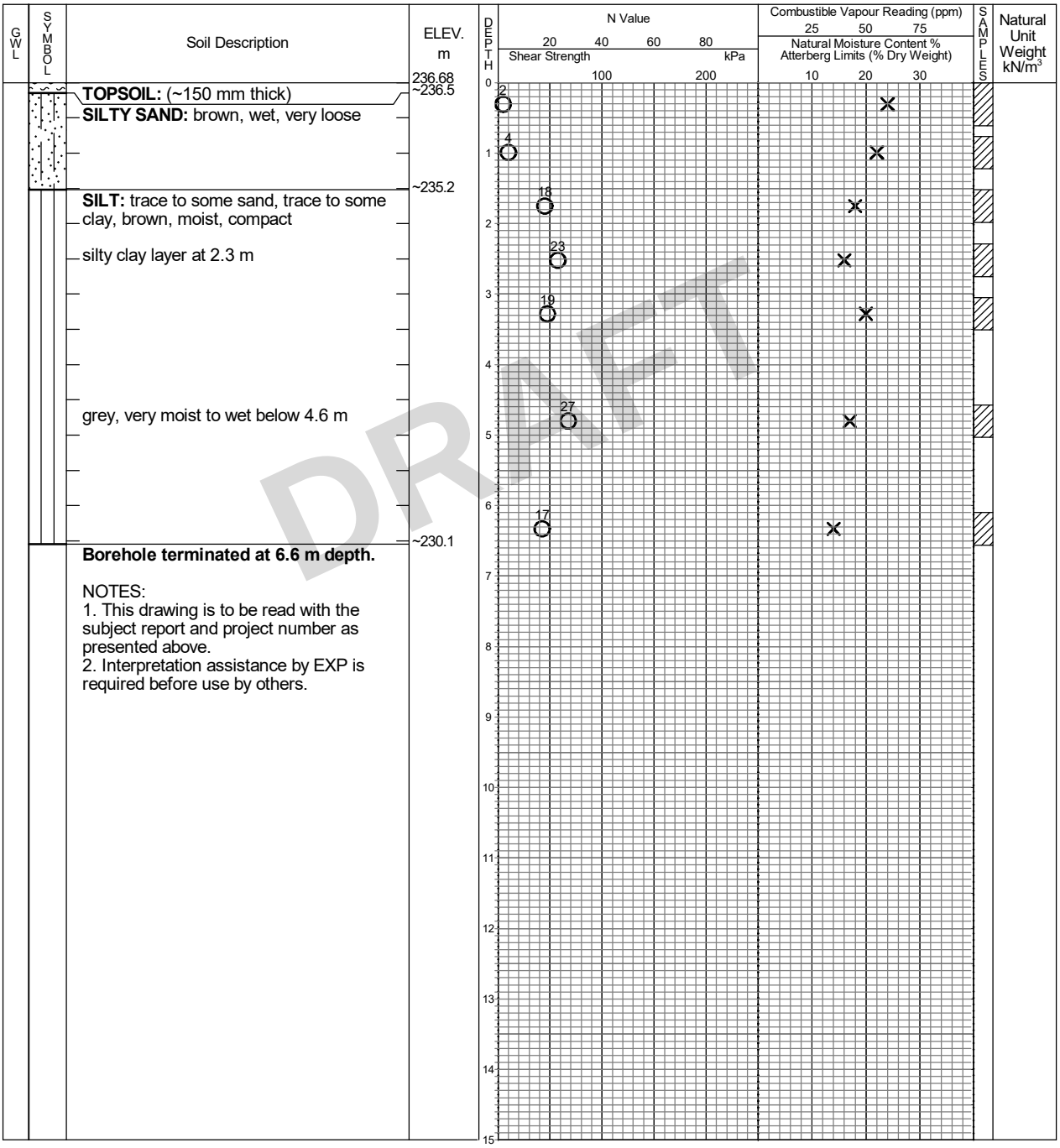
Date Drilled: March 26, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	4.32 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-27

Project No. HAM-00801363-A0 | Drawing No. 29

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

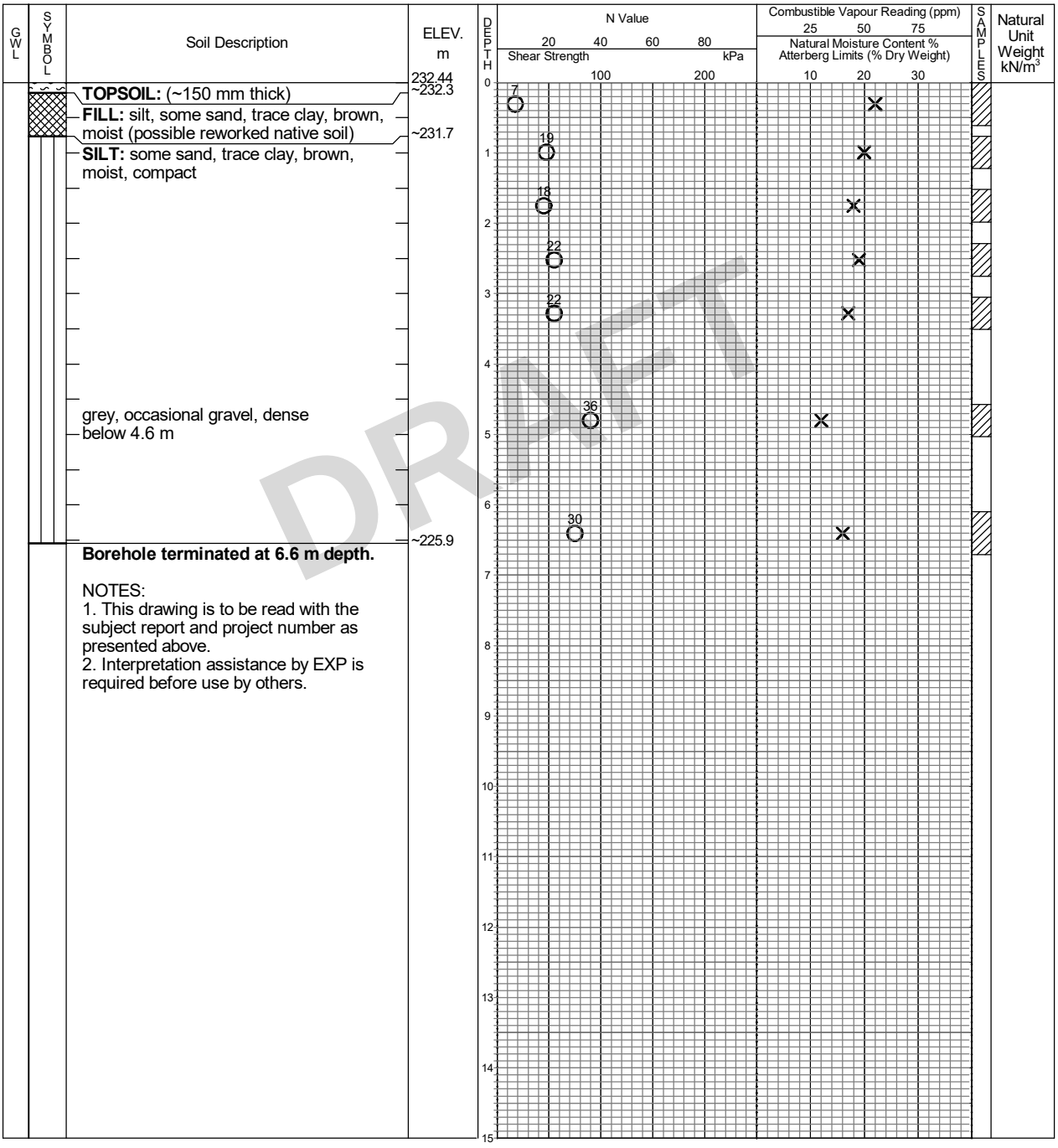
Date Drilled: April 18, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.83 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-28

Project No. HAM-00801363-A0 Drawing No. 30

Project: Proposed Glanbrook Industrial Subdivision Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

Date Drilled: April 18, 2018

Drill Type: D-50 Track Mount. Solid Stem.

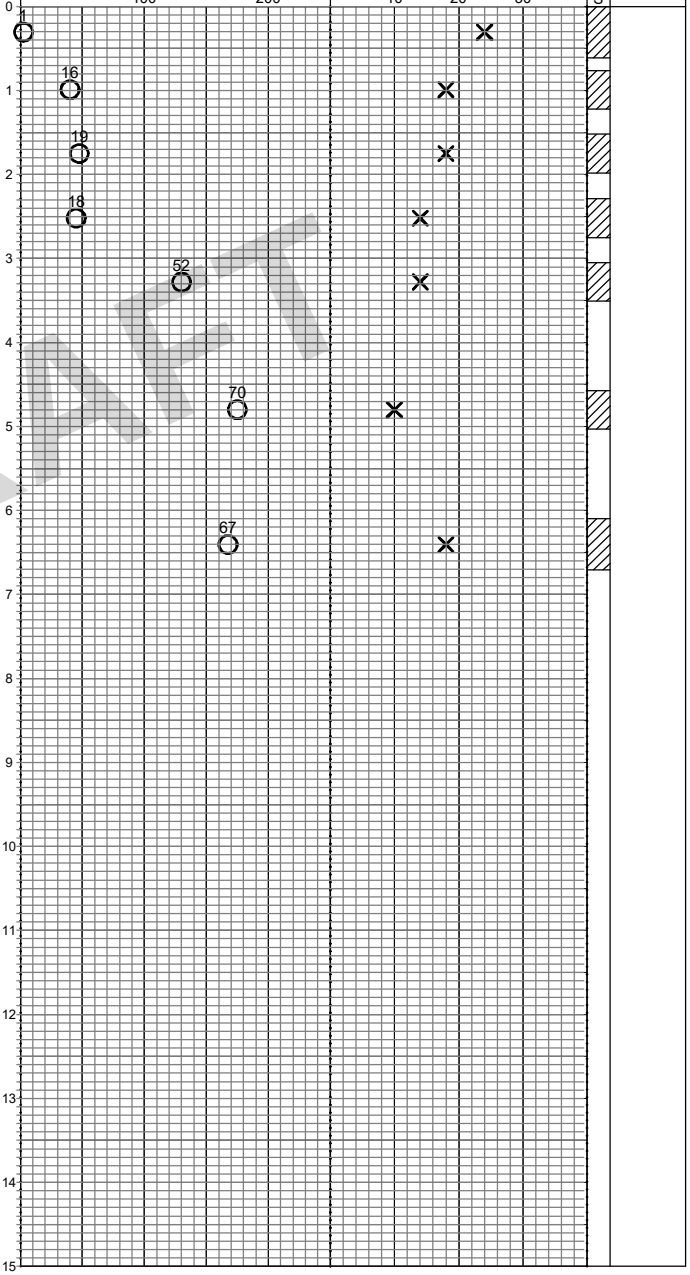
Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer

Soil Description	ELEV. m
	225.12
TOPSOIL: (~150 mm thick)	~225.0
FILL: silt, some sand, trace clay, brown, moist (possible reworked native soil)	~224.4
SILT: some sand, trace clay, brown, moist, compact	
grey, occasional gravel below 2.3 m	
sandy, trace gravel, very dense below 3.1 m	
wet below 6.1 m	
Borehole terminated at 6.6 m depth.	~218.6

NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	5.94 bgs	no cave

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-29

Project No. HAM-00801363-A0 | Drawing No. 31

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

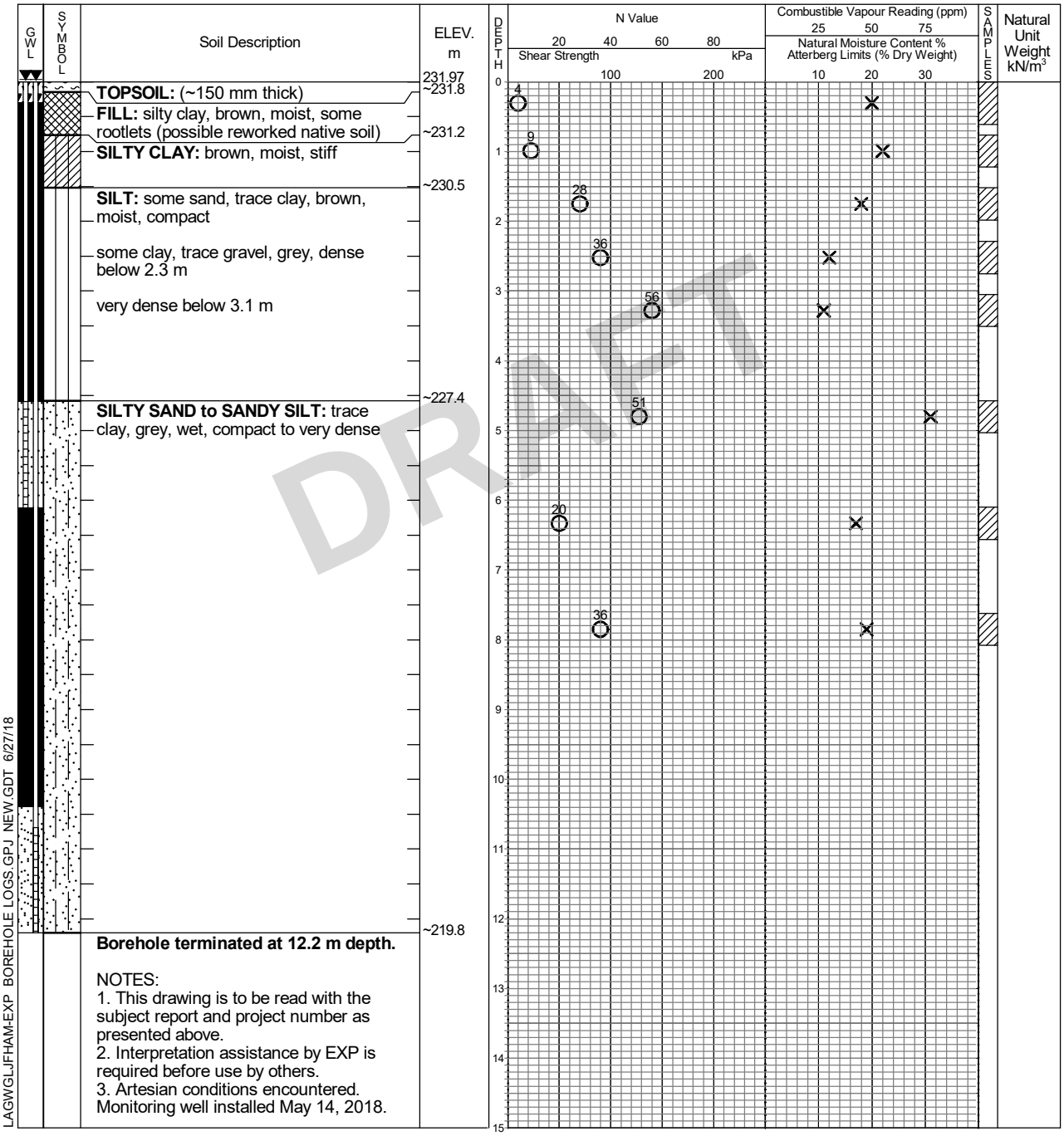
Date Drilled: March 28, 2018

Drill Type: CME-55 Track Mount. Hollow Stem.

Datum: Geodetic

Auger Sample | SPT (N) Value | Dynamic Cone Test | Shelby Tube | Field Vane Test (S)

Combustible Vapour Reading | Natural Moisture | Plastic and Liquid Limit | Undrained Triaxial at % Strain at Failure | Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.
3. Artesian conditions encountered. Monitoring well installed May 14, 2018.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	0.84 bgs	6.1
Mar. 29 (shallow)	ags	--
Mar. 29 (deep)	ags	--
Jun. 5 (shallow)	2.90 ags	--
Jun. 5 (deep)	1.37 ags	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-30

Project No. HAM-00801363-A0 | Drawing No. 32

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

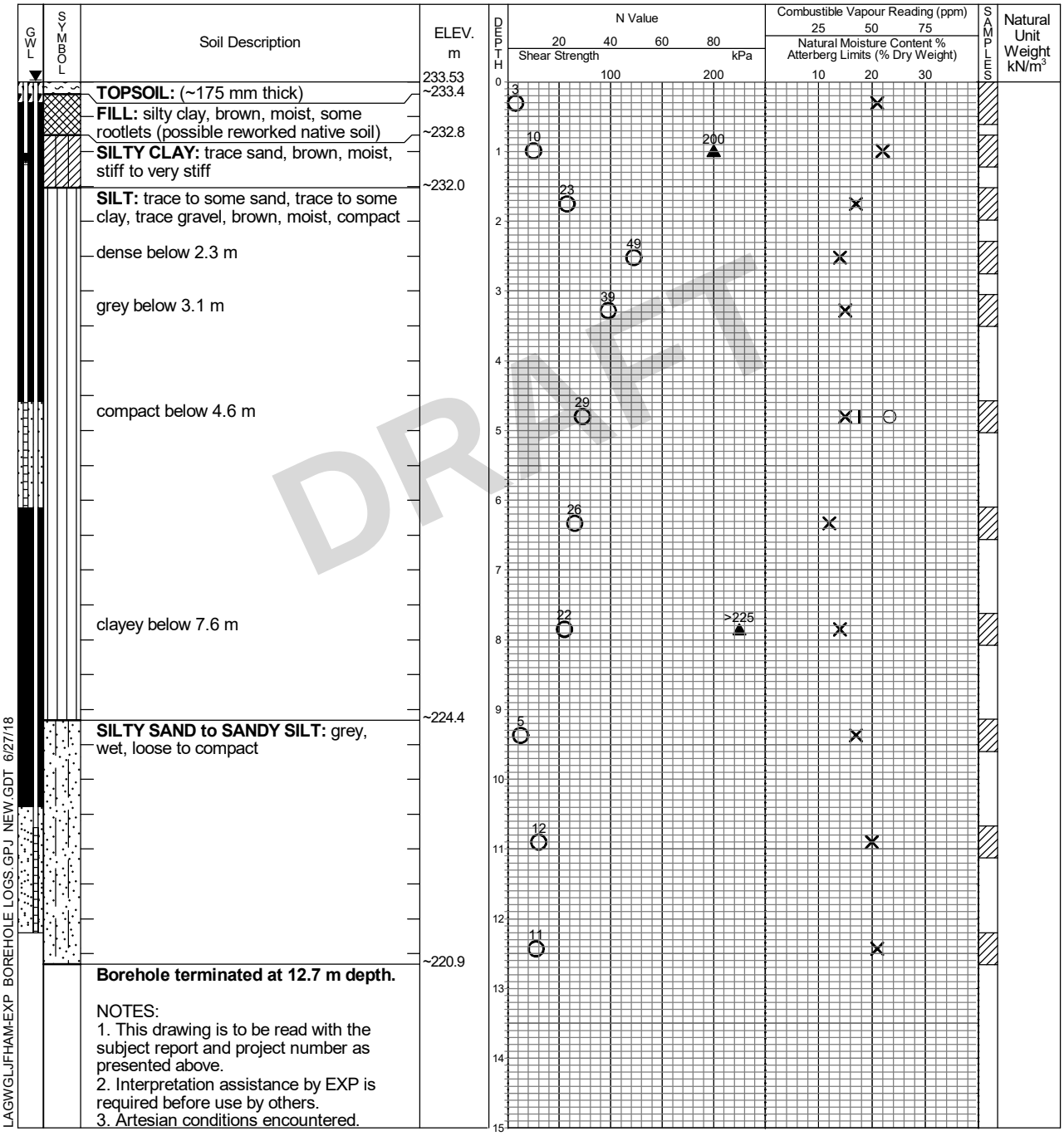
Date Drilled: May 10, 2018

Drill Type: CME-55 Track Mount. Hollow Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



NOTES:
1. This drawing is to be read with the subject report and project number as presented above.
2. Interpretation assistance by EXP is required before use by others.
3. Artesian conditions encountered.

LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	ags	9.3
Jun. 5 (shallow)	1.18 bgs	--
Jun. 5 (deep)	0.70 ags	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-31

Project No. HAM-00801363-A0 | Drawing No. 33

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

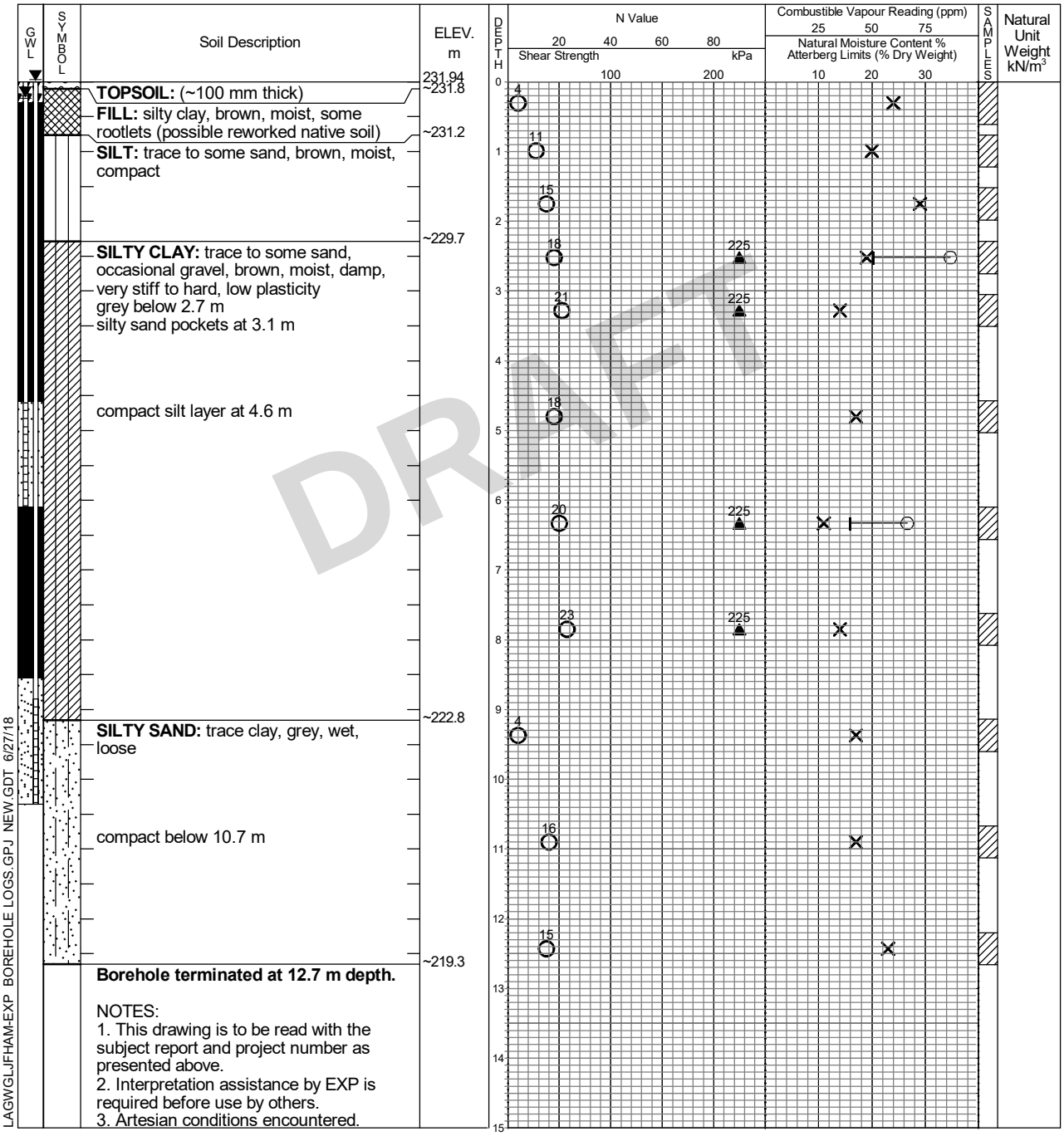
Date Drilled: March 26, 2018

Drill Type: D-50 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	3.10 bgs	10.41
Mar. 27 (shallow)	0.51 bgs	--
Mar. 27 (deep)	0.50 ags	--
Jun. 5 (shallow)	0.20 bgs	--
Jun. 5 (deep)	1.12 ags	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-32

Project No. HAM-00801363-A0 | Drawing No. 34

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

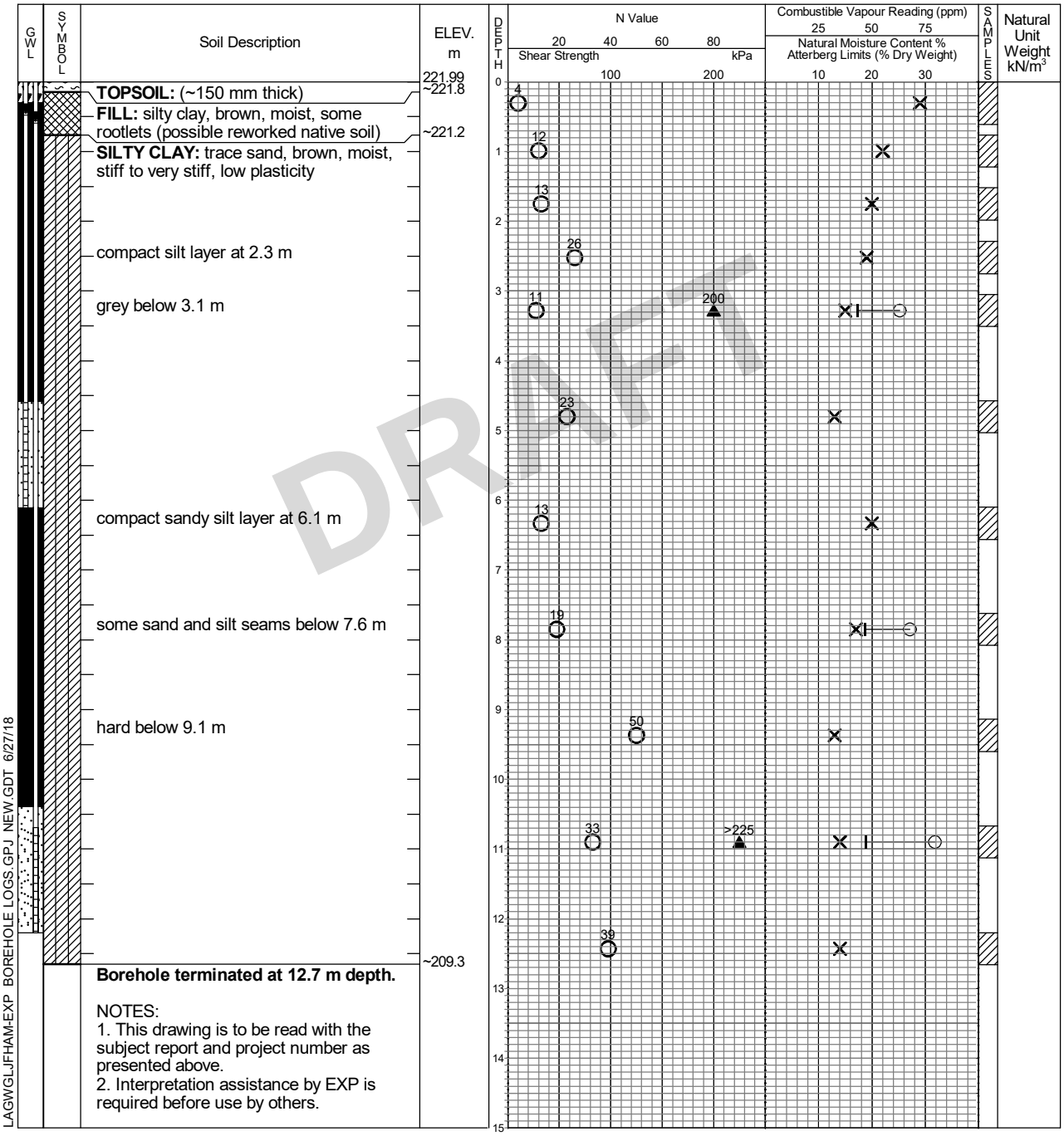
Date Drilled: May 9, 2018

Drill Type: CME-55 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	dry	no cave
Jun. 5 (shallow)	0.46 bgs	--
Jun. 5 (deep)	0.56 bgs	--

ags (above ground surface)
bgs (below ground surface)

Log of Borehole BH-33

Project No. HAM-00801363-A0 | Drawing No. 35

Project: Proposed Glanbrook Industrial Subdivision | Sheet No. 1 of 1

Location: Twenty Road West, Hamilton, ON

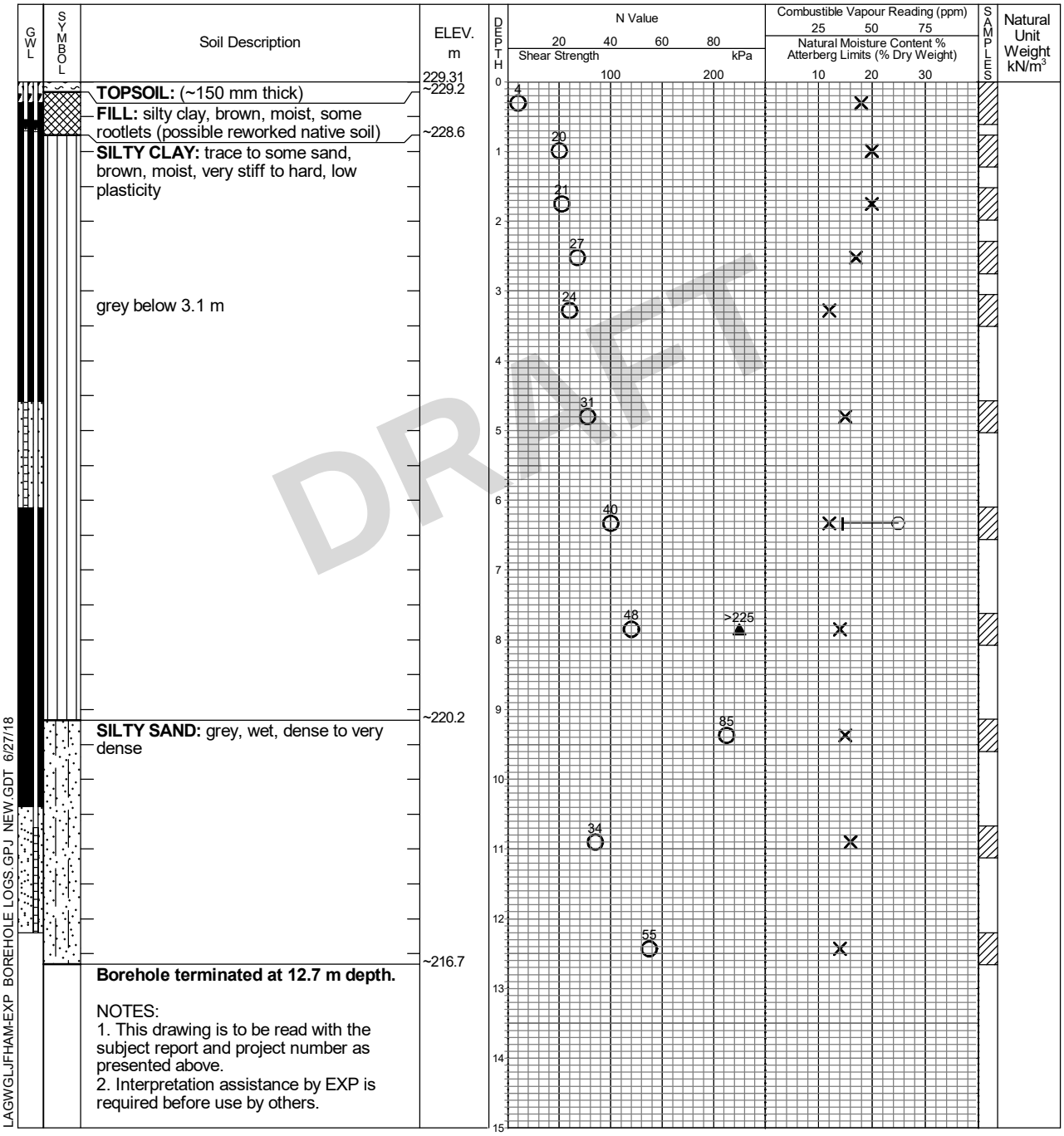
Date Drilled: May 9, 2018

Drill Type: CME-55 Track Mount. Solid Stem.

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



LAGWGLJFHAM-EXP BOREHOLE LOGS.GPJ NEW.GDT 6/27/18

EXP Services Inc.
Hamilton, Ontario
Telephone: 905.573.4000
Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)
on completion	11.62 bgs	no cave
Jun. 4 (shallow)	0.66 bgs	--
Jun. 4 (deep)	0.71 bgs	--

ags (above ground surface)
bgs (below ground surface)

Appendix C: Water Levels

TABLE C: Groundwater Elevation Summary

Monitoring Well ID	Ground Surface Elevation (masl)	Stick Up (+) / Stick Down (-) (m)	Approximate Full Well Depth (mbTOP)	Approximate Full Well Depth (mbgs)	Depth	4-Jun-18	5-Jun-18	13-Jun-18	14-Jun-18	19-Jun-18
BH1	237.93	0.960	8.3	7.3	mbTOP	-	1.74	-	1.99	-
					mbgs	-	0.78	-	1.03	-
					masl	-	237.15	-	236.90	-
BH5	228.76	1.069	7.0	6.0	mbTOP	-	1.80		1.99	
					mbgs	-	0.73	-	0.92	-
					masl	-	228.03	-	227.84	-
BH7	222.10	0.884	10.0	9.2	mbTOP	1.15	-	-	1.46	-
					mbgs	0.27	-	-	0.58	-
					masl	221.83	-	-	221.52	-
BH8	232.15	0.800	8.5	7.7	mbTOP	1.33	-	-	1.45	-
					mbgs	0.53	-	-	0.65	-
					masl	231.62	-	-	231.50	-
BH9	233.03	0.880	7.0	6.1	mbTOP	1.62	-	-	1.81	-
					mbgs	0.74	-	-	0.93	-
					masl	232.29	-	-	232.10	-
BH11	231.57	2.530	9.5	7.0	mbTOP	-	1.33	-	1.16	-
					mbgs	-	-1.20	-	-1.37	-
					masl	-	232.77	-	232.94	-
BH12	232.18	2.410	8.1	5.7	mbTOP	-	2.45	0.97	-	
					mbgs	-	0.04	0.19	-	-
					masl	-	232.14	231.99	-	-
BH13	230.40	1.025	6.9	5.9	mbTOP	-	0.84	1.21		
					mbgs	-	-0.19	0.18	-	-
					masl	-	230.59	230.22	-	-
BH15	232.19	0.922	8.4	7.5	mbTOP	1.58	-	-	-	1.46
					mbgs	0.65	-	-	-	0.54
					masl	231.54	-	-	-	231.65
BH17	231.03	0.883	7.0	6.1	mbTOP	-	1.38	1.50	-	-
					mbgs	-	0.50	0.61	-	-
					masl	-	230.54	230.42	-	-
BH18	233.81	0.905	7.2	6.3	mbTOP	0.06	-	0.43	-	-
					mbgs	-0.85	-	-0.47	-	-
					masl	234.66	-	234.28	-	-
BH25	235.30	0.950	7.0	6.1	mbTOP	-	1.29	1.41		
					mbgs	-	0.34	0.46	-	-
					masl	-	234.96	234.85	-	-
BH29-S	231.97	0.74	7.0	6.2	mbTOP	-				-
					mbgs	-	-2.63	-2.80	-2.73	-
					masl	-	234.60	234.77	234.70	-
BH29-D	231.97	3.940	13.9	9.9	mbTOP	-				-
					mbgs	-	-2.57	-2.82	-2.79	-
					masl	-	234.54	234.79	234.76	-
BH30-S	233.53	0.864	6.9	6.0	mbTOP	-	2.04	1.17	-	-
					mbgs	-	1.18	0.30	-	-
					masl	-	232.36	233.23	-	-
BH30-D	233.53	0.980	11.6	10.6	mbTOP	-	0.29	0.41		0.53
					mbgs	-	-0.70	-0.57	-	-0.45
					masl	-	234.23	234.10	-	233.98
BH31-S	231.94	0.82	6.94	6.1	mbTOP	-	1.02	1.12	-	-
					mbgs	-	0.20	0.31	-	-
					masl	-	231.74	231.64	-	-
BH31-D	231.94	2.440	11.7	9.3	mbTOP	-	1.32	1.31	-	
					mbgs	-	-1.12	-1.13	-	-
					masl	-	233.06	233.07	-	-
BH32-S	221.99	0.905	7.1	6.1	mbTOP	1.37	-	-	1.54	-
					mbgs	0.46	-	-	0.63	-
					masl	221.53	-	-	221.36	-
BH32-D	221.99	0.765	13.1	12.4	mbTOP	1.33	-	-	1.49	-
					mbgs	0.56	-	-	0.73	-
					masl	221.43	-	-	221.26	-
BH33-S	229.31	0.930	7.0	6.1	mbTOP	1.59	-	-	1.81	-
					mbgs	0.66	-	-	0.88	-
					masl	228.66	-	-	228.43	-
BH33-D	229.31	0.950	11.9	11.0	mbTOP	1.66	-	-	1.89	-
					mbgs	0.71	-	-	0.94	-
					masl	228.60	-	-	228.37	-

Notes:

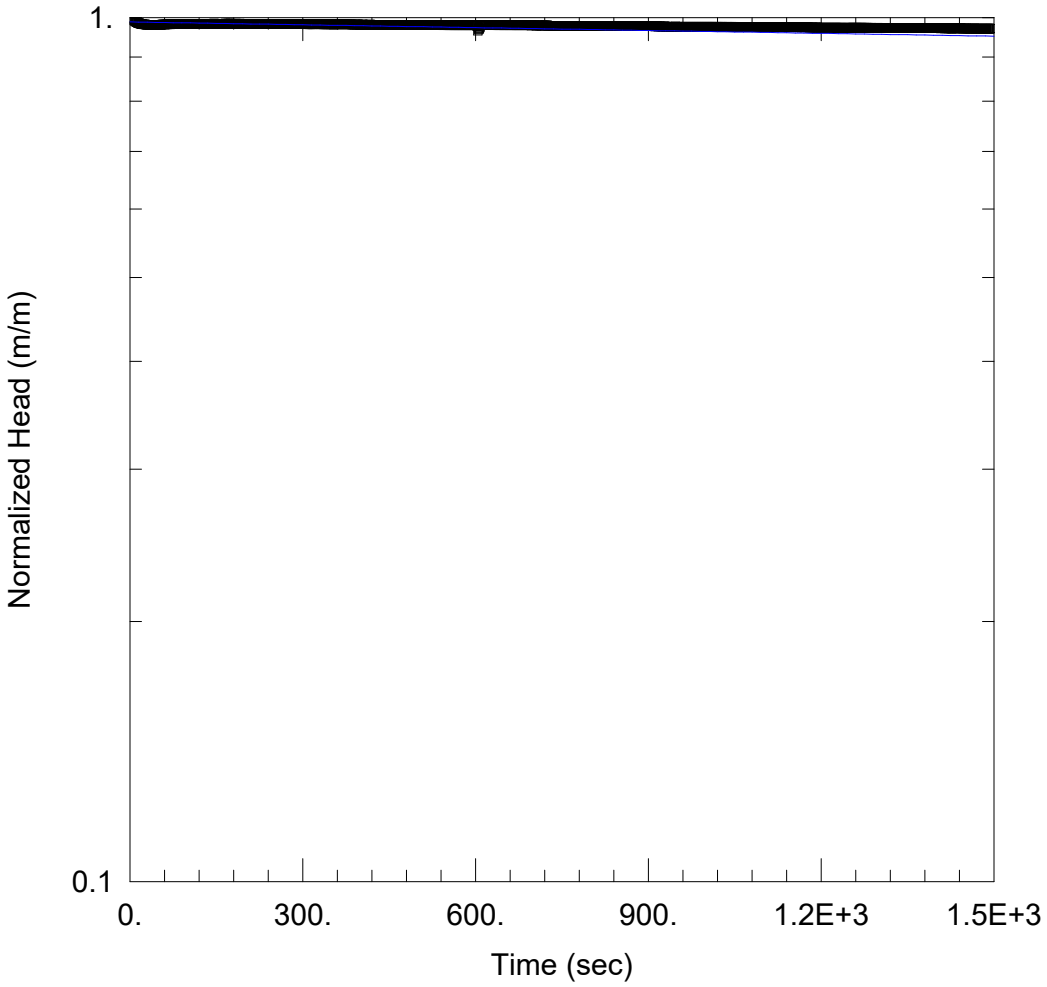
mbTOP - meters below top of the pipe

mbgs - meters below ground surface

masl - meters above mean sea level

Artesian (Water Level Above Ground Surface)

Appendix D:
SWRT Procedures and Results



SWRT - RISING HEAD - BH 1

Data Set: \...\BH1.aqt
Date: 06/29/18 Time: 11:52:58

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 1
Test Date: June 14, 2018

AQUIFER DATA

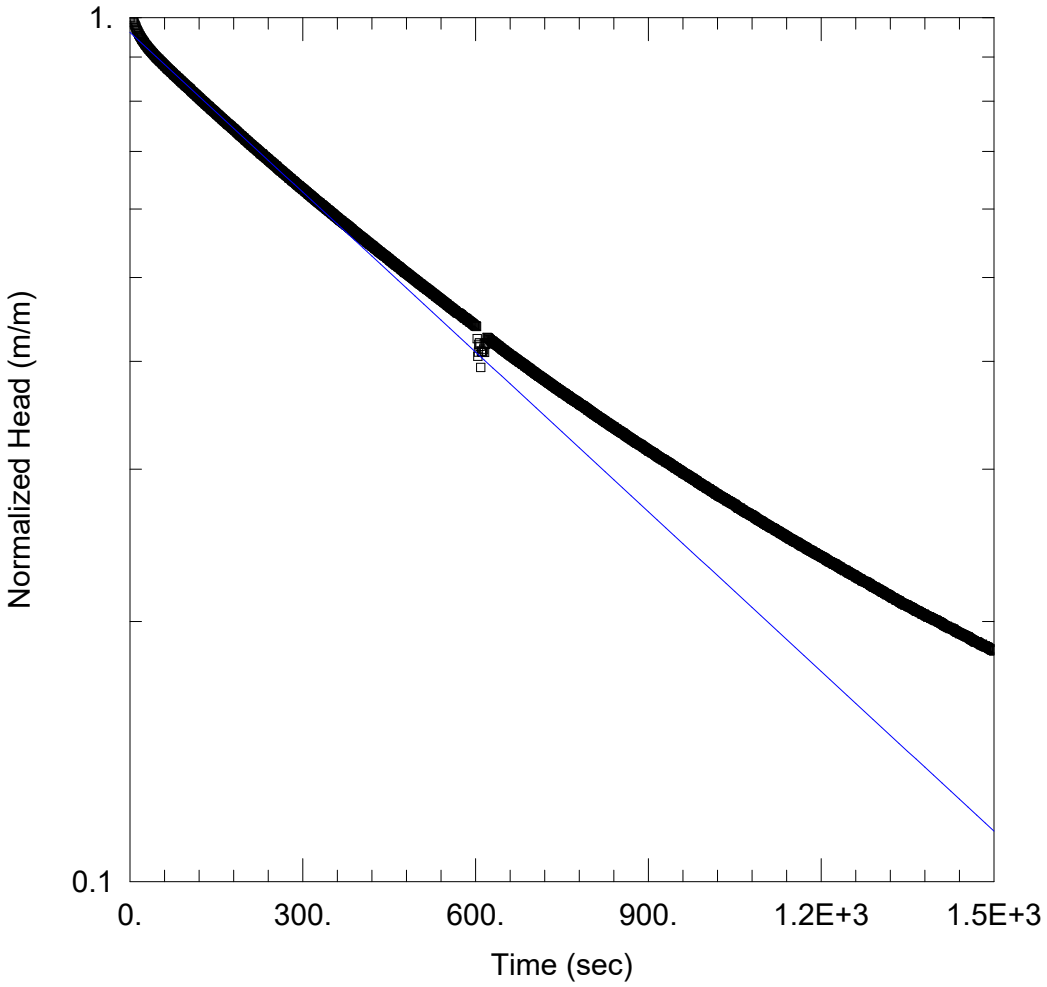
Saturated Thickness: 6.82 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH 1)

Initial Displacement: 3.25 m
Total Well Penetration Depth: 6.82 m
Casing Radius: 0.0254 m
Static Water Column Height: 6.82 m
Screen Length: 3. m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.113E-8 m/sec
y0 = 3.212 m



SWRT - RISING HEAD - BH 5

Data Set: \...\BH5.aqt
Date: 06/29/18 Time: 11:58:15

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 5
Test Date: June 14, 2018

AQUIFER DATA

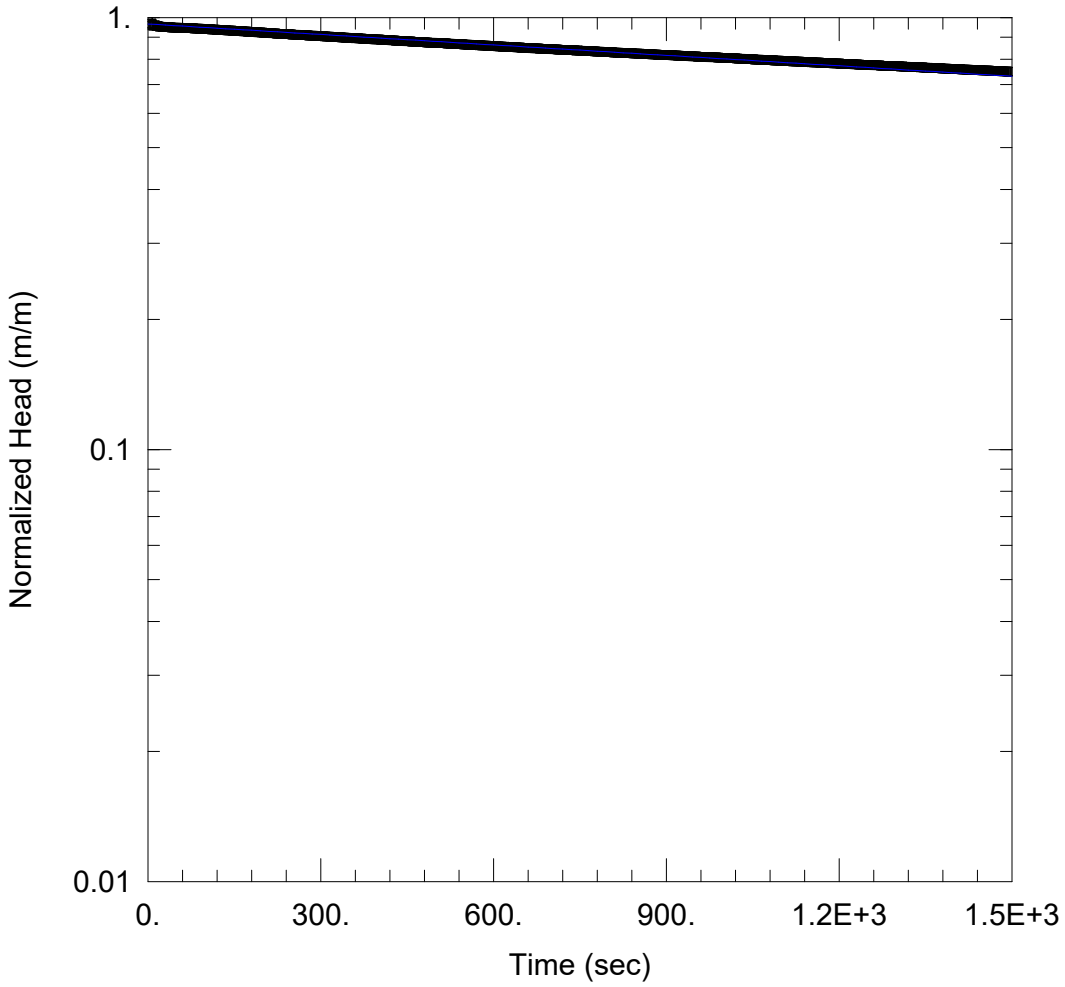
Saturated Thickness: 5.04 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH 5)

Initial Displacement: 2.29 m
Total Well Penetration Depth: 5.04 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.04 m
Screen Length: 3. m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 6.223E-7 m/sec
y0 = 2.2 m



SWRT - RISING HEAD - BH 7

Data Set: \...\BH7.aqt
Date: 06/29/18 Time: 11:16:56

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 7
Test Date: June 14, 2018

AQUIFER DATA

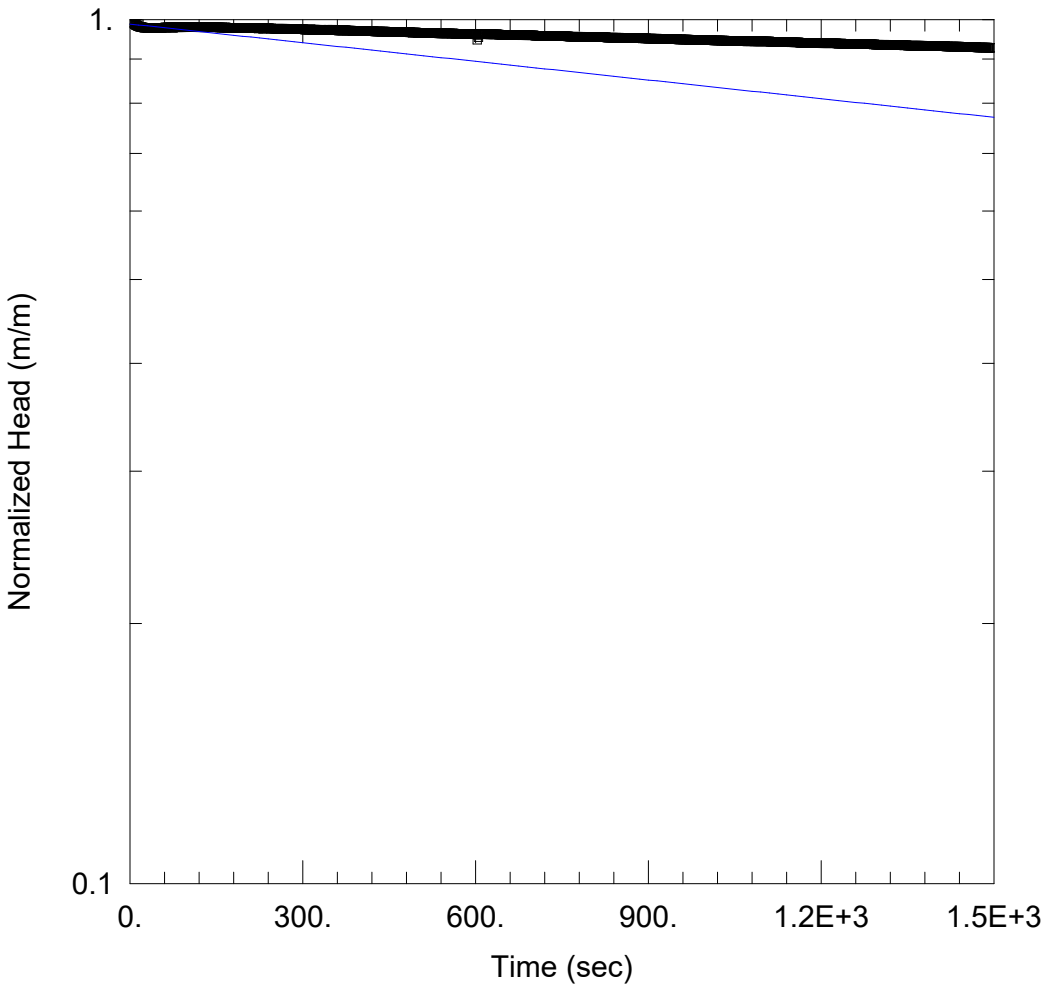
Saturated Thickness: 8.63 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH 7)

Initial Displacement: 3.07 m Static Water Column Height: 8.63 m
Total Well Penetration Depth: 8.63 m Screen Length: 3. m
Casing Radius: 0.0254 m Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev
K = 6.761E-8 m/sec y0 = 2.965 m



SWRT - RISING HEAD - BH 8

Data Set: \...\BH8.aqt
Date: 06/29/18 Time: 13:38:36

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 8
Test Date: June 14, 2018

AQUIFER DATA

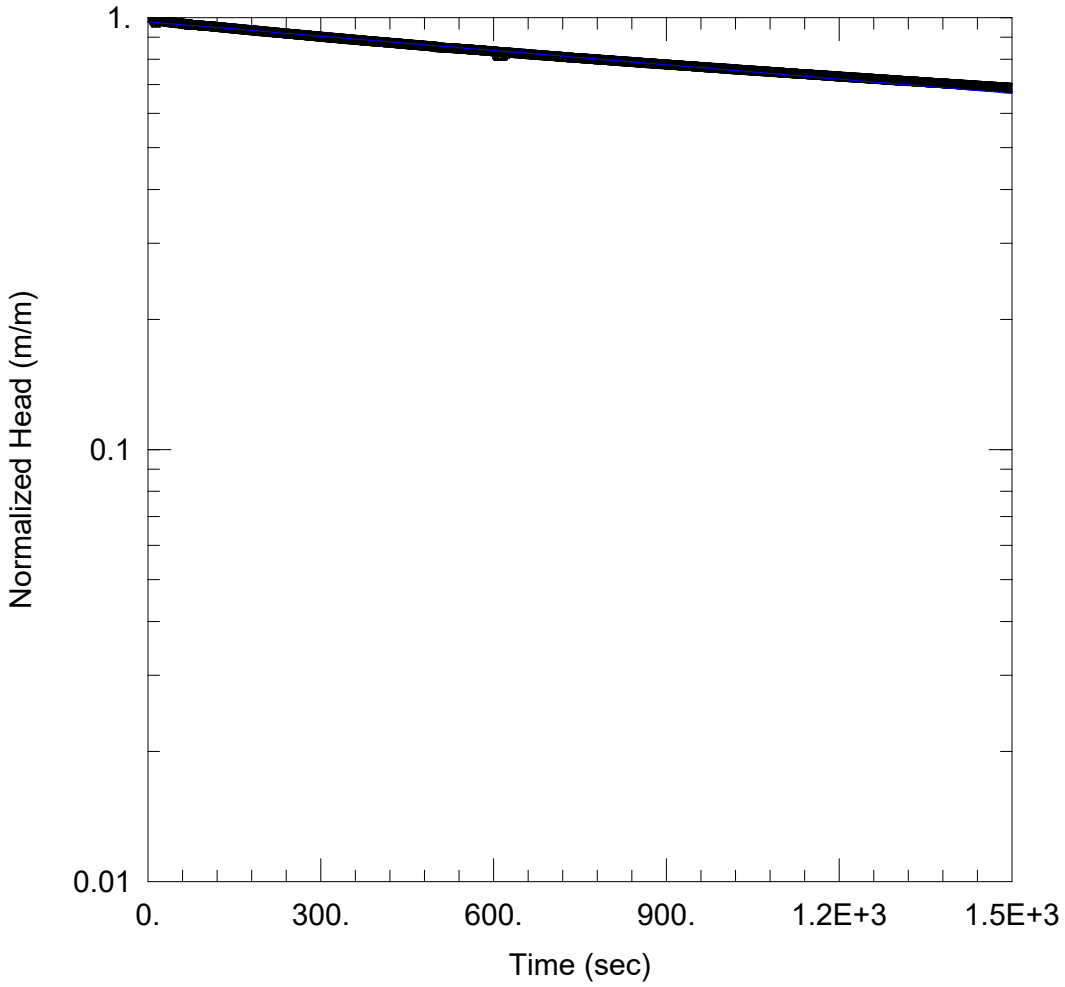
Saturated Thickness: 7.07 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH 8)

Initial Displacement: 2.67 m
Total Well Penetration Depth: 8.074 m
Casing Radius: 0.0254 m
Static Water Column Height: 7.07 m
Screen Length: 3. m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 7.272E-8 m/sec
y0 = 2.638 m



SWRT - RISING HEAD - BH 9

Data Set: \...\BH9.aqt
Date: 06/29/18 Time: 11:31:55

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 9
Test Date: June 14, 2018

AQUIFER DATA

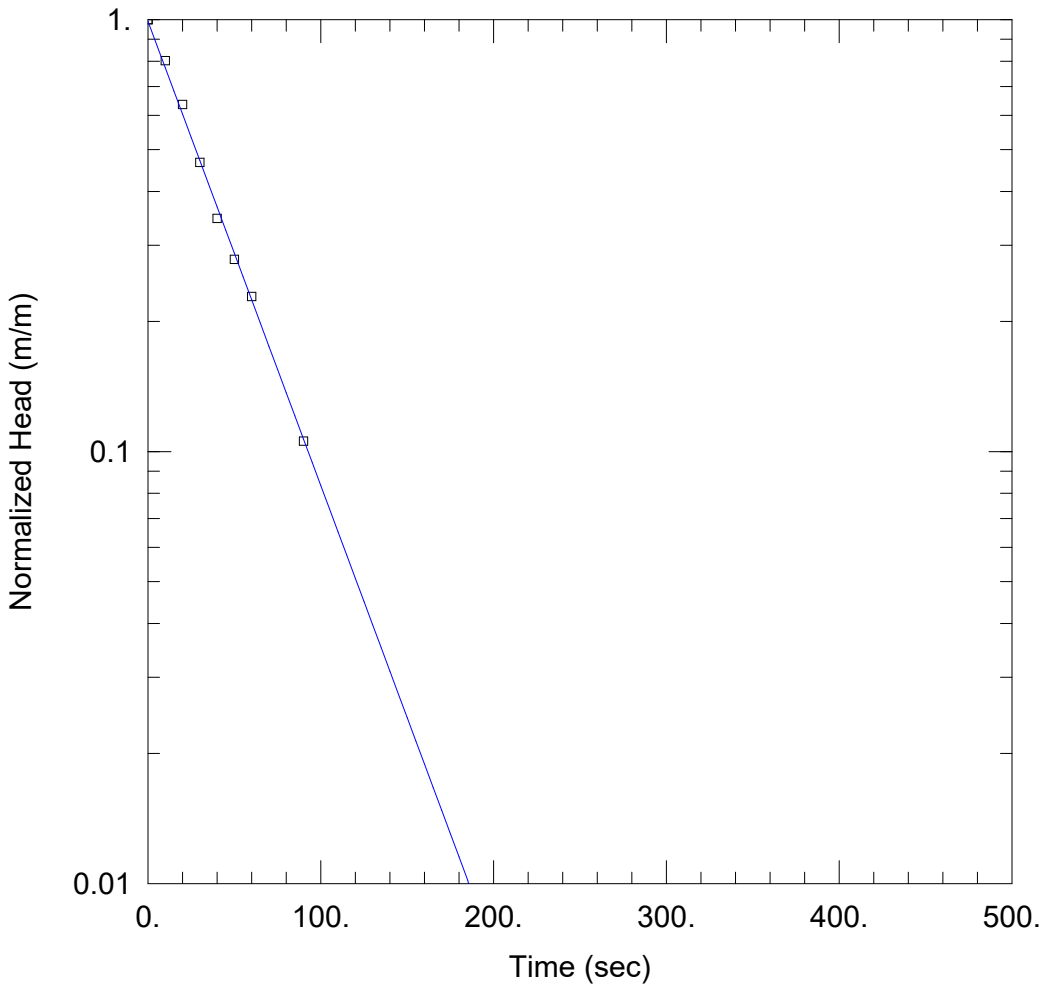
Saturated Thickness: 8.63 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH 9)

Initial Displacement: 2.46 m
Total Well Penetration Depth: 8.63 m
Casing Radius: 0.0254 m
Static Water Column Height: 8.63 m
Screen Length: 3. m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 9.263E-8 m/sec
y0 = 2.404 m



SWRT - RISING HEAD - BH 11

Data Set: \...\BH11.aqt
Date: 06/28/18 Time: 18:00:42

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 11
Test Date: June 13, 2018

AQUIFER DATA

Saturated Thickness: 9.01 m Anisotropy Ratio (Kz/Kr): 1.

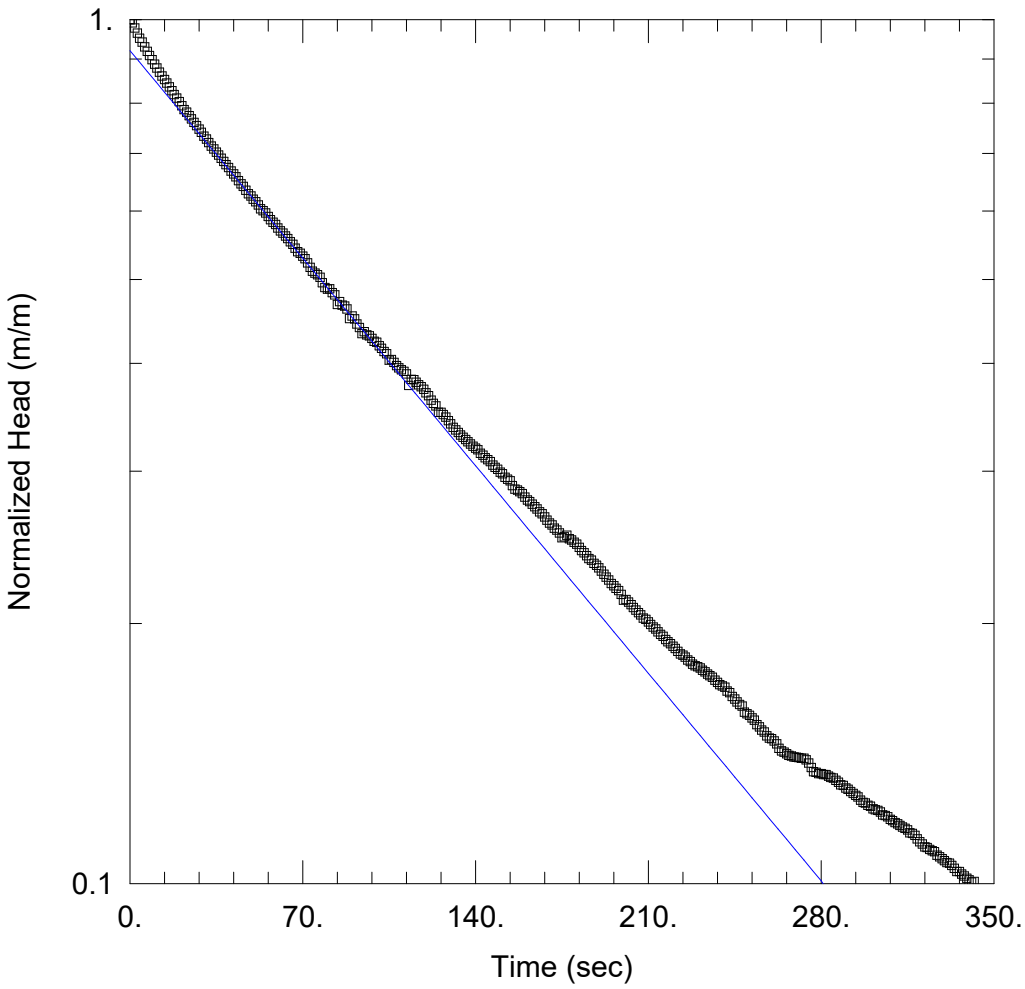
WELL DATA (BH 11)

Initial Displacement: 1.4 m
Total Well Penetration Depth: 9.005 m
Casing Radius: 0.0254 m
Static Water Column Height: 9.01 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.435E-5 m/sec y0 = 1.387 m



SWRT - RISING HEAD - BH 12

Data Set: \...\BH12.aqt
Date: 06/28/18 Time: 16:59:19

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 12
Test Date: June 13, 2018

AQUIFER DATA

Saturated Thickness: 5.41 m Anisotropy Ratio (Kz/Kr): 1.

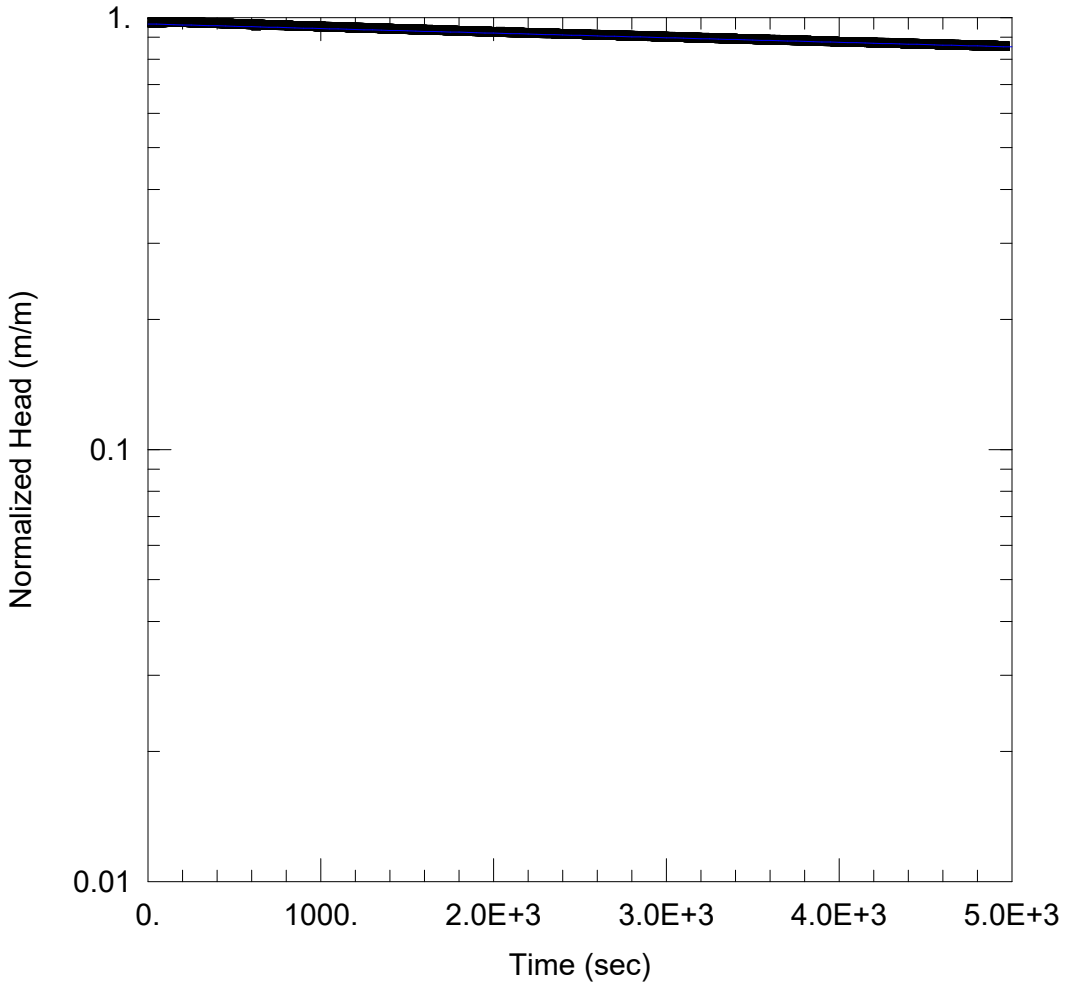
WELL DATA (BH 12)

Initial Displacement: 1.89 m
Total Well Penetration Depth: 4.41 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.41 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 4.582E-6 m/sec y0 = 1.739 m



SWRT - RISING HEAD - BH 13

Data Set: \...\BH13.aqt
Date: 06/28/18 Time: 18:04:02

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 13
Test Date: June 13, 2018

AQUIFER DATA

Saturated Thickness: 5.69 m Anisotropy Ratio (Kz/Kr): 1.

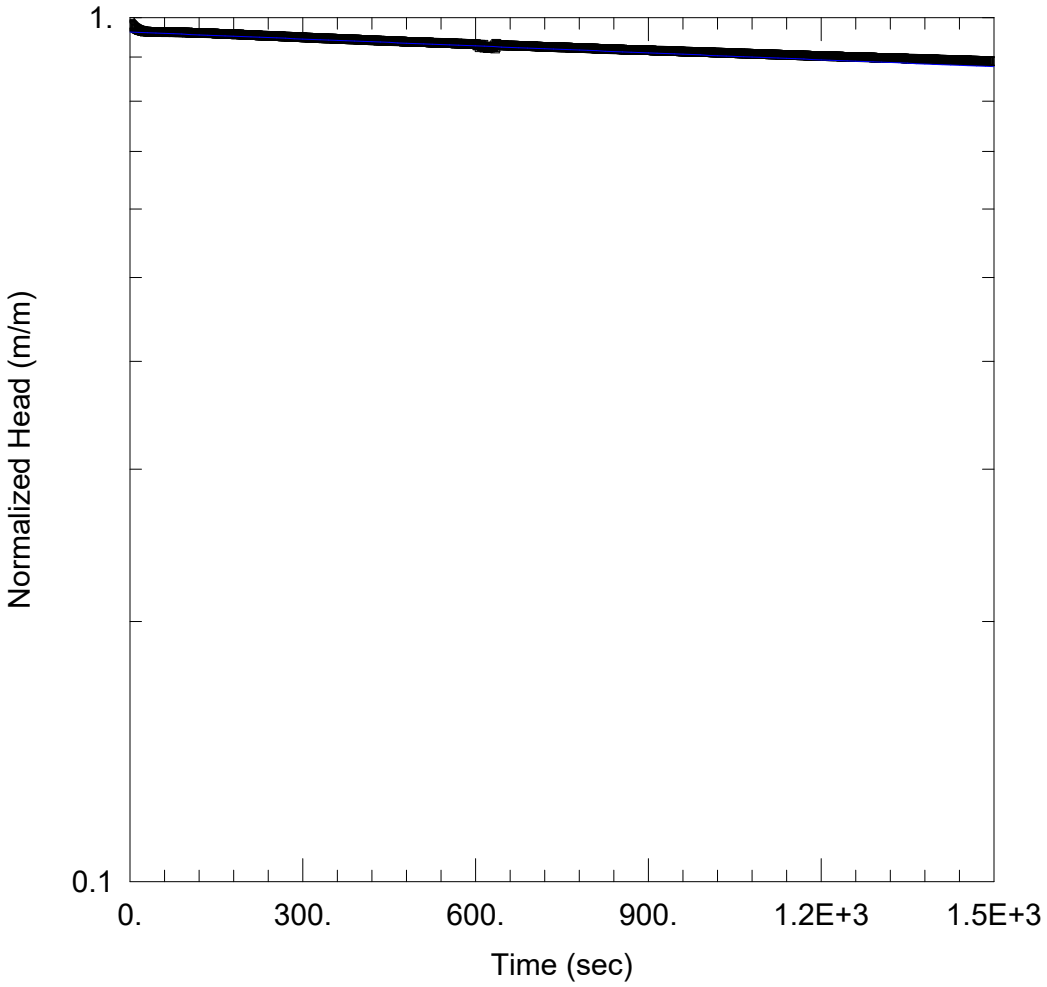
WELL DATA (BH 13)

Initial Displacement: 2.735 m
Total Well Penetration Depth: 5.69 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.69 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.779E-8 m/sec y0 = 2.643 m



SWRT - RISING HEAD - BH 17

Data Set: \...\BH17.aqt
Date: 06/28/18 Time: 17:08:01

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 17
Test Date: June 13, 2018

AQUIFER DATA

Saturated Thickness: 5.47 m Anisotropy Ratio (Kz/Kr): 1.

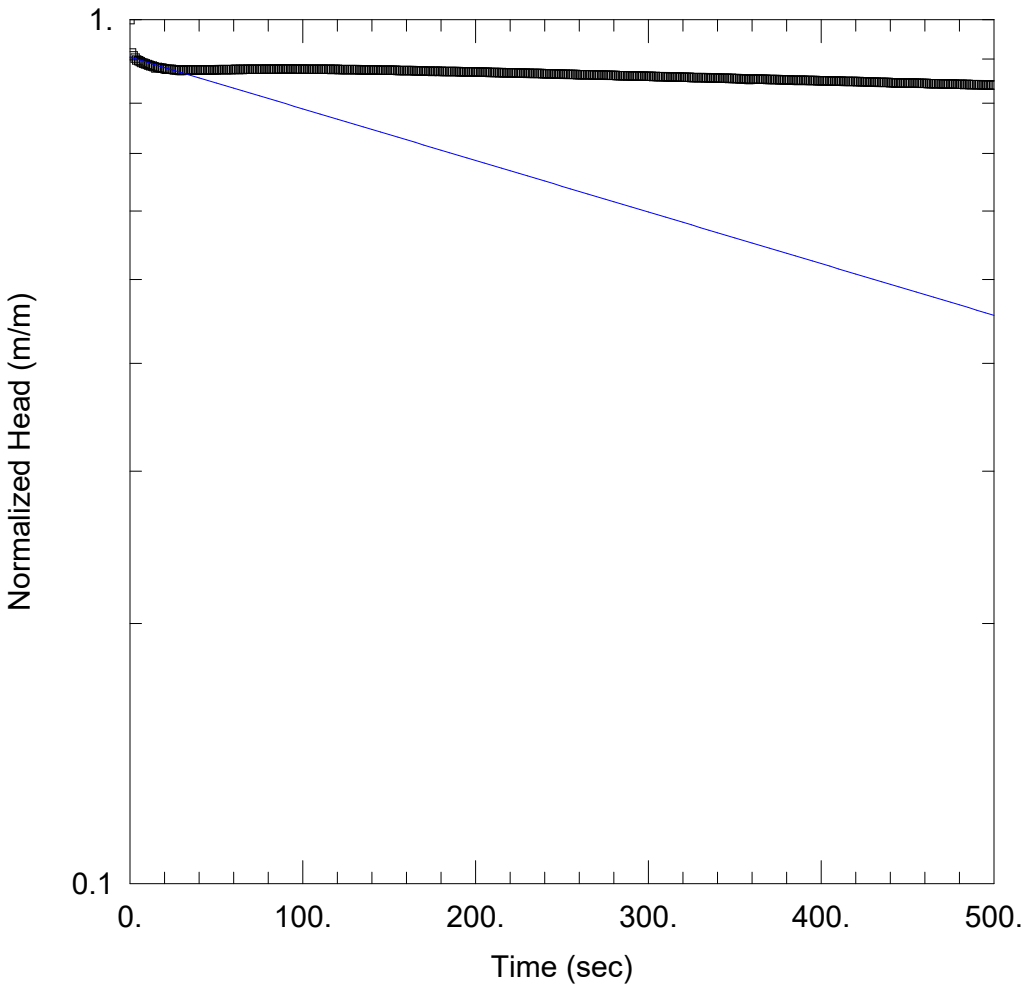
WELL DATA (BH 17)

Initial Displacement: 3.87 m
Total Well Penetration Depth: 4.41 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.47 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 3.571E-8 m/sec y0 = 3.723 m



SWRT - RISING HEAD - BH 18

Data Set: \...\BH18.aqt
Date: 06/28/18 Time: 17:49:31

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 18
Test Date: June 13, 2018

AQUIFER DATA

Saturated Thickness: 5.69 m Anisotropy Ratio (Kz/Kr): 1.

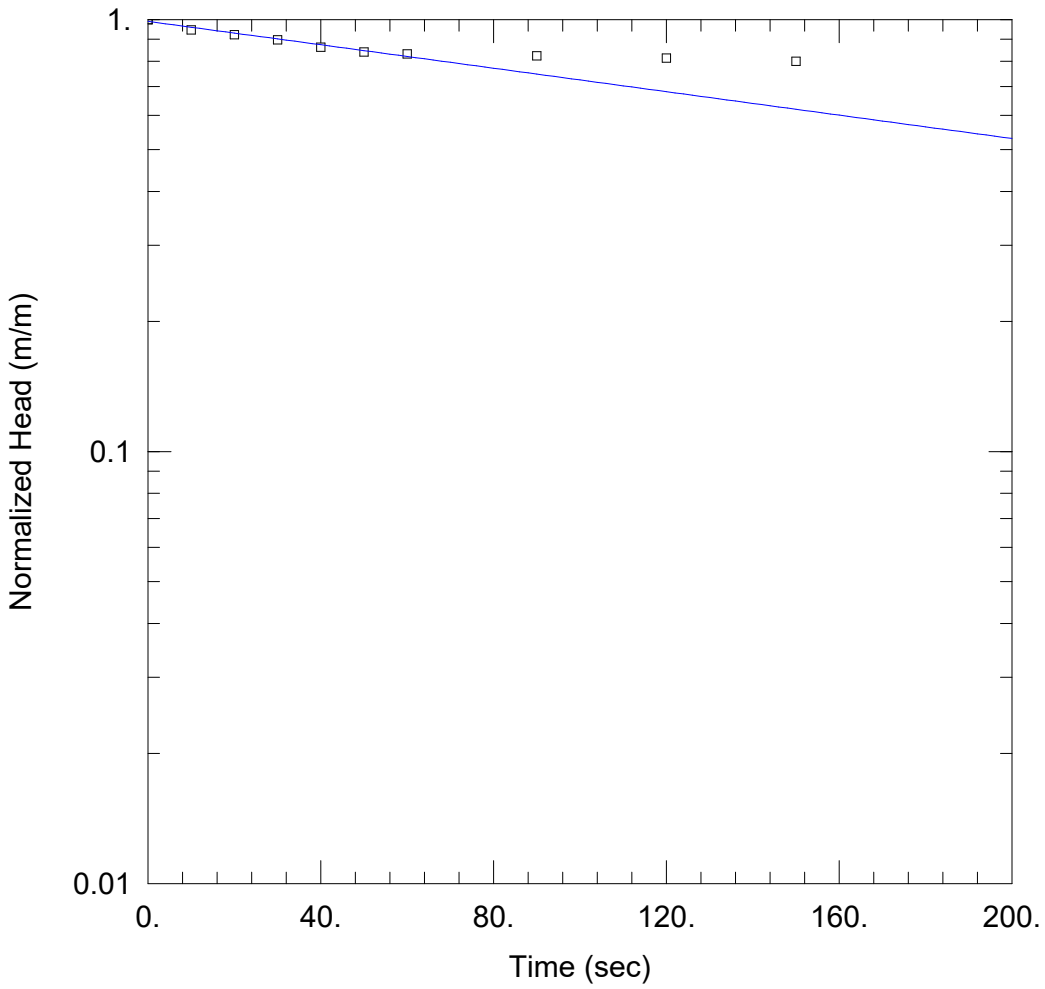
WELL DATA (BH 18)

Initial Displacement: 3.24 m
Total Well Penetration Depth: 5.69 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.69 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.002E-6 m/sec y0 = 2.93 m



SWRT - RISING HEAD - BH 25

Data Set: \...\BH25.aqt
Date: 06/28/18 Time: 15:47:12

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 25
Test Date: June 13, 2018

AQUIFER DATA

Saturated Thickness: 5.69 m Anisotropy Ratio (Kz/Kr): 1.

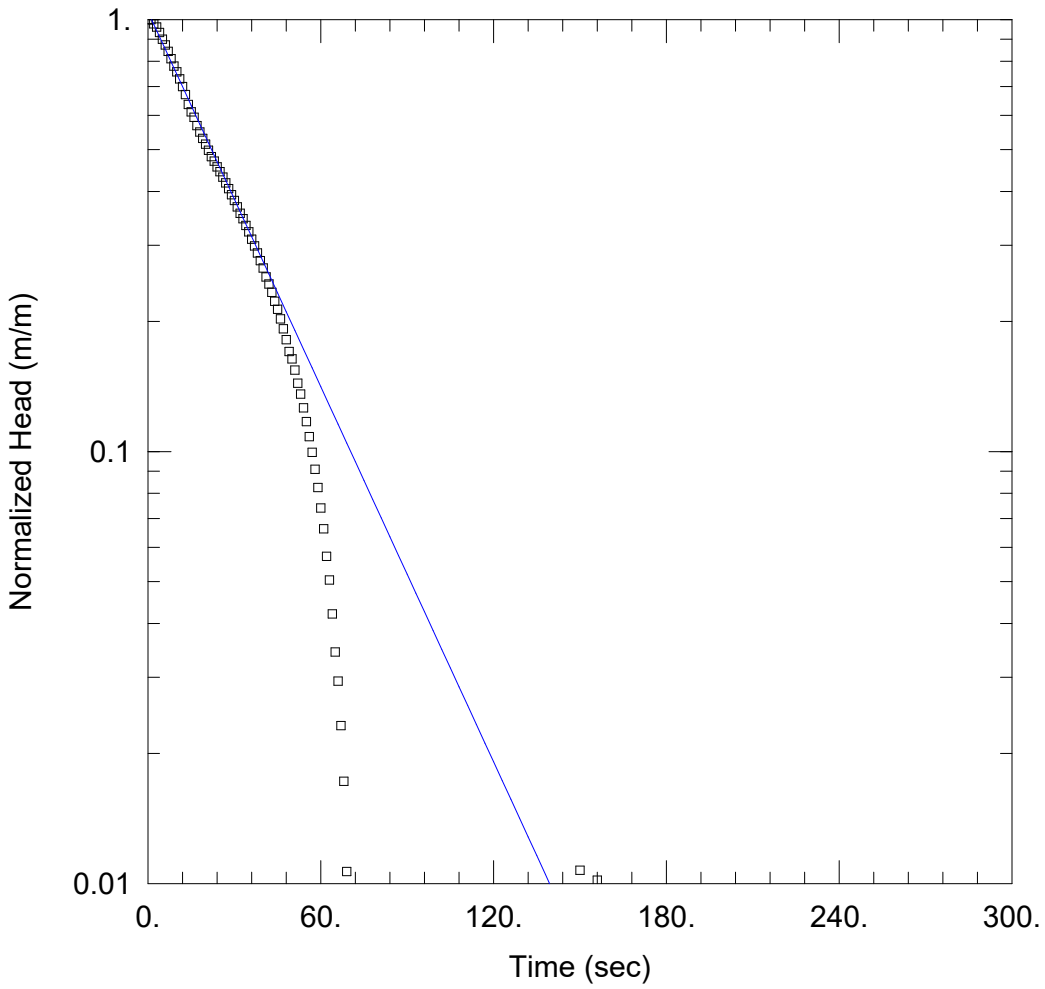
WELL DATA (BH 25)

Initial Displacement: 1.49 m
Total Well Penetration Depth: 5.62 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.62 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.811E-6 m/sec y0 = 1.476 m



SWRT - RISING HEAD - BH 29-D

Data Set: \...\BH29-D.aqt
Date: 07/03/18 Time: 11:29:31

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 29-D
Test Date: June 14, 2018

AQUIFER DATA

Saturated Thickness: 7.109 m Anisotropy Ratio (Kz/Kr): 1.

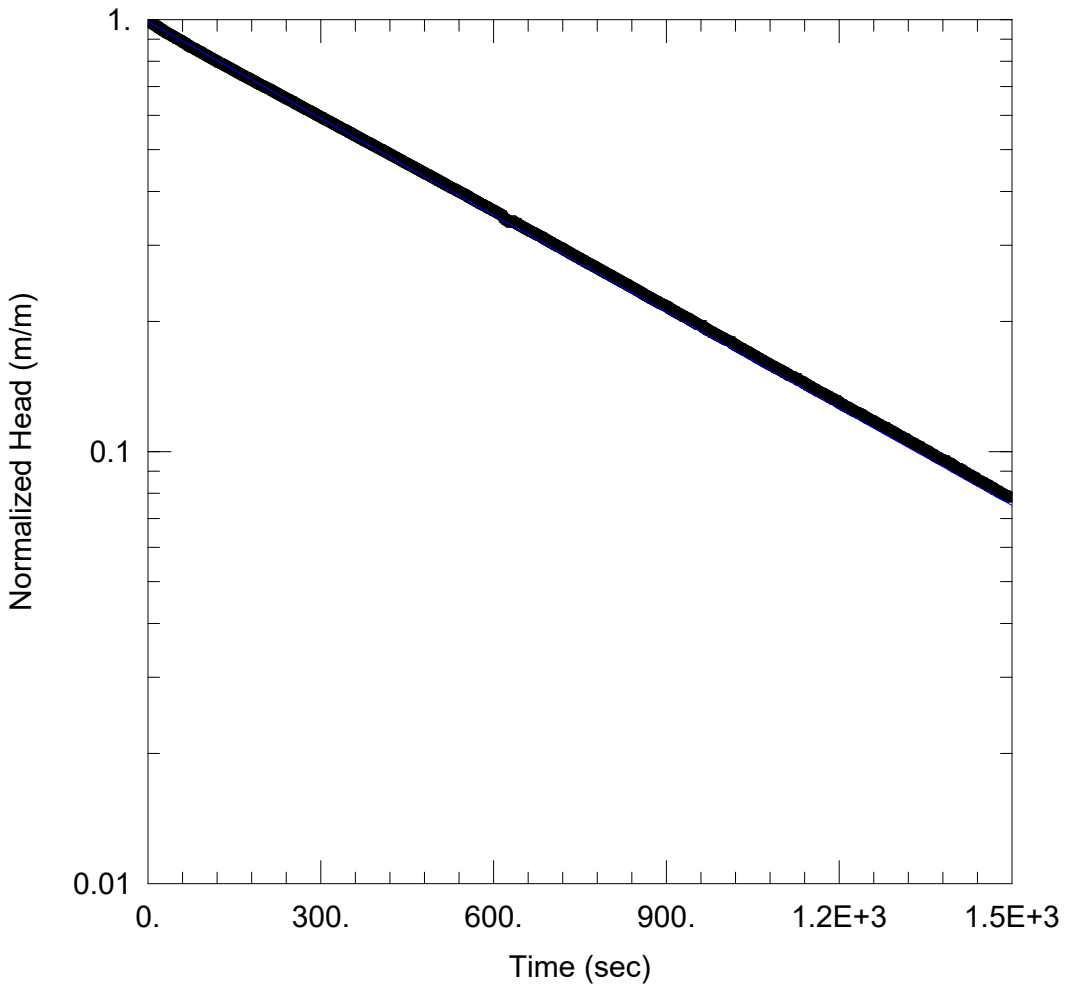
WELL DATA (29-D)

Initial Displacement: 2.683 m
Total Well Penetration Depth: 7.109 m
Casing Radius: 0.0254 m
Static Water Column Height: 7.109 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 2.427E-5 m/sec y0 = 2.798 m



SWRT - RISING HEAD - BH 31-D

Data Set: \...\BH31-D.aqt
Date: 07/03/18 Time: 10:39:48

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 31-D
Test Date: June 14, 2018

AQUIFER DATA

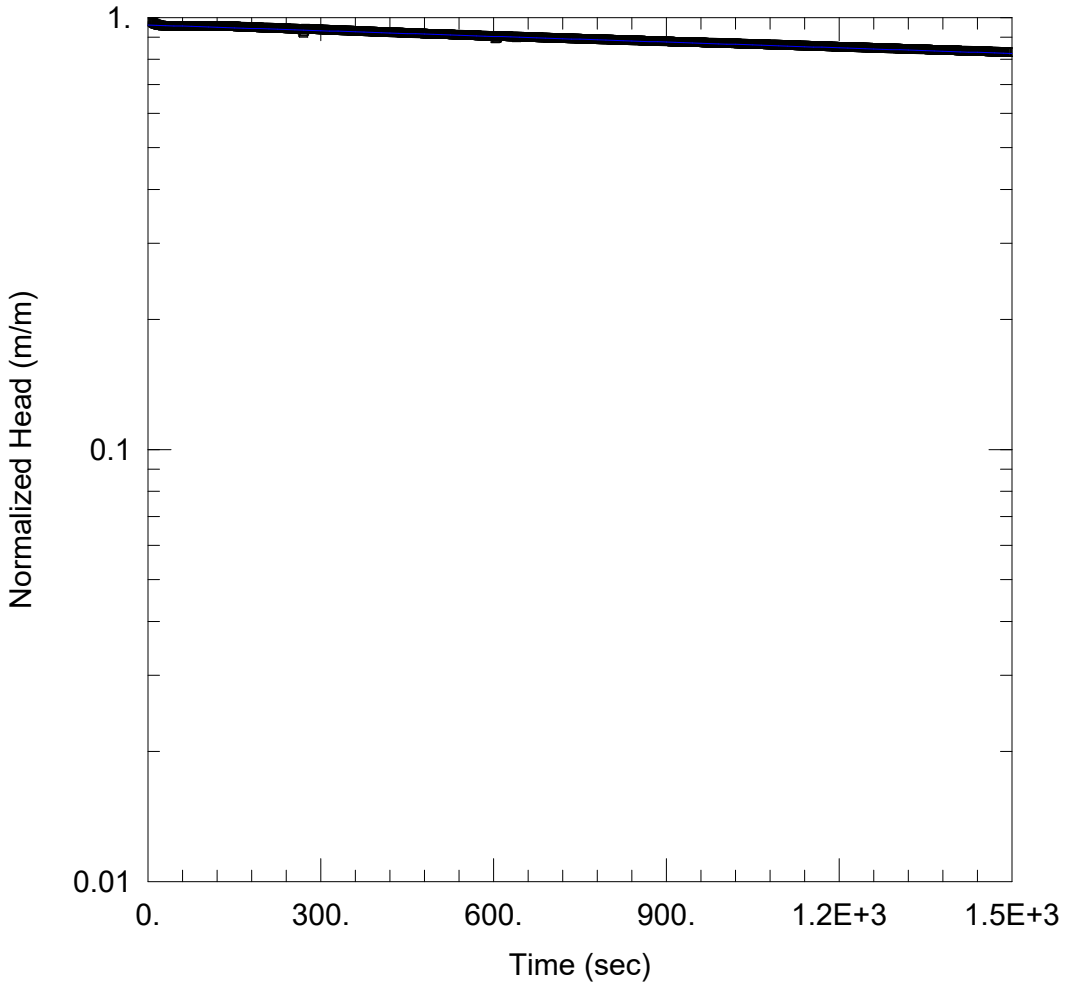
Saturated Thickness: 11.12 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (31-D)

Initial Displacement: 4.691 m
Total Well Penetration Depth: 11.12 m
Casing Radius: 0.0254 m
Static Water Column Height: 11.12 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.253E-6 m/sec
y0 = 4.642 m



SWRT - RISING HEAD - BH 31-S

Data Set: \...\BH31-S.aqt
Date: 06/28/18 Time: 16:35:41

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 31-S
Test Date: June 13, 2018

AQUIFER DATA

Saturated Thickness: 5.81 m Anisotropy Ratio (Kz/Kr): 1.

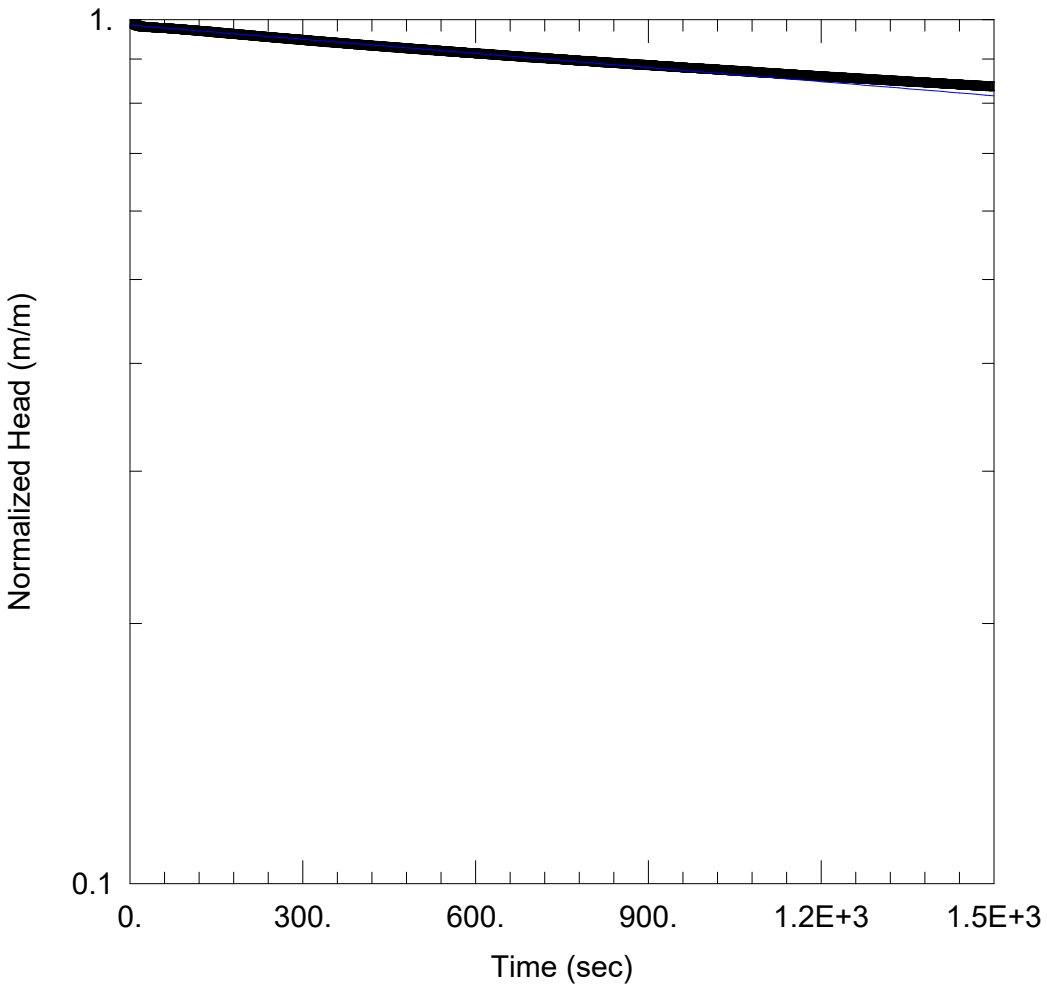
WELL DATA (BH 31-S)

Initial Displacement: 2.37 m Static Water Column Height: 5.81 m
Total Well Penetration Depth: 5.81 m Screen Length: 1.5 m
Casing Radius: 0.0254 m Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 7.384E-8 m/sec y0 = 2.277 m



SWRT - RISING HEAD - BH 32-D

Data Set: \...\BH32-D.aqt
Date: 06/29/18 Time: 13:45:08

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 32-D
Test Date: June 14, 2018

AQUIFER DATA

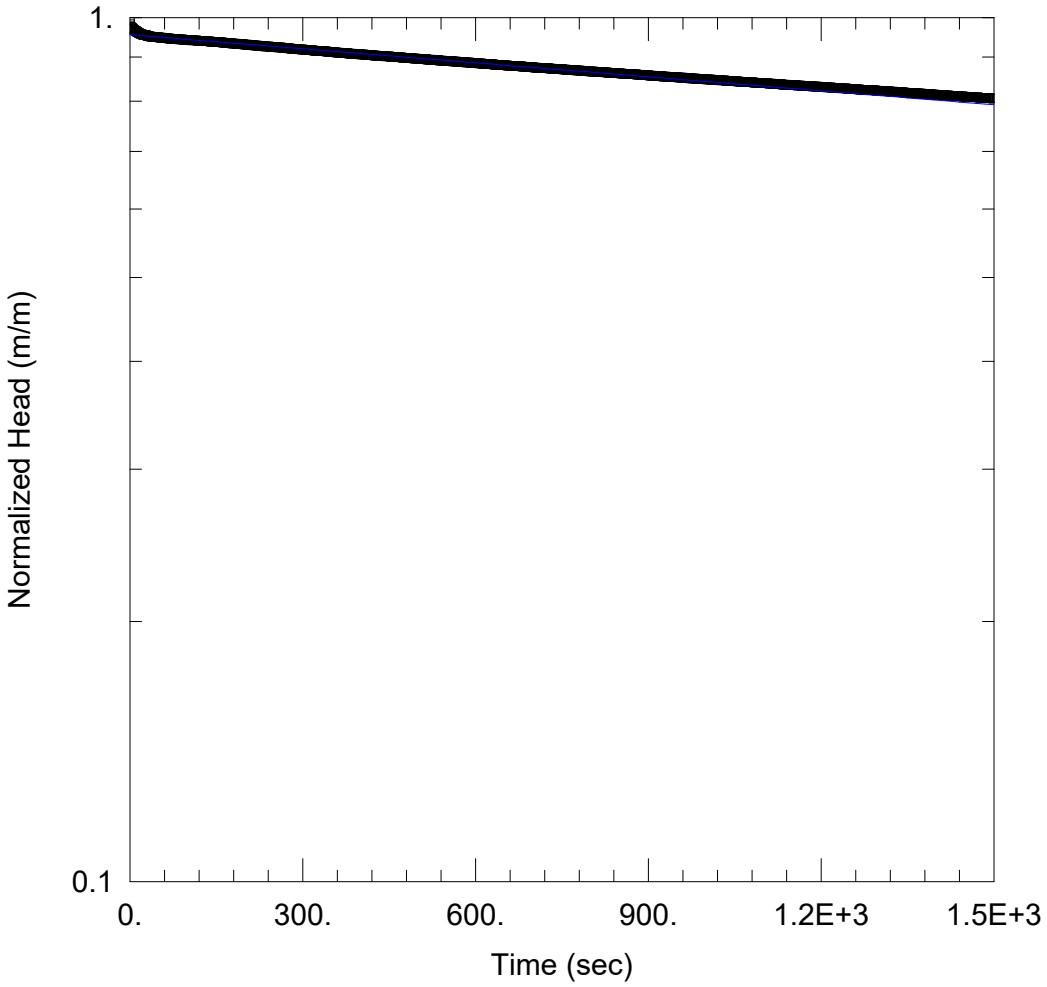
Saturated Thickness: 11.68 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (32-D)

Initial Displacement: 3.44 m
Total Well Penetration Depth: 11.68 m
Casing Radius: 0.0254 m
Static Water Column Height: 11.68 m
Screen Length: 3. m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 5.497E-8 m/sec
y0 = 3.388 m



SWRT - RISING HEAD - BH 32-S

Data Set: \...\BH32-S.aqt
Date: 06/29/18 Time: 11:40:49

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 32-S
Test Date: June 14, 2018

AQUIFER DATA

Saturated Thickness: 5.51 m Anisotropy Ratio (Kz/Kr): 1.

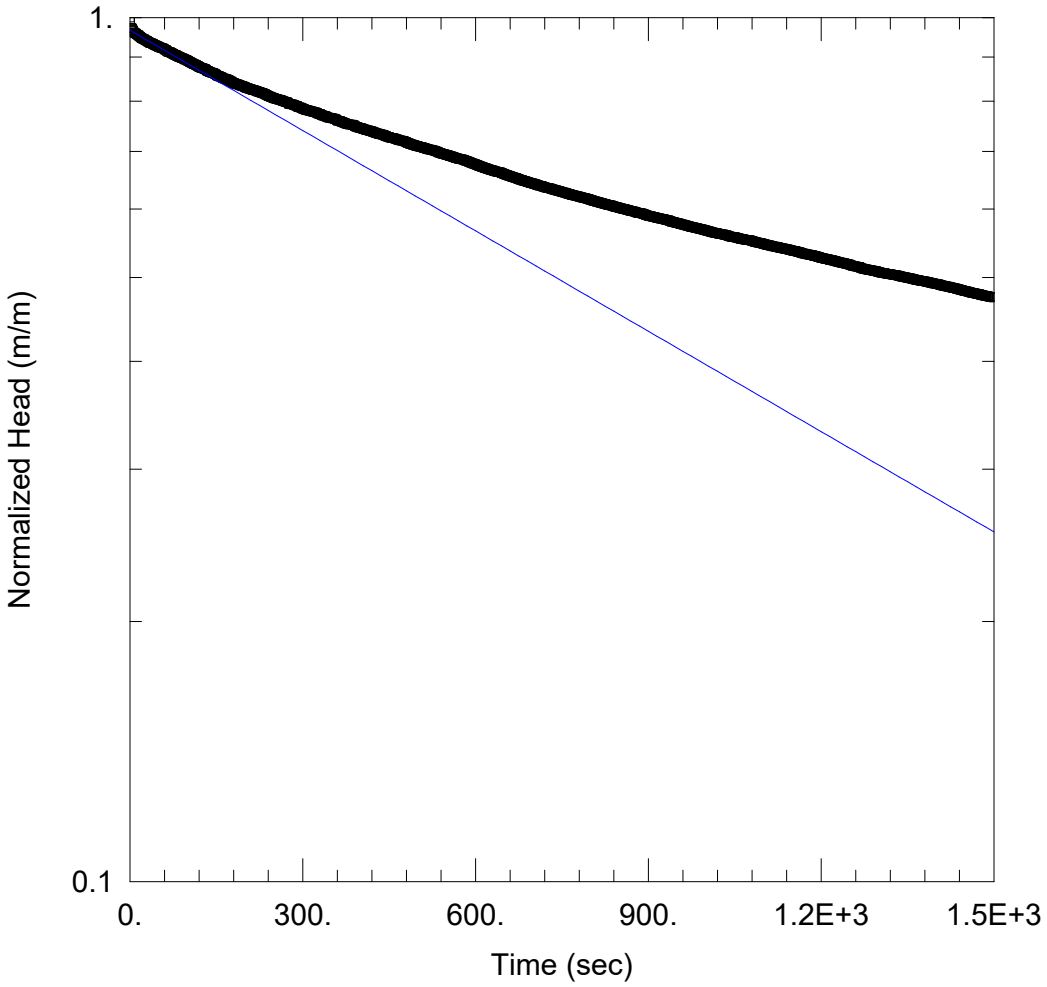
WELL DATA (BH 32-S)

Initial Displacement: 2.22 m
Total Well Penetration Depth: 5.51 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.51 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 9.066E-8 m/sec y0 = 2.12 m



SWRT - RISING HEAD - BH 33-D

Data Set: \...\BH33-D.aqt
Date: 06/29/18 Time: 13:52:51

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 33-D
Test Date: June 14, 2018

AQUIFER DATA

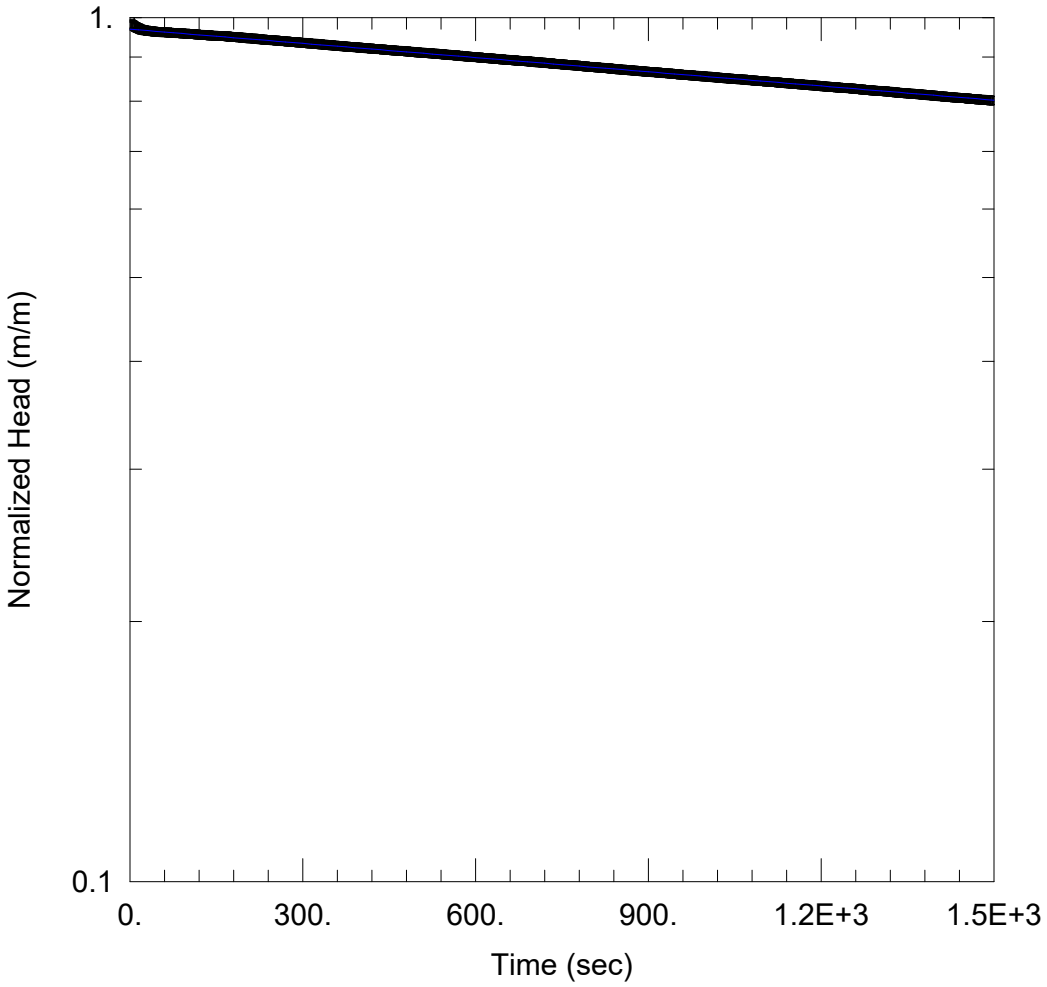
Saturated Thickness: 10. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (33-D)

Initial Displacement: 5.49 m
Total Well Penetration Depth: 10. m
Casing Radius: 0.0254 m
Static Water Column Height: 10. m
Screen Length: 3. m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.91E-7 m/sec
y0 = 5.307 m



SWRT - RISING HEAD - BH 33-S

Data Set: \...\BH33-S.aqt
Date: 06/29/18 Time: 11:47:11

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 33-S
Test Date: June 14, 2018

AQUIFER DATA

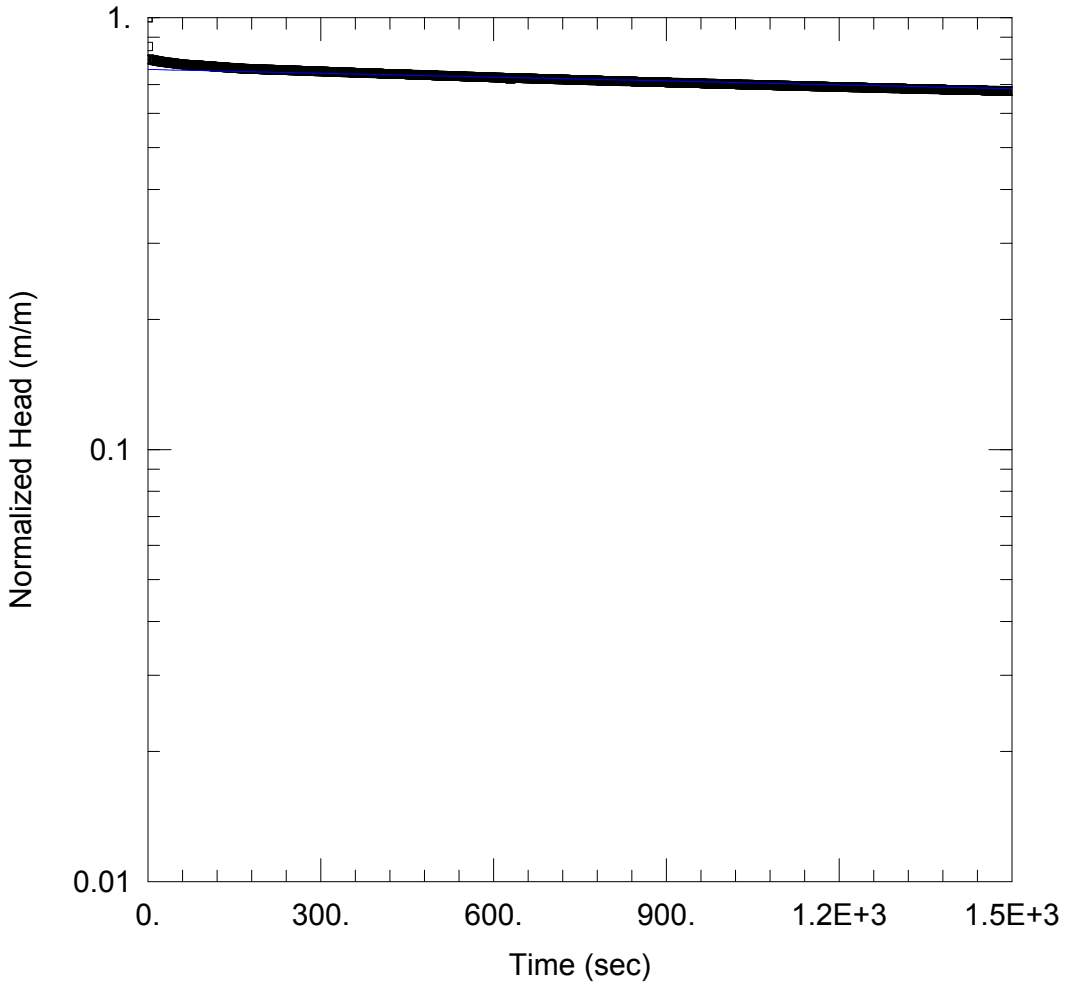
Saturated Thickness: 5.16 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH 33-S)

Initial Displacement: 2.31 m
Total Well Penetration Depth: 5.16 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.16 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 9.185E-8 m/sec
y0 = 2.239 m



SWRT - RISING HEAD - BH/MW 15

Data Set: C:\Users\SimonC\Documents\BHMW15.aqt
Date: 06/27/18 Time: 16:07:34

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH/MW 15
Test Date: June 19, 2018

AQUIFER DATA

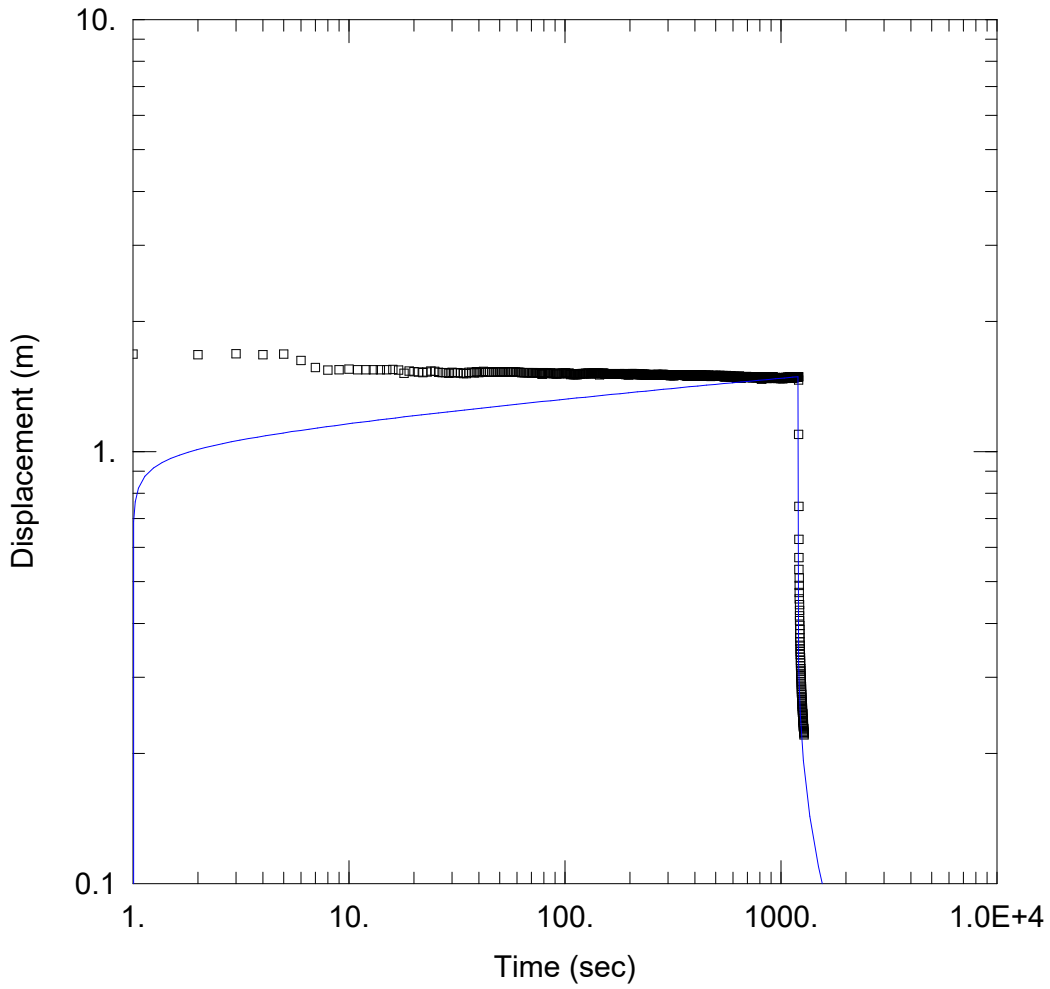
Saturated Thickness: 6.78 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW 15)

Initial Displacement: 9.365 m
Total Well Penetration Depth: 6.78 m
Casing Radius: 0.0254 m
Static Water Column Height: 6.78 m
Screen Length: 2. m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 4.06E-8 m/sec
y0 = 7.102 m



WELL TEST ANALYSIS

Data Set:
Date: 07/02/18 Time: 19:27:04

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 29-S
Test Date: June 13, 2018

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH 29-S	0	0

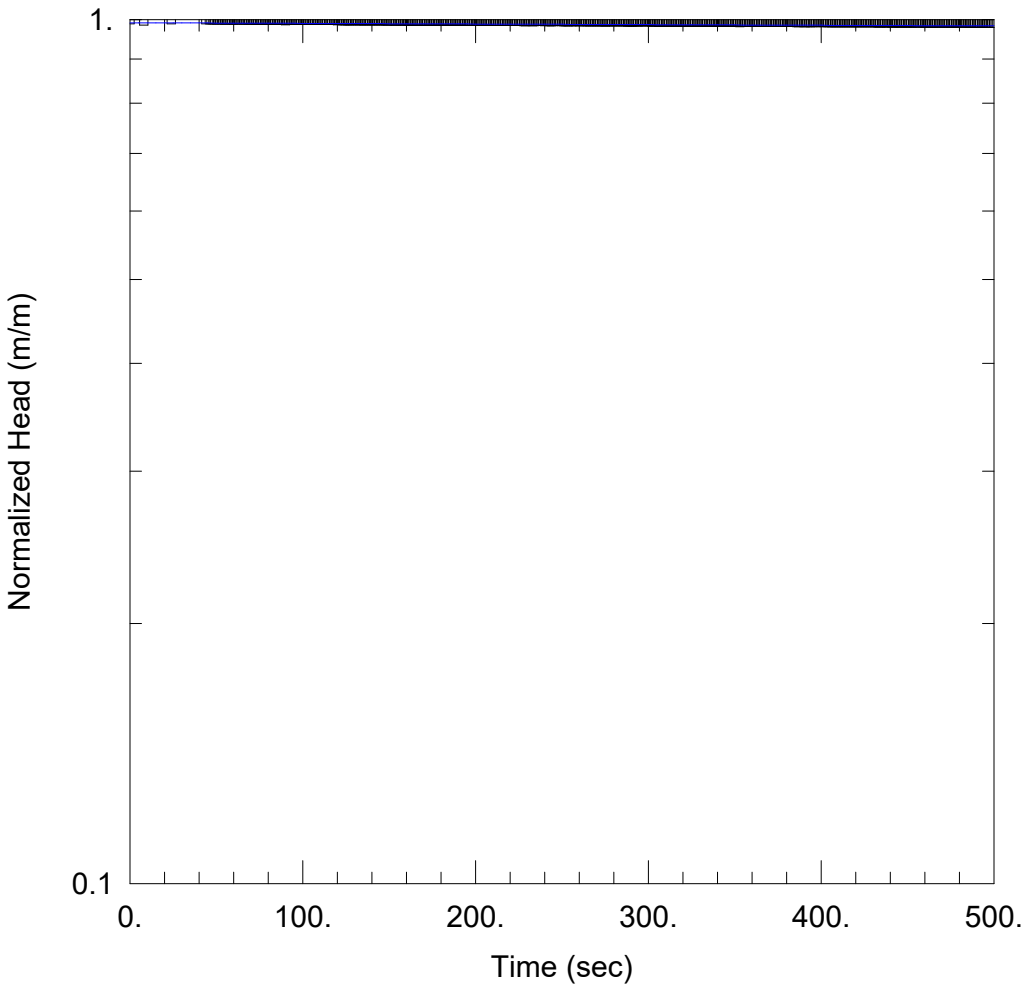
Observation Wells

Well Name	X (m)	Y (m)
▫ BH 29-S	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 1.567E-5 m^2/sec
S = 1.08E-9
Kz/Kr = 1.
b = 8.88 m



SWRT - RISING HEAD - BH 30-S

Data Set: \...\BH 30-S.aqt
Date: 06/29/18 Time: 09:46:14

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH 30-S
Test Date: June 13, 2018

AQUIFER DATA

Saturated Thickness: 5.71 m Anisotropy Ratio (Kz/Kr): 1.

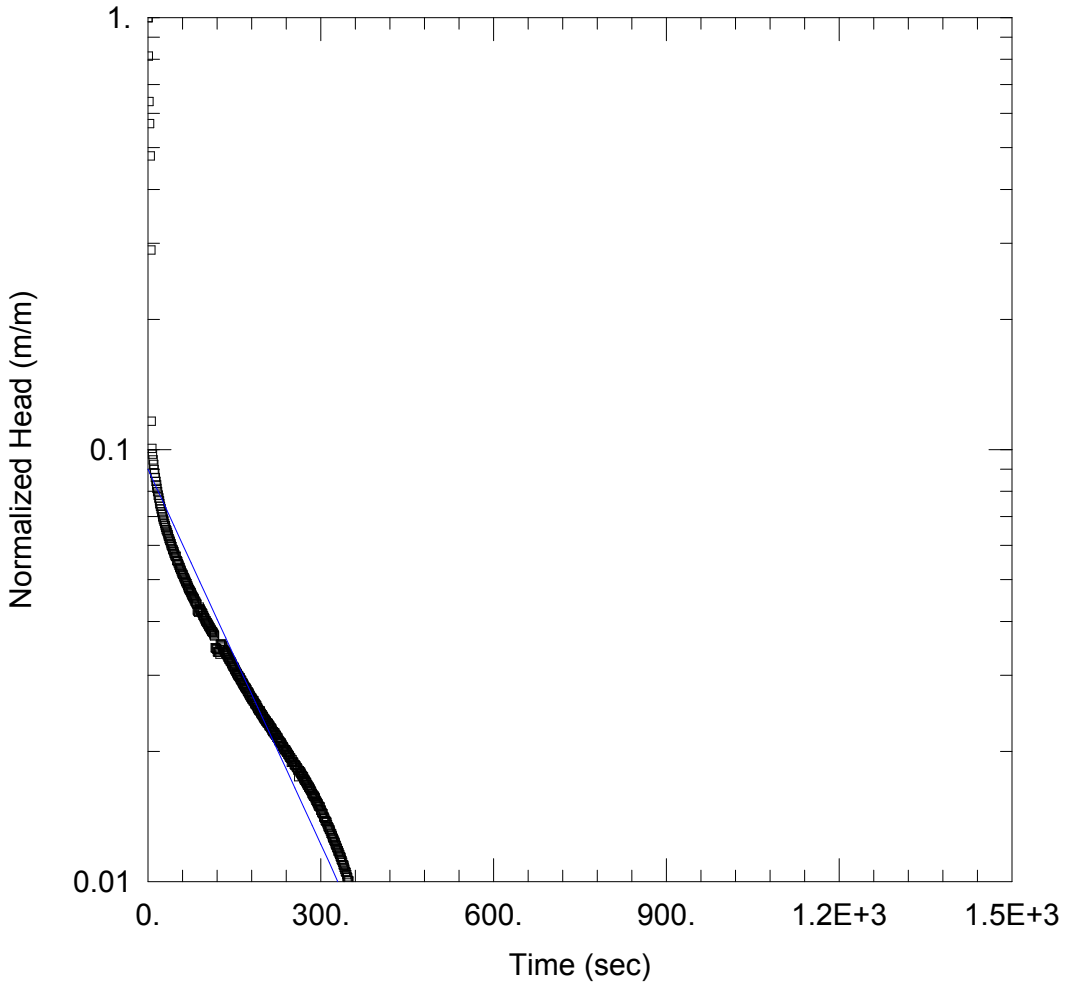
WELL DATA (BH 30-S)

Initial Displacement: 1.83 m
Total Well Penetration Depth: 5.71 m
Casing Radius: 0.0254 m
Static Water Column Height: 5.71 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.223E-8 m/sec y0 = 1.814 m



SWRT - RISING HEAD - BHMW 30-D

Data Set: C:\Users\SimonC\Documents\BHMW30-D.aqt
Date: 06/27/18 Time: 16:14:10

PROJECT INFORMATION

Company: EXP Services Inc
Client: Corbett Land Strategies
Project: BRM-00801363-B0
Location: Twenty Road, Hamilton, ON
Test Well: BH/MW 30-D
Test Date: June 19, 2018

AQUIFER DATA

Saturated Thickness: 10.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BHMW 30-D)

Initial Displacement: 9.348 m
Total Well Penetration Depth: 10.83 m
Casing Radius: 0.0254 m
Static Water Column Height: 10.83 m
Screen Length: 1.5 m
Well Radius: 0.1016 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 4.85E-6 m/sec
y0 = 0.8413 m

Appendix E: Laboratory Certificates of Analysis

Maxxam
A Bureau Veritas Group Company

Your P.O. #: BRM-ENV
Your Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your C.O.C. #: 667541-01-01

Attention: Ryan Smith

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

Report Date: 2018/06/21
Report #: R5260005
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8E5608
Received: 2018/06/14, 19:53

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Sewer Use By-Law Semivolatile Organics	1	2018/06/15	2018/06/16	EPA 8270 CAM SOP 00301	EPA 8270 m
Carbonaceous BOD	1	2018/06/15	2018/06/20	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	1	N/A	2018/06/18	CAM SOP-00463	EPA 325.2 m
Total Cyanide	1	2018/06/15	2018/06/19	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2018/06/15	2018/06/19	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2018/06/19	2018/06/19	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2018/06/20	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2018/06/15	CAM SOP-00552	MOE LSB E3371
Animal and Vegetable Oil and Grease	1	N/A	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2018/06/16	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520A m
OC Pesticides (Selected) & PCB (1)	1	2018/06/15	2018/06/16	CAM SOP-00307	EPA 8081A/8082B m
OC Pesticides Summed Parameters	1	N/A	2018/06/15	CAM SOP-00307	EPA 8081A/8082B m
pH	1	N/A	2018/06/19	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2018/06/19	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2018/06/18	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2018/06/18	2018/06/19	CAM SOP-00938	OMOE E3516 m
Total PAHs (Hamilton Sewer By-law) (2)	1	N/A	2018/06/18	CAM SOP - 00301	EPA 8270 m
Mineral/Synthetic O & G (TPH Heavy Oil) (3)	1	2018/06/16	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2018/06/15	2018/06/16	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2018/06/19	CAM SOP-00228	EPA 8260C m

Remarks:

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

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Your P.O. #: BRM-ENV
Your Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your C.O.C. #: 667541-01-01

Attention: Ryan Smith

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

Report Date: 2018/06/21
Report #: R5260005
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8E5608
Received: 2018/06/14, 19:53

or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane
(2) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(3) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

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

==========

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

Maxxam Job #: B8E5608
Report Date: 2018/06/21

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID				GYQ545			GYQ545		
Sampling Date				2018/06/14 16:30			2018/06/14 16:30		
COC Number				667541-01-01			667541-01-01		
	UNITS	Criteria	Criteria-2	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch
Calculated Parameters									
Total Animal/Vegetable Oil and Grease	mg/L	150	10	ND	0.50	5582125			
Inorganics									
Total Carbonaceous BOD	mg/L	300	-	2	2	5582809			
Fluoride (F-)	mg/L	10	-	0.13	0.10	5583635			
Total Kjeldahl Nitrogen (TKN)	mg/L	100	-	ND	0.10	5585579			
pH	pH	5.5:9.5	5.5:9.5	8.08		5583636			
Phenols-4AAP	mg/L	1	0.02	ND	0.0010	5587501			
Total Suspended Solids	mg/L	350	15	ND	10	5583935			
Dissolved Sulphate (SO4)	mg/L	1500	-	42	1.0	5584658			
Total Cyanide (CN)	mg/L	2	-	ND	0.0050	5583472			
Dissolved Chloride (Cl)	mg/L	1500	-	2.7	1.0	5584657			
Petroleum Hydrocarbons									
Total Oil & Grease	mg/L	-	-	ND	0.50	5584407			
Total Oil & Grease Mineral/Synthetic	mg/L	15	-	ND	0.50	5584408			
Metals									
Mercury (Hg)	mg/L	0.01	-	ND	0.0001	5587046			
Semivolatile Organics									
Di-N-butyl phthalate	ug/L	80	-	ND	2	5583033	ND	2	5583033
Bis(2-ethylhexyl)phthalate	ug/L	12	-	ND	2	5583033	ND	2	5583033
3,3'-Dichlorobenzidine	ug/L	2	-	ND	0.8	5583033	ND	0.8	5583033
Pentachlorophenol	ug/L	5	-	ND	1	5583033	ND	1	5583033
Phenanthrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Anthracene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Fluoranthene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Pyrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: City of Hamilton Sanitary and combined Sewer Discharge By Law No. 14-090 April 23, 2014
Criteria-2: City of Hamilton Storm Discharge By Law No. 14-090
April 23, 2014
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8E5608
Report Date: 2018/06/21

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID				GYQ545			GYQ545		
Sampling Date				2018/06/14 16:30			2018/06/14 16:30		
COC Number				667541-01-01			667541-01-01		
	UNITS	Criteria	Criteria-2	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch
Benzo(a)anthracene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Chrysene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(b/j)fluoranthene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(k)fluoranthene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(a)pyrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Indeno(1,2,3-cd)pyrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Dibenz(a,h)anthracene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(g,h,i)perylene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Dibenzo(a,i)pyrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(e)pyrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Perylene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Dibenzo(a,j) acridine	ug/L	-	-	ND	0.4	5583033	ND	0.4	5583033
7H-Dibenzo(c,g) Carbazole	ug/L	-	-	ND	0.4	5583033	ND	0.4	5583033
Calculated Parameters									
Total PAHs (18 PAHs)	ug/L	5	-	ND	0.96	5582441			
Volatile Organics									
Benzene	ug/L	10	-	ND	0.50	5584557			
Chloroform	ug/L	40	-	ND	0.50	5584557			
1,2-Dichlorobenzene	ug/L	50	-	ND	1.3	5584557			
1,4-Dichlorobenzene	ug/L	80	-	ND	1.3	5584557			
cis-1,2-Dichloroethylene	ug/L	4000	-	ND	1.3	5584557			
trans-1,3-Dichloropropene	ug/L	140	-	ND	1.0	5584557			
Ethylbenzene	ug/L	160	-	ND	0.50	5584557			
Methylene Chloride(Dichloromethane)	ug/L	2000	-	ND	5.0	5584557			
1,1,2,2-Tetrachloroethane	ug/L	1400	-	ND	1.3	5584557			
Tetrachloroethylene	ug/L	1000	-	ND	0.50	5584557			

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: City of Hamilton Sanitary and combined Sewer Discharge By Law No. 14-090 April 23, 2014
Criteria-2: City of Hamilton Storm Discharge By Law No. 14-090
April 23, 2014
ND = Not detected

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8E5608
Report Date: 2018/06/21

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID				GYQ545			GYQ545		
Sampling Date				2018/06/14 16:30			2018/06/14 16:30		
COC Number				667541-01-01			667541-01-01		
	UNITS	Criteria	Criteria-2	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch
Toluene	ug/L	16	-	ND	0.50	5584557			
Trichloroethylene	ug/L	400	-	ND	0.50	5584557			
p+m-Xylene	ug/L	-	-	ND	0.50	5584557			
o-Xylene	ug/L	-	-	ND	0.50	5584557			
Total Xylenes	ug/L	1400	-	ND	0.50	5584557			
Pesticides & Herbicides									
Aldrin	ug/L	-	-	ND	0.005	5584043			
Dieldrin	ug/L	-	-	ND	0.005	5584043			
a-Chlordane	ug/L	-	-	ND	0.005	5584043			
g-Chlordane	ug/L	-	-	ND	0.005	5584043			
o,p-DDT	ug/L	-	-	ND	0.005	5584043			
p,p-DDT	ug/L	-	-	ND	0.005	5584043			
Lindane	ug/L	100	-	ND	0.003	5584043			
Hexachlorobenzene	ug/L	0.1	-	ND	0.005	5584043			
Mirex	ug/L	100	-	ND	0.005	5584043			
Surrogate Recovery (%)									
2,4,6-Tribromophenol	%	-	-	89		5583033	70		5583033
2-Fluorobiphenyl	%	-	-	55		5583033	49		5583033
D14-Terphenyl (FS)	%	-	-	104		5583033	104		5583033
D5-Nitrobenzene	%	-	-	74		5583033	72		5583033
D8-Acenaphthylene	%	-	-	64		5583033	60		5583033
2,4,5,6-Tetrachloro-m-xylene	%	-	-	84		5584043			
Decachlorobiphenyl	%	-	-	101		5584043			
4-Bromofluorobenzene	%	-	-	90		5584557			
D4-1,2-Dichloroethane	%	-	-	116		5584557			
D8-Toluene	%	-	-	92		5584557			

No Fill — No Exceedance
Grey — Exceeds 1 criteria policy/level
Black — Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: City of Hamilton Sanitary and combined Sewer Discharge By Law No. 14-090 April 23, 2014
Criteria-2: City of Hamilton Storm Discharge By Law No. 14-090
April 23, 2014
ND = Not detected

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Maxxam Job #: B8E5608
Report Date: 2018/06/21

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

HAMILTON STORM SEWER USE-BYLAW (WATER)

Maxxam ID				GYQ545		
Sampling Date				2018/06/14 16:30		
COC Number				667541-01-01		
	UNITS	**Criteria**	**Criteria-2**	**BH29-D**	**RDL**	**QC Batch**
Metals						
Total Aluminum (Al)	ug/L	50000	-	23	5.0	5587524
Total Antimony (Sb)	ug/L	5000	-	ND	0.50	5587524
Total Arsenic (As)	ug/L	1000	-	6.1	1.0	5587524
Total Bismuth (Bi)	ug/L	5000	-	ND	1.0	5587524
Total Cadmium (Cd)	ug/L	700	1000	ND	0.10	5587524
Total Chromium (Cr)	ug/L	5000	1000	ND	5.0	5587524
Total Cobalt (Co)	ug/L	5000	-	ND	0.50	5587524
Total Copper (Cu)	ug/L	2000	1000	ND	1.0	5587524
Total Iron (Fe)	ug/L	50000	-	640	100	5587524
Total Lead (Pb)	ug/L	2000	1000	ND	0.50	5587524
Total Manganese (Mn)	ug/L	5000	-	37	2.0	5587524
Total Molybdenum (Mo)	ug/L	1000	-	ND	0.50	5587524
Total Nickel (Ni)	ug/L	2000	1000	ND	1.0	5587524
Total Phosphorus (P)	ug/L	10000	-	ND	100	5587524
Total Selenium (Se)	ug/L	1000	-	ND	2.0	5587524
Total Silver (Ag)	ug/L	5000	-	ND	0.10	5587524
Total Tin (Sn)	ug/L	5000	-	ND	1.0	5587524
Total Titanium (Ti)	ug/L	5000	-	ND	5.0	5587524
Total Vanadium (V)	ug/L	5000	-	ND	0.50	5587524
Total Zinc (Zn)	ug/L	3000	3000	ND	5.0	5587524
Microbiological						
Escherichia coli	CFU/100mL	-	2400	<10	10	5584111

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Criteria: City of Hamilton Sanitary and combined Sewer Discharge By Law No. 14-090 April 23, 2014

Criteria-2: City of Hamilton Storm Discharge By Law No. 14-090
April 23, 2014

ND = Not detected

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Sampler Initials: MY

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

Maxxam ID			GYQ545		
Sampling Date			2018/06/14 16:30		
COC Number			667541-01-01		
	UNITS	**Criteria**	**BH29-D**	**RDL**	**QC Batch**
Calculated Parameters					
Aldrin + Dieldrin	ug/L	0.2	ND	0.005	5582440
Chlordane (Total)	ug/L	100	ND	0.005	5582440
o,p-DDT + p,p-DDT	ug/L	0.1	ND	0.005	5582440
Total PCB	ug/L	1	ND	0.05	5582440

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: City of Hamilton Sanitary and combined Sewer Discharge By Law No. 14-090 April 23, 2014
ND = Not detected

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Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

TEST SUMMARY

Maxxam ID: GYQ545
Sample ID: BH29-D
Matrix: Water

Collected: 2018/06/14
Shipped:
Received: 2018/06/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	5583033	2018/06/15	2018/06/16	Kathy Horvat
Carbonaceous BOD	DO	5582809	2018/06/15	2018/06/20	Prakash Piya
Chloride by Automated Colourimetry	KONE	5584657	N/A	2018/06/18	Deonarine Ramnarine
Total Cyanide	SKAL/CN	5583472	2018/06/15	2018/06/19	Xuanhong Qiu
Fluoride	ISE	5583635	2018/06/15	2018/06/19	Yogesh Patel
Mercury in Water by CVAA	CV/AA	5587046	2018/06/19	2018/06/19	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5587524	N/A	2018/06/20	Thao Nguyen
E.coli, (CFU/100mL)	PL	5584111	N/A	2018/06/15	Sonja Elavinamannil
Animal and Vegetable Oil and Grease	BAL	5582125	N/A	2018/06/16	Automated Statchk
Total Oil and Grease	BAL	5584407	2018/06/16	2018/06/16	Mansoor Ahmed
OC Pesticides (Selected) & PCB	GC/ECD	5584043	2018/06/15	2018/06/16	Mahmudul Khan
OC Pesticides Summed Parameters	CALC	5582440	N/A	2018/06/15	Automated Statchk
pH	AT	5583636	N/A	2018/06/19	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5587501	N/A	2018/06/19	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5584658	N/A	2018/06/18	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5585579	2018/06/18	2018/06/19	Bramdeo Motiram
Total PAHs (Hamilton Sewer By-law)	CALC	5582441	N/A	2018/06/18	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5584408	2018/06/16	2018/06/16	Mansoor Ahmed
Total Suspended Solids	BAL	5583935	2018/06/15	2018/06/16	Mandeep Kaur
Volatile Organic Compounds in Water	GC/MS	5584557	N/A	2018/06/19	Juan Pangilinan

Maxxam ID: GYQ545 Dup
Sample ID: BH29-D
Matrix: Water

Collected: 2018/06/14
Shipped:
Received: 2018/06/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	5583033	2018/06/15	2018/06/16	Kathy Horvat

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GENERAL COMMENTS

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

Package 1	14.0°C

Sample GYQ545 [BH29-D] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5583033	2,4,6-Tribromophenol	2018/06/16	117	10 - 130	98	10 - 130	84	%				
5583033	2-Fluorobiphenyl	2018/06/16	74	30 - 130	73	30 - 130	77	%				
5583033	D14-Terphenyl (FS)	2018/06/16	110	30 - 130	101	30 - 130	102	%				
5583033	D5-Nitrobenzene	2018/06/16	103	30 - 130	87	30 - 130	84	%				
5583033	D8-Acenaphthylene	2018/06/16	86	30 - 130	75	30 - 130	72	%				
5584043	2,4,5,6-Tetrachloro-m-xylene	2018/06/16	80	50 - 130	77	50 - 130	77	%				
5584043	Decachlorobiphenyl	2018/06/16	108	50 - 130	112	50 - 130	112	%				
5584557	4-Bromofluorobenzene	2018/06/18	100	70 - 130	101	70 - 130	96	%				
5584557	D4-1,2-Dichloroethane	2018/06/18	110	70 - 130	107	70 - 130	112	%				
5584557	D8-Toluene	2018/06/18	100	70 - 130	103	70 - 130	91	%				
5582809	Total Carbonaceous BOD	2018/06/20					ND,RDL=2	mg/L	0	30	93	85 - 115
5583033	3,3'-Dichlorobenzidine	2018/06/16	0.47 (1)	30 - 130	104	30 - 130	ND, RDL=0.8	ug/L	NC	40		
5583033	7H-Dibenzo(c,g) Carbazole	2018/06/16	102	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC	40		
5583033	Anthracene	2018/06/16	91	30 - 130	91	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(a)anthracene	2018/06/16	106	30 - 130	97	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(a)pyrene	2018/06/16	98	30 - 130	101	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(b/j)fluoranthene	2018/06/16	109	30 - 130	109	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(e)pyrene	2018/06/16	116	30 - 130	115	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(g,h,i)perylene	2018/06/16	112	30 - 130	105	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(k)fluoranthene	2018/06/16	107	30 - 130	109	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Bis(2-ethylhexyl)phthalate	2018/06/16	107	30 - 130	100	30 - 130	ND,RDL=2	ug/L	NC	40		
5583033	Chrysene	2018/06/16	104	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenz(a,h)anthracene	2018/06/16	98	30 - 130	94	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenzo(a,i)pyrene	2018/06/16	100	30 - 130	112	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenzo(a,j) acridine	2018/06/16	100	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC	40		
5583033	Di-N-butyl phthalate	2018/06/16	114	30 - 130	108	30 - 130	ND,RDL=2	ug/L	NC	40		
5583033	Fluoranthene	2018/06/16	109	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Indeno(1,2,3-cd)pyrene	2018/06/16	104	30 - 130	95	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Pentachlorophenol	2018/06/16	103	30 - 130	57	30 - 130	ND,RDL=1	ug/L	NC	40		
5583033	Perylene	2018/06/16	120	30 - 130	108	30 - 130	ND, RDL=0.2	ug/L	NC	40		

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Maxxam Job #: B8E5608
Report Date: 2018/06/21

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5583033	Phenanthrene	2018/06/16	98	30 - 130	97	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Pyrene	2018/06/16	108	30 - 130	107	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583472	Total Cyanide (CN)	2018/06/19	99	80 - 120	103	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
5583635	Fluoride (F-)	2018/06/19	100	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	1.4	20		
5583636	pH	2018/06/19			102	98 - 103			0.079	N/A		
5583935	Total Suspended Solids	2018/06/16					ND, RDL=10	mg/L	NC	25	96	85 - 115
5584043	a-Chlordane	2018/06/16	101	50 - 130	104	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Aldrin	2018/06/16	80	50 - 130	84	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Dieldrin	2018/06/16	113	50 - 130	116	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	g-Chlordane	2018/06/16	99	50 - 130	101	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Hexachlorobenzene	2018/06/16	94	50 - 130	96	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Lindane	2018/06/16	85	50 - 130	85	50 - 130	ND, RDL=0.003	ug/L	NC	30		
5584043	Mirex	2018/06/16	106	30 - 130	99	30 - 130	ND, RDL=0.005	ug/L	NC	40		
5584043	o,p-DDT	2018/06/16	94	50 - 130	89	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	p,p-DDT	2018/06/16	82	50 - 130	71	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584407	Total Oil & Grease	2018/06/16			100	85 - 115	ND, RDL=0.50	mg/L	4.9	25		
5584408	Total Oil & Grease Mineral/Synthetic	2018/06/16			94	85 - 115	ND, RDL=0.50	mg/L	2.6	25		
5584557	1,1,2,2-Tetrachloroethane	2018/06/18	99	70 - 130	101	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	1,2-Dichlorobenzene	2018/06/18	88	70 - 130	93	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	1,4-Dichlorobenzene	2018/06/18	88	70 - 130	95	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	Benzene	2018/06/18	97	70 - 130	101	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Chloroform	2018/06/18	99	70 - 130	103	70 - 130	ND, RDL=0.20	ug/L	NC	30		

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QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
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Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5584557	cis-1,2-Dichloroethylene	2018/06/18	101	70 - 130	105	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	Ethylbenzene	2018/06/18	87	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Methylene Chloride(Dichloromethane)	2018/06/18	95	70 - 130	96	70 - 130	ND, RDL=2.0	ug/L	NC	30		
5584557	o-Xylene	2018/06/18	84	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	p+m-Xylene	2018/06/18	87	70 - 130	95	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Tetrachloroethylene	2018/06/18	87	70 - 130	93	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Toluene	2018/06/18	90	70 - 130	97	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Total Xylenes	2018/06/18					ND, RDL=0.20	ug/L	NC	30		
5584557	trans-1,3-Dichloropropene	2018/06/18	75	70 - 130	76	70 - 130	ND, RDL=0.40	ug/L	NC	30		
5584557	Trichloroethylene	2018/06/18	91	70 - 130	96	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584657	Dissolved Chloride (Cl)	2018/06/18	100	80 - 120	104	80 - 120	ND, RDL=1.0	mg/L	0.071	20		
5584658	Dissolved Sulphate (SO4)	2018/06/18	104	75 - 125	101	80 - 120	ND, RDL=1.0	mg/L	0.49	20		
5585579	Total Kjeldahl Nitrogen (TKN)	2018/06/19	103	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	0	20	99	80 - 120
5587046	Mercury (Hg)	2018/06/19	92	75 - 125	91	80 - 120	ND, RDL=0.0001	mg/L	NC	20		
5587501	Phenols-4AAP	2018/06/19	91	80 - 120	93	80 - 120	ND, RDL=0.0010	mg/L	0	20		
5587524	Total Aluminum (Al)	2018/06/20	NC	80 - 120	105	80 - 120	ND, RDL=5.0	ug/L	1.8	20		
5587524	Total Antimony (Sb)	2018/06/20	107	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L				
5587524	Total Arsenic (As)	2018/06/20	103	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L				
5587524	Total Bismuth (Bi)	2018/06/20	92	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	NC	20		
5587524	Total Cadmium (Cd)	2018/06/20	100	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5587524	Total Chromium (Cr)	2018/06/20	100	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC	20		
5587524	Total Cobalt (Co)	2018/06/20	98	80 - 120	96	80 - 120	ND, RDL=0.50	ug/L	16	20		
5587524	Total Copper (Cu)	2018/06/20	103	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	3.0	20		
5587524	Total Iron (Fe)	2018/06/20	99	80 - 120	97	80 - 120	ND, RDL=100	ug/L	1.8	20		
5587524	Total Lead (Pb)	2018/06/20	93	80 - 120	95	80 - 120	ND, RDL=0.50	ug/L	0.78	20		
5587524	Total Manganese (Mn)	2018/06/20	97	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	2.5	20		
5587524	Total Molybdenum (Mo)	2018/06/20	107	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	5.5	20		
5587524	Total Nickel (Ni)	2018/06/20	97	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	4.7	20		

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QUALITY ASSURANCE REPORT(CONT'D)

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Your P.O. #: BRM-ENV
Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5587524	Total Phosphorus (P)	2018/06/20	110	80 - 120	107	80 - 120	ND, RDL=100	ug/L	1.1	20		
5587524	Total Selenium (Se)	2018/06/20	108	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L				
5587524	Total Silver (Ag)	2018/06/20	97	80 - 120	95	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5587524	Total Tin (Sn)	2018/06/20	103	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L				
5587524	Total Titanium (Ti)	2018/06/20	104	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L				
5587524	Total Vanadium (V)	2018/06/20	102	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	2.1	20		
5587524	Total Zinc (Zn)	2018/06/20	100	80 - 120	104	80 - 120	ND, RDL=5.0	ug/L	1.1	20		

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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

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

(1) Some recoveries were below the lower control limits. This may represent a low bias in some results for these flagged analytes.

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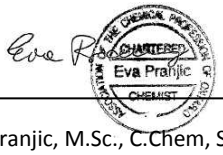
Maxxam Job #: B8E5608
Report Date: 2018/06/21

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Service Specialist



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Sonja Elavinamannil, Analyst I

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

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Sampler Initials: MY

Exceedence Summary Table – Hamiton Sanitary & comb.

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Exceedence Summary Table – Hamiton Storm

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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MICRO

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CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#30554 exp Services Inc	Company Name:	Exp Services.	Quotation #:	~~B45997~~ Stream 2	Maxxam Job #:	Bottle Order #:
Attention:	Central Services	Attention:	Ryan. Smith @ exp.com	P.O. #:	BRM-ENV		667541
Address:	1595 Clark Blvd Brampton ON L6T 4V1	Address:	Tomson.hecht@exp.com	Project:	BRM-00801363	COC #:	Project Manager:
Tel:	(905) 793-9800 Fax (905) 793-0641	Tel:	Fax:	Project Name:	Twenty RD West, Hamilton	C#667541-01-01	Deepthi Shaji
Email:	Karen.Burke@exp.com; Luizza.Jose@exp.com; AP@e	Email:	Minoo.Yazdanpanah@exp.com	Site #:			
				Sampled By:	M.Y & K.P		

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

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

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

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

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

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Hamilton Sanitary and Storm Sewer Bylaw (06-226)	# of Bottles	Comments
1		BH 29-D	2018/06/14	4.30	GW	N	✓	17	Iron analysis please
2									please meet 5day TAT
3									
4									
5									
6									
7									
8									
9									
10									

14-Jun-18 19:53
Deepthi Shaji
B8E5608
HGL ENV-1109

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Minoo Yazdanpanah	2018/06/14	7:48pm	MARJIT ZILIM	2018/06/14	19:53	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal Present	Yes	No
	14/14/14 on ice	Intact	✓	

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

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

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

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

White: Maxxa Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam
A Bureau Veritas Group Company

Your P.O. #: BRM-ENV
Your Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your C.O.C. #: 667541-01-01

Attention: Ryan Smith

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

Report Date: 2018/07/03
Report #: R5278713
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8E5608
Received: 2018/06/14, 19:53

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Sewer Use By-Law Semivolatile Organics	1	2018/06/15	2018/06/16	EPA 8270 CAM SOP 00301	EPA 8270 m
Carbonaceous BOD	1	2018/06/15	2018/06/20	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	1	N/A	2018/06/18	CAM SOP-00463	EPA 325.2 m
Total Cyanide	1	2018/06/15	2018/06/19	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2018/06/15	2018/06/19	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2018/06/19	2018/06/19	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2018/06/20	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2018/06/15	CAM SOP-00552	MOE LSB E3371
Animal and Vegetable Oil and Grease	1	N/A	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2018/06/16	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520A m
OC Pesticides (Selected) & PCB (1)	1	2018/06/15	2018/06/16	CAM SOP-00307	EPA 8081A/8082B m
OC Pesticides Summed Parameters	1	N/A	2018/06/15	CAM SOP-00307	EPA 8081A/8082B m
pH	1	N/A	2018/06/19	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2018/06/19	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2018/06/18	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2018/06/18	2018/06/19	CAM SOP-00938	OMOE E3516 m
Total PAHs (Hamilton, Ottawa S.U.B.) (2)	1	N/A	2018/06/18	CAM SOP - 00301	EPA 8270 m
Mineral/Synthetic O & G (TPH Heavy Oil) (3)	1	2018/06/16	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2018/06/15	2018/06/16	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2018/06/19	CAM SOP-00228	EPA 8260C m

Remarks:

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

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed

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Maxxam
A Bureau Veritas Group Company

Your P.O. #: BRM-ENV
Your Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your C.O.C. #: 667541-01-01

Attention: Ryan Smith

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

Report Date: 2018/07/03
Report #: R5278713
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8E5608
Received: 2018/06/14, 19:53

or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane
(2) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(3) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

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

==========

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Maxxam Job #: B8E5608
Report Date: 2018/07/03

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID			GYQ545			GYQ545		
Sampling Date			2018/06/14 16:30			2018/06/14 16:30		
COC Number			667541-01-01			667541-01-01		
	UNITS	**Criteria**	**BH29-D**	**RDL**	**QC Batch**	**BH29-D Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters								
Total Animal/Vegetable Oil and Grease	mg/L	-	ND	0.50	5582125			
Inorganics								
Total Carbonaceous BOD	mg/L	-	2	2	5582809			
Fluoride (F-)	mg/L	-	0.13	0.10	5583635			
Total Kjeldahl Nitrogen (TKN)	mg/L	-	ND	0.10	5585579			
pH	pH	6.5:8.5	8.08		5583636			
Phenols-4AAP	mg/L	0.001	ND	0.0010	5587501			
Total Suspended Solids	mg/L	-	ND	10	5583935			
Dissolved Sulphate (SO4)	mg/L	-	42	1.0	5584658			
Total Cyanide (CN)	mg/L	-	ND	0.0050	5583472			
Dissolved Chloride (Cl)	mg/L	-	2.7	1.0	5584657			
Petroleum Hydrocarbons								
Total Oil & Grease	mg/L	-	ND	0.50	5584407			
Total Oil & Grease Mineral/Synthetic	mg/L	0.5	ND	0.50	5584408			
Metals								
Mercury (Hg)	mg/L	0.0002	ND	0.0001	5587046			
Semivolatile Organics								
Di-N-butyl phthalate	ug/L	4	ND	2	5583033	ND	2	5583033
Bis(2-ethylhexyl)phthalate	ug/L	0.6	**ND (1)**	2	5583033	**ND (1)**	2	5583033
3,3'-Dichlorobenzidine	ug/L	0.6	**ND (1)**	0.8	5583033	**ND (1)**	0.8	5583033
Pentachlorophenol	ug/L	0.5	**ND (1)**	1	5583033	**ND (1)**	1	5583033
Phenanthrene	ug/L	0.03	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Anthracene	ug/L	0.0008	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Fluoranthene	ug/L	0.0008	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Pyrene	ug/L	-	ND	0.2	5583033	ND	0.2	5583033

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
ND = Not detected
(1) RDL exceeds criteria

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Maxxam Job #: B8E5608
Report Date: 2018/07/03

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID			GYQ545			GYQ545		
Sampling Date			2018/06/14 16:30			2018/06/14 16:30		
COC Number			667541-01-01			667541-01-01		
	UNITS	**Criteria**	**BH29-D**	**RDL**	**QC Batch**	**BH29-D Lab-Dup**	**RDL**	**QC Batch**
Benzo(a)anthracene	ug/L	0.0004	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Chrysene	ug/L	0.0001	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Benzo(b/j)fluoranthene	ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(k)fluoranthene	ug/L	0.0002	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Benzo(a)pyrene	ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Indeno(1,2,3-cd)pyrene	ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Dibenz(a,h)anthracene	ug/L	0.002	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Benzo(g,h,i)perylene	ug/L	0.00002	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Dibenzo(a,i)pyrene	ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(e)pyrene	ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Perylene	ug/L	0.00007	**ND (1)**	0.2	5583033	**ND (1)**	0.2	5583033
Dibenzo(a,j) acridine	ug/L	-	ND	0.4	5583033	ND	0.4	5583033
7H-Dibenzo(c,g) Carbazole	ug/L	-	ND	0.4	5583033	ND	0.4	5583033
Calculated Parameters								
Total PAHs (18 PAHs)	ug/L	-	ND	0.96	5582441			
Volatile Organics								
Benzene	ug/L	100	ND	0.50	5584557			
Chloroform	ug/L	-	ND	0.50	5584557			
1,2-Dichlorobenzene	ug/L	2.5	ND	1.3	5584557			
1,4-Dichlorobenzene	ug/L	4	ND	1.3	5584557			
cis-1,2-Dichloroethylene	ug/L	200	ND	1.3	5584557			
trans-1,3-Dichloropropene	ug/L	7	ND	1.0	5584557			
Ethylbenzene	ug/L	8	ND	0.50	5584557			
Methylene Chloride(Dichloromethane)	ug/L	100	ND	5.0	5584557			
1,1,2,2-Tetrachloroethane	ug/L	70	ND	1.3	5584557			
Tetrachloroethylene	ug/L	50	ND	0.50	5584557			

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
ND = Not detected
(1) RDL exceeds criteria

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Maxxam Job #: B8E5608
Report Date: 2018/07/03

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID			GYQ545			GYQ545		
Sampling Date			2018/06/14 16:30			2018/06/14 16:30		
COC Number			667541-01-01			667541-01-01		
	UNITS	**Criteria**	**BH29-D**	**RDL**	**QC Batch**	**BH29-D Lab-Dup**	**RDL**	**QC Batch**
Toluene	ug/L	0.8	ND	0.50	5584557			
Trichloroethylene	ug/L	20	ND	0.50	5584557			
p+m-Xylene	ug/L	-	ND	0.50	5584557			
o-Xylene	ug/L	40	ND	0.50	5584557			
Total Xylenes	ug/L	-	ND	0.50	5584557			
Pesticides & Herbicides								
Aldrin	ug/L	0.001	**ND (1)**	0.005	5584043			
Dieldrin	ug/L	0.001	**ND (1)**	0.005	5584043			
a-Chlordane	ug/L	0.06	ND	0.005	5584043			
g-Chlordane	ug/L	0.06	ND	0.005	5584043			
o,p-DDT	ug/L	0.003	**ND (1)**	0.005	5584043			
p,p-DDT	ug/L	0.003	**ND (1)**	0.005	5584043			
Lindane	ug/L	0.01	ND	0.003	5584043			
Hexachlorobenzene	ug/L	0.0065	ND	0.005	5584043			
Mirex	ug/L	0.001	**ND (1)**	0.005	5584043			
Surrogate Recovery (%)								
2,4,6-Tribromophenol	%	-	89		5583033	70		5583033
2-Fluorobiphenyl	%	-	55		5583033	49		5583033
D14-Terphenyl (FS)	%	-	104		5583033	104		5583033
D5-Nitrobenzene	%	-	74		5583033	72		5583033
D8-Acenaphthylene	%	-	64		5583033	60		5583033
2,4,5,6-Tetrachloro-m-xylene	%	-	84		5584043			
Decachlorobiphenyl	%	-	101		5584043			
4-Bromofluorobenzene	%	-	90		5584557			
D4-1,2-Dichloroethane	%	-	116		5584557			
D8-Toluene	%	-	92		5584557			

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
ND = Not detected
(1) RDL exceeds criteria

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Maxxam Job #: B8E5608
Report Date: 2018/07/03

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

HAMILTON STORM SEWER USE-BYLAW (WATER)

Maxxam ID			GYQ545		
Sampling Date			2018/06/14 16:30		
COC Number			667541-01-01		
	UNITS	**Criteria**	**BH29-D**	**RDL**	**QC Batch**
Metals					
Total Aluminum (Al)	ug/L	-	23	5.0	5587524
Total Antimony (Sb)	ug/L	20	ND	0.50	5587524
Total Arsenic (As)	ug/L	100	6.1	1.0	5587524
Total Bismuth (Bi)	ug/L	-	ND	1.0	5587524
Total Cadmium (Cd)	ug/L	0.2	ND	0.10	5587524
Total Chromium (Cr)	ug/L	-	ND	5.0	5587524
Total Cobalt (Co)	ug/L	0.9	ND	0.50	5587524
Total Copper (Cu)	ug/L	5	ND	1.0	5587524
Total Iron (Fe)	ug/L	300	**640**	100	5587524
Total Lead (Pb)	ug/L	5	ND	0.50	5587524
Total Manganese (Mn)	ug/L	-	37	2.0	5587524
Total Molybdenum (Mo)	ug/L	40	ND	0.50	5587524
Total Nickel (Ni)	ug/L	25	ND	1.0	5587524
Total Phosphorus (P)	ug/L	10	**ND (1)**	100	5587524
Total Selenium (Se)	ug/L	100	ND	2.0	5587524
Total Silver (Ag)	ug/L	0.1	ND	0.10	5587524
Total Tin (Sn)	ug/L	-	ND	1.0	5587524
Total Titanium (Ti)	ug/L	-	ND	5.0	5587524
Total Vanadium (V)	ug/L	6	ND	0.50	5587524
Total Zinc (Zn)	ug/L	30	ND	5.0	5587524
Microbiological					
Escherichia coli	CFU/100mL	100	<10	10	5584111

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
ND = Not detected
(1) RDL exceeds criteria

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Maxxam Job #: B8E5608
Report Date: 2018/07/03

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

Maxxam ID			GYQ545		
Sampling Date			2018/06/14 16:30		
COC Number			667541-01-01		
	UNITS	**Criteria**	**BH29-D**	**RDL**	**QC Batch**
Calculated Parameters					
Aldrin + Dieldrin	ug/L	0.001	**ND (1)**	0.005	5582440
Chlordane (Total)	ug/L	0.06	ND	0.005	5582440
o,p-DDT + p,p-DDT	ug/L	-	ND	0.005	5582440
Total PCB	ug/L	0.001	**ND (1)**	0.05	5582440

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
ND = Not detected
(1) RDL exceeds criteria

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Sampler Initials: MY

TEST SUMMARY

Maxxam ID: GYQ545
Sample ID: BH29-D
Matrix: Water

Collected: 2018/06/14
Shipped:
Received: 2018/06/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	5583033	2018/06/15	2018/06/16	Kathy Horvat
Carbonaceous BOD	DO	5582809	2018/06/15	2018/06/20	Prakash Piya
Chloride by Automated Colourimetry	KONE	5584657	N/A	2018/06/18	Deonarine Ramnarine
Total Cyanide	SKAL/CN	5583472	2018/06/15	2018/06/19	Xuanhong Qiu
Fluoride	ISE	5583635	2018/06/15	2018/06/19	Yogesh Patel
Mercury in Water by CVAA	CV/AA	5587046	2018/06/19	2018/06/19	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5587524	N/A	2018/06/20	Thao Nguyen
E.coli, (CFU/100mL)	PL	5584111	N/A	2018/06/15	Sonja Elavinamannil
Animal and Vegetable Oil and Grease	BAL	5582125	N/A	2018/06/16	Automated Statchk
Total Oil and Grease	BAL	5584407	2018/06/16	2018/06/16	Mansoor Ahmed
OC Pesticides (Selected) & PCB	GC/ECD	5584043	2018/06/15	2018/06/16	Mahmudul Khan
OC Pesticides Summed Parameters	CALC	5582440	N/A	2018/06/15	Automated Statchk
pH	AT	5583636	N/A	2018/06/19	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5587501	N/A	2018/06/19	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5584658	N/A	2018/06/18	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5585579	2018/06/18	2018/06/19	Bramdeo Motiram
Total PAHs (Hamilton, Ottawa S.U.B.)	CALC	5582441	N/A	2018/06/18	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5584408	2018/06/16	2018/06/16	Mansoor Ahmed
Total Suspended Solids	BAL	5583935	2018/06/15	2018/06/16	Mandeep Kaur
Volatile Organic Compounds in Water	GC/MS	5584557	N/A	2018/06/19	Juan Pangilinan

Maxxam ID: GYQ545 Dup
Sample ID: BH29-D
Matrix: Water

Collected: 2018/06/14
Shipped:
Received: 2018/06/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	5583033	2018/06/15	2018/06/16	Kathy Horvat

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GENERAL COMMENTS

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

Package 1	14.0°C

Revised Report (2018/07/03): Requested regulatory criteria have been revised as per client request

Sample GYQ545 [BH29-D] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: BRM-00801363
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Your P.O. #: BRM-ENV
Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5583033	2,4,6-Tribromophenol	2018/06/16	117	10 - 130	98	10 - 130	84	%				
5583033	2-Fluorobiphenyl	2018/06/16	74	30 - 130	73	30 - 130	77	%				
5583033	D14-Terphenyl (FS)	2018/06/16	110	30 - 130	101	30 - 130	102	%				
5583033	D5-Nitrobenzene	2018/06/16	103	30 - 130	87	30 - 130	84	%				
5583033	D8-Acenaphthylene	2018/06/16	86	30 - 130	75	30 - 130	72	%				
5584043	2,4,5,6-Tetrachloro-m-xylene	2018/06/16	80	50 - 130	77	50 - 130	77	%				
5584043	Decachlorobiphenyl	2018/06/16	108	50 - 130	112	50 - 130	112	%				
5584557	4-Bromofluorobenzene	2018/06/18	100	70 - 130	101	70 - 130	96	%				
5584557	D4-1,2-Dichloroethane	2018/06/18	110	70 - 130	107	70 - 130	112	%				
5584557	D8-Toluene	2018/06/18	100	70 - 130	103	70 - 130	91	%				
5582809	Total Carbonaceous BOD	2018/06/20					ND,RDL=2	mg/L	0	30	93	85 - 115
5583033	3,3'-Dichlorobenzidine	2018/06/16	0.47 (1)	30 - 130	104	30 - 130	ND, RDL=0.8	ug/L	NC	40		
5583033	7H-Dibenzo(c,g) Carbazole	2018/06/16	102	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC	40		
5583033	Anthracene	2018/06/16	91	30 - 130	91	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(a)anthracene	2018/06/16	106	30 - 130	97	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(a)pyrene	2018/06/16	98	30 - 130	101	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(b/j)fluoranthene	2018/06/16	109	30 - 130	109	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(e)pyrene	2018/06/16	116	30 - 130	115	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(g,h,i)perylene	2018/06/16	112	30 - 130	105	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(k)fluoranthene	2018/06/16	107	30 - 130	109	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Bis(2-ethylhexyl)phthalate	2018/06/16	107	30 - 130	100	30 - 130	ND,RDL=2	ug/L	NC	40		
5583033	Chrysene	2018/06/16	104	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenz(a,h)anthracene	2018/06/16	98	30 - 130	94	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenzo(a,i)pyrene	2018/06/16	100	30 - 130	112	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenzo(a,j) acridine	2018/06/16	100	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC	40		
5583033	Di-N-butyl phthalate	2018/06/16	114	30 - 130	108	30 - 130	ND,RDL=2	ug/L	NC	40		
5583033	Fluoranthene	2018/06/16	109	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Indeno(1,2,3-cd)pyrene	2018/06/16	104	30 - 130	95	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Pentachlorophenol	2018/06/16	103	30 - 130	57	30 - 130	ND,RDL=1	ug/L	NC	40		
5583033	Perylene	2018/06/16	120	30 - 130	108	30 - 130	ND, RDL=0.2	ug/L	NC	40		

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Maxxam Job #: B8E5608
Report Date: 2018/07/03

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: BRM-00801363
Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5583033	Phenanthrene	2018/06/16	98	30 - 130	97	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Pyrene	2018/06/16	108	30 - 130	107	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583472	Total Cyanide (CN)	2018/06/19	99	80 - 120	103	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
5583635	Fluoride (F-)	2018/06/19	100	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	1.4	20		
5583636	pH	2018/06/19			102	98 - 103			0.079	N/A		
5583935	Total Suspended Solids	2018/06/16					ND, RDL=10	mg/L	NC	25	96	85 - 115
5584043	a-Chlordane	2018/06/16	101	50 - 130	104	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Aldrin	2018/06/16	80	50 - 130	84	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Dieldrin	2018/06/16	113	50 - 130	116	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	g-Chlordane	2018/06/16	99	50 - 130	101	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Hexachlorobenzene	2018/06/16	94	50 - 130	96	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Lindane	2018/06/16	85	50 - 130	85	50 - 130	ND, RDL=0.003	ug/L	NC	30		
5584043	Mirex	2018/06/16	106	30 - 130	99	30 - 130	ND, RDL=0.005	ug/L	NC	40		
5584043	o,p-DDT	2018/06/16	94	50 - 130	89	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	p,p-DDT	2018/06/16	82	50 - 130	71	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584407	Total Oil & Grease	2018/06/16			100	85 - 115	ND, RDL=0.50	mg/L	4.9	25		
5584408	Total Oil & Grease Mineral/Synthetic	2018/06/16			94	85 - 115	ND, RDL=0.50	mg/L	2.6	25		
5584557	1,1,2,2-Tetrachloroethane	2018/06/18	99	70 - 130	101	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	1,2-Dichlorobenzene	2018/06/18	88	70 - 130	93	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	1,4-Dichlorobenzene	2018/06/18	88	70 - 130	95	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	Benzene	2018/06/18	97	70 - 130	101	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Chloroform	2018/06/18	99	70 - 130	103	70 - 130	ND, RDL=0.20	ug/L	NC	30		

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QUALITY ASSURANCE REPORT(CONT'D)

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			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5584557	cis-1,2-Dichloroethylene	2018/06/18	101	70 - 130	105	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	Ethylbenzene	2018/06/18	87	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Methylene Chloride(Dichloromethane)	2018/06/18	95	70 - 130	96	70 - 130	ND, RDL=2.0	ug/L	NC	30		
5584557	o-Xylene	2018/06/18	84	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	p+m-Xylene	2018/06/18	87	70 - 130	95	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Tetrachloroethylene	2018/06/18	87	70 - 130	93	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Toluene	2018/06/18	90	70 - 130	97	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Total Xylenes	2018/06/18					ND, RDL=0.20	ug/L	NC	30		
5584557	trans-1,3-Dichloropropene	2018/06/18	75	70 - 130	76	70 - 130	ND, RDL=0.40	ug/L	NC	30		
5584557	Trichloroethylene	2018/06/18	91	70 - 130	96	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584657	Dissolved Chloride (Cl)	2018/06/18	100	80 - 120	104	80 - 120	ND, RDL=1.0	mg/L	0.071	20		
5584658	Dissolved Sulphate (SO4)	2018/06/18	104	75 - 125	101	80 - 120	ND, RDL=1.0	mg/L	0.49	20		
5585579	Total Kjeldahl Nitrogen (TKN)	2018/06/19	103	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	0	20	99	80 - 120
5587046	Mercury (Hg)	2018/06/19	92	75 - 125	91	80 - 120	ND, RDL=0.0001	mg/L	NC	20		
5587501	Phenols-4AAP	2018/06/19	91	80 - 120	93	80 - 120	ND, RDL=0.0010	mg/L	0	20		
5587524	Total Aluminum (Al)	2018/06/20	NC	80 - 120	105	80 - 120	ND, RDL=5.0	ug/L	1.8	20		
5587524	Total Antimony (Sb)	2018/06/20	107	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L				
5587524	Total Arsenic (As)	2018/06/20	103	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L				
5587524	Total Bismuth (Bi)	2018/06/20	92	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	NC	20		
5587524	Total Cadmium (Cd)	2018/06/20	100	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5587524	Total Chromium (Cr)	2018/06/20	100	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC	20		
5587524	Total Cobalt (Co)	2018/06/20	98	80 - 120	96	80 - 120	ND, RDL=0.50	ug/L	16	20		
5587524	Total Copper (Cu)	2018/06/20	103	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	3.0	20		
5587524	Total Iron (Fe)	2018/06/20	99	80 - 120	97	80 - 120	ND, RDL=100	ug/L	1.8	20		
5587524	Total Lead (Pb)	2018/06/20	93	80 - 120	95	80 - 120	ND, RDL=0.50	ug/L	0.78	20		
5587524	Total Manganese (Mn)	2018/06/20	97	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	2.5	20		
5587524	Total Molybdenum (Mo)	2018/06/20	107	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	5.5	20		
5587524	Total Nickel (Ni)	2018/06/20	97	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	4.7	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5587524	Total Phosphorus (P)	2018/06/20	110	80 - 120	107	80 - 120	ND, RDL=100	ug/L	1.1	20		
5587524	Total Selenium (Se)	2018/06/20	108	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L				
5587524	Total Silver (Ag)	2018/06/20	97	80 - 120	95	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5587524	Total Tin (Sn)	2018/06/20	103	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L				
5587524	Total Titanium (Ti)	2018/06/20	104	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L				
5587524	Total Vanadium (V)	2018/06/20	102	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	2.1	20		
5587524	Total Zinc (Zn)	2018/06/20	100	80 - 120	104	80 - 120	ND, RDL=5.0	ug/L	1.1	20		

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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

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

(1) Some recoveries were below the lower control limits. This may represent a low bias in some results for these flagged analytes.

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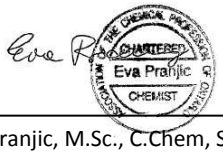
Sampler Initials: MY

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Service Specialist



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Sonja Elavinamannil, Analyst I

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

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Site Location: TWENTY RD WEST, HAMILTON
Your P.O. #: BRM-ENV
Sampler Initials: MY

Exceedence Summary Table – Prov. Water Quality Obj.

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
BH29-D	GYQ545-07	Total Iron (Fe)	300	640	100	ug/L

Detection Limit Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
BH29-D	GYQ545-01	3,3'-Dichlorobenzidine	0.6	<0.8	0.8	ug/L
BH29-D	GYQ545-01-Lab Dup	3,3'-Dichlorobenzidine	0.6	<0.8	0.8	ug/L
BH29-D	GYQ545-05	Aldrin	0.001	<0.005	0.005	ug/L
BH29-D	GYQ545-05	Aldrin + Dieldrin	0.001	<0.005	0.005	ug/L
BH29-D	GYQ545-01	Anthracene	0.0008	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Anthracene	0.0008	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Benzo(a)anthracene	0.0004	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Benzo(a)anthracene	0.0004	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Benzo(g,h,i)perylene	0.00002	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Benzo(g,h,i)perylene	0.00002	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Benzo(k)fluoranthene	0.0002	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Benzo(k)fluoranthene	0.0002	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Bis(2-ethylhexyl)phthalate	0.6	<2	2	ug/L
BH29-D	GYQ545-01	Bis(2-ethylhexyl)phthalate	0.6	<2	2	ug/L
BH29-D	GYQ545-01	Chrysene	0.0001	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Chrysene	0.0001	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Dibenz(a,h)anthracene	0.002	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Dibenz(a,h)anthracene	0.002	<0.2	0.2	ug/L
BH29-D	GYQ545-05	Dieldrin	0.001	<0.005	0.005	ug/L
BH29-D	GYQ545-01	Fluoranthene	0.0008	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Fluoranthene	0.0008	<0.2	0.2	ug/L
BH29-D	GYQ545-05	Mirex	0.001	<0.005	0.005	ug/L
BH29-D	GYQ545-05	o,p-DDT	0.003	<0.005	0.005	ug/L
BH29-D	GYQ545-05	p,p-DDT	0.003	<0.005	0.005	ug/L
BH29-D	GYQ545-01	Pentachlorophenol	0.5	<1	1	ug/L
BH29-D	GYQ545-01-Lab Dup	Pentachlorophenol	0.5	<1	1	ug/L
BH29-D	GYQ545-01	Perylene	0.00007	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Perylene	0.00007	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Phenanthrene	0.03	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Phenanthrene	0.03	<0.2	0.2	ug/L
BH29-D	GYQ545-07	Total Phosphorus (P)	10	<100	100	ug/L
BH29-D	GYQ545-05	Total PCB	0.001	<0.05	0.05	ug/L

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Appendix F: Safe Excavation Depth (SED) Calculations

Twenty Road West Development: Safe Excavation Depths and Elevations

Location	Easting	Northing	Ground Elevation	Interface for SED calculations: Top of Aquifer/permeable strata						SED	Piezometric Level (highest measured)		Bulk Unit Weight of Cover[1]	Bulk Unit Weight of Water[2]	Factor of Safety	Piezometric Level above Aquifer Top	Minimum Soil Cover Required (above Aquifer Top)	Inferred Safe Excavation Depth (SED)	Inferred Safe Excavation Depth Elevation
													g_s	g_w	F_s	h_w	$h = (F_s \times g_w \times h_w)/g_s$		
			masl	In Situ Hydraulic Conductivity (Slug Test) (M/sec)	Soil Type WL and K at MW level	mbgs	masl	Lower K Interface used for SED: Top of Upper Strata/impermeable Strata)	Rational for Choosing Interface with upper lower K deposit		mbgs	masl	KN/m^3	KN/m^3		m	m	m	masl
BH/MW1			237.93		Silt	1.50	236.43	Silty Clay		SED	0.78	237.15	21	9.81	1.4	0.7	0.47	1.0	236.9
BH/MW7			222.10		Silt	2.30	219.80	Silty Clay		SED	0.27	221.83	21	9.81	1.4	2.0	1.33	1.0	221.1
BH/MW11			231.57		Silty Sand to Sand	4.60	226.97	Silty Clay		SED	-1.37	232.94	21	9.81	1.4	6.0	3.90	0.7	230.9
BH/MW12			232.18		Silty Sand to Sandy Silt	4.60	227.58	Silt	Confining Layer Silt which seems unconfined but artesian	SED	0.04	232.14	21	9.81	1.4	4.6	2.98	1.6	230.6
Bh/MW13			230.40		Silt with occasional gravel, becoming sandy	2.30	228.10	Silt	Confining Layer Silt which seems unconfined but artesian	SED	-0.19	230.59	21	9.81	1.4	2.5	1.63	0.7	229.7
BH/MW18			233.81		Silty Sand to Sandy Silt	1.50	232.31	Silty Clay		SED	-0.85	234.66	21	9.81	1.4	2.3	1.54	0.0	233.8
BH/MWW25			235.30		Silt	2.30	233.00	Silty Clay		SED	0.34	2.00	21	9.81	1.4	2.0	1.28	1.0	234.3
BH/MW29-D			231.97		Silty Sand to Sandy Silt	1.60	230.37	Silty Clay	Silty Clay overlying Silt	SED	-2.82	234.79	21	9.81	1.4	4.4	2.89	0.0	232.0
BH/MW30-D			233.53		Silty Sand to Silt	1.60	231.93	Silty Clay		SED	-0.70	234.23	21	9.81	1.4	2.3	1.50	0.1	233.4
BH/MW31-D			231.94		Silty Sand	9.20	222.74	Silty Clay		SED	-1.13	233.07	21	9.81	1.4	10.3	6.76	2.4	229.5

Notes

1 Bulk Unit Weight for overburden cover=21 KN/m^3

2 Bulk Unit Weight of water = 9.81 KN/m^3

ARTESIAN (groundwater level above ground surface - true artesian)