TIL TorontoInspection LTD.
GEO-ENVIRONMENTAL CONSULTANTS

# HYDROGEOLOGICAL INVESTIGATION
603-643, 645-699 KINGSTON ROAD
PICKERING, ON
L1V 3N7

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## Executive Summary

Toronto Inspection Ltd. (TIL) was retained by Director Industrial Holdings Limited (the Client) to conduct a hydrogeological investigation for the proposed development property encompassing the municipal addresses of 603-643 and 645-699 Kingston Road in Pickering, ON (the Site). It is our understanding that the Client is proposing a mixed-use residential/commercial development for the Site consisting of six (6) high-rise towers, (2) mid-rise towers, and four (4) blocks of 4-storey stacked, back- to-back townhouses. It is also understood that the Site will include four (4) underground parking facilities. Each building complex will have two (2) levels of underground parking, with the exception of Podium 1, which will have one (1) level of underground parking. Since the project is currently at a planning stage for the development, each parking level was assumed to be 3 m high. This Hydrogeological Report provides estimates for the short-term (construction) and long- term dewatering rates for the parking facilities only as a Site Servicing Plan was not available for review. Therefore, the requirements for groundwater control during the construction of services at the Site will need to be evaluated prior to construction and the submission of applications for dewatering and/or discharge permits, as the case may be. Further, at that stage in the design process, it is anticipated that finalized building elevations and a Site Grading Plan will be available for review to refine all groundwater control requirements on the project.

The Site is located within the Petticoat Creek watershed, under the jurisdiction of the Toronto and Region Conservation Authority (TRCA); however, it is not located within TRCA regulated areas. Furthermore, no environmental features were identified within or slightly beyond the Site boundary. The Site is located within the Toronto and Region Source Protection Area (TRSPA) within the CTC Source Protection Region; however, it is not shown to be subject to the policies of the CTC Source Protection Plan (SPP).

The local scale geological and hydrogeological characteristics of the Site were assessed using the observations from sixteen (16) boreholes that were drilled by TIL in February and March of 2019. The boreholes investigated to depths ranging from 4.87 m below ground surface (bgs) to 20.88 mbgs. The findings from the field investigation showed that the subsurface geology at the Site consists mainly of a layer of fill underlain by a laterally extensive sandy silt unit to the terminal depths of the investigation. However, an isolated sand and gravel deposit was identified at one point of investigation along the southern Site boundary with a thickness of 12.9 m, and smaller sand units were observed in surrounding boreholes as well.

Of the 16 boreholes, nine (9) were instrumented as monitoring wells to be used as part of this investigation. Additionally, three (3) monitoring wells were installed to improve the understanding of the groundwater system at the Site. All monitoring wells were installed with 51 mm riser pipe and 10-slot, 10-foot screens. Monitoring wells were used to measure static water levels, to perform in-situ hydraulic conductivity tests, and to collect representative groundwater quality samples. Once it is determined that monitoring wells are no longer required, they should be decommissioned by a licensed well contractor according to the provisions of Regulation 903 (Reg. 903).

Groundwater elevations for the water table at the Site were recorded as part of a long-term monitoring program in the period of March to June of 2019. The groundwater elevations over this time ranged from a low of 96.53 masl (8.89 mbgs) in the northeast corner of the Site in late March, to a high of 103.57 masl (1.4 mbgs) in the southwest corner of the Site in late March. The variability in groundwater elevations over the long-term monitoring period was on average, approximately

0.39 m across the Site excluding wells that demonstrated uncharacteristic variability, which were located in the northeast corner of the Site. It is expected that there will be some seasonal variability in groundwater elevations resulting from periods of regional groundwater recharge and more frequent storm events. Groundwater levels are typically highest in the Spring and lowest in the Fall to early Winter.

In-situ hydraulic conductivity testing in the form of single well response testing was undertaken within the sandy silt at select monitoring wells in March of 2019. The estimated hydraulic conductivity for the sandy silt ranged between 1.6 x $10^{-8}$ m/s and 1.8 x $10^{-7}$ m/s, with a geometric mean of 6.0 x $10^{-8}$ m/s. The results of grain-size analysis from samples collected with the sand and gravel deposit suggest a relatively conductive material with a hydraulic conductivity on the order of $10^{-6}$ m/s. Overall, the estimates of hydraulic conductivity for subsurface materials are within the literature range of hydraulic conductivity for those materials.

A non-filtered groundwater quality sample was collected on March 12, 2019, and analyzed for the *Regional Municipality of Durham Sewer Use By-Law No. 55-2013* (By-Law 55-2013). With the exception of Total Suspended Solids (TSS), all parameters were found to be within acceptable limits of the *Table 2 – Limits for Storm Sewer Discharge*. Additionally, all parameters, including TSS, were found to meet the limits of the *Table 1 – Limits for Sanitary Sewer Discharge.*

An analysis of potential short-term and long-term dewatering rates was undertaken for each development block on-Site. Based on the current conceptual hydrogeological model for the Site and the anticipated depths of the foundations for all underground structures, the estimated total dewatering rates for each block were calculated to be:

| **Block** | **Short-Term** | | | **Long-Term (L/day)** |
|---|---|---|---|---|
| | **Groundwater (L/day)** | **Stormwater (L/day)** | **Total (L/day)** | |
| Podium 1 | 28,771 | 59,500 | 88,271 | 9,590 |
| Podium 4 | 569,298 | 43,050 | 612,348 | 189,766 |
| Block 1, Block 2, Tower 4 | 27,408 | 90,000 | 117,408 | 9,136 |
| Block 3, Block 4, Tower 5, Tower 8 | 43,416 | 140,300 | 183,716 | 14,472 |
| Total | 668,893 | 332,850 | 1,001,743 | 222,964 |

The anticipated total dewatering rate for the development, assuming dewatering will be required simultaneously for all development blocks, is approximately 1,001,743 L/day. Since the cumulative dewatering rate in this scenario is greater than 400,000 L/day, it will be necessary to obtain a Category 3 Permit to Take Water (PTTW) from the Ministry of the Environment, Conservation, and Parks (MECP) to facilitate construction dewatering. Since the dewatering rates between all blocks are variable, consideration of the approach to construction phasing in the context of potential dewatering permitting requirements is warranted to determine the maximum dewatering rate that should be requested in the PTTW application. Since the estimated dewatering rate for Podium 4 exceeds 400,000 L/day, the amalgamated rate requested in the PTTW application should consider the dewatering rate from Podium 4 as the minimum and that any additional dewatering requirements for other blocks be added to calculate the total permitting rate.

Construction dewatering activities remove groundwater from the soil and can increase the effective stress of those soils whose pore spaces were once occupied by water. The increase in effective stress can lead to differential soil settlement and damage local infrastructure at the surface. The potential risks associated with dewatering settlement should be reviewed by a geotechnical engineer prior to construction such that any necessary controls for stabilization can be implemented.

For the post-construction phase, the foundations for all buildings are anticipated to extend below the water table. As a result, it will be necessary for each foundation to either control groundwater using a foundation drainage network or by waterproofing those foundations. If a Private Water Drainage System (PWDS) is proposed to collect and discharge groundwater over the long-term, the cumulative dewatering rate for the Site will likely be 1/3rd the rates calculated for short-term groundwater dewatering, equating to approximately 222,964 L/day. Since the estimated long-term dewatering rates are cumulatively greater than 50,000 L/day, a PTTW from the MECP will be required if long-term takings are proposed.

If excess groundwater/stormwater encountered during construction or collected in a dedicated PWDS over the long-term is proposed to be discharged to a municipal sewer, approval from Durham Region will be required. All private water discharge to a municipal sewer must satisfy the relevant water quality criteria of By-Law 55-2013 for that sewer. Consultation with Durham Region is recommended to determine the requirements for a discharge approval during construction as well as permanent sewer connections and discharge agreements for groundwater over the long-term.

Separate applications for PTTWs will be needed to satisfy both the short-term and the long-term permitting requirements on the project. The PTTW application will require preparation of a hydrogeological report to support the application that includes the dewatering rate required, identification of potential unacceptable impacts of the water taking, monitoring requirements, and a contingency plan to mitigate unacceptable impacts in the event they were to occur. It is recommended that a minimum of six (6) months lead time be provided for the MECP PTTW application review and approval process if PTTWs will be pursued.

A search of the MECP Water Well Information System (WWIS) for well records within a 1 km radius of the Site returned 73 records and no active PTTWs. The primary well usage within the search radius is for monitoring/observation/test well (36%) purposes. Considering that the Site and surrounding area have municipal servicing and there are no sensitive ecological receptors near the Site, short-term and long-term impacts to the groundwater system, other groundwater users, and the surface water system are not expected. However, it is recommended to implement a Spill Prevention and Response Plan as well as an Erosion and Sediment Control (ESC) Plan during construction to limit potential impacts to the groundwater system and the off-Site release of sediment. Considering the size of the Site, a Salt Management Plan is recommended over the long-term.

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# 1 Introduction

## 1.1 Project Background

Toronto Inspection Ltd. (TIL) was retained by Director Industrial Holdings Limited (the Client) to conduct a hydrogeological investigation for the proposed development property encompassing the municipal addresses of 603-643 and 645-699 Kingston Road in Pickering, ON (the Site). It is our understanding that the Client is proposing a mixed-use residential/commercial development for the Site consisting of six (6) high-rise towers, (2) mid-rise towers, and four (4) blocks of 4-storey stacked, back- to-back townhouses. It is also understood that the Site will include four (4) underground parking facilities. Each building complex will have two (2) levels of underground parking, with the exception of Podium 1, which will have one (1) level of underground parking. Since the project is currently at a planning stage for the development, each parking level was assumed to be 3 m high.

This Hydrogeological Report provides estimates for the short-term (construction) and long-term dewatering rates for the parking facilities only as a Site Servicing Plan was not available for review. Therefore, the requirements for groundwater control during the construction of services at the Site will need to be evaluated prior to construction and the submission of applications for dewatering and/or discharge permits, as the case may be. Further, at that stage in the design process, it is anticipated that finalized building elevations and a Site Grading Plan will be available for review in order to refine all groundwater control requirements for the development.

The location of the Site is shown in **Figure 1.** A Site Plan and Architectural Drawings for the proposed development are provided in **Appendix A**.

## 1.2 Site Description

The Site is located on the southwest corner of the intersection between Whites Road and Kingston Road and is approximately rectangular in shape and 4.85 hectares (ha) in area. The Site was most recently used for commercial purposes and is occupied by three (3) commercial buildings including a strip mall having several occupants. The area immediately surrounding the Site is primarily occupied for residential, commercial, and transportation uses. The Site is bounded by Kingston Road to the north, Whites Road to the east, the Highway 401 corridor to the south, and an automobile dealership to the west.

## 1.3 Objectives of the Hydrogeological Investigation

The report herein identifies regulations which may be relevant to the development of the Site from a groundwater and environmental perspective and develops a conceptual understanding of the Site setting by characterizing the existing geological and hydrogeological conditions at the Site; including groundwater elevations, groundwater flow direction, and hydraulic properties of soils. Based on the conceptual understanding of the Site and proposed development, an evaluation is made of potential dewatering requirements for the during-construction phase and long-term operation of the Site.

## 1.4 Scope of Work

### 1.4.1 Conceptual Understanding

A conceptual understanding of the regional and local geological and hydrogeological system was developed through the review of existing reports and available geological information. This included:

- Mapping and reports by Toronto and Region Conservation Authority (TRCA);
- Geological and Hydrogeological Information from Ontario Geological Survey (OGS);
- Geological and Hydrogeological Information from Ontario Ministry of Natural Resources and Forestry (MNRF); and
- Ministry of the Environment, Conservation, and Parks (MECP) Well Records Database
- Toronto Inspection Ltd. Preliminary Geotechnical Report – 603 to 699 Kingston Road, Pickering, Ontario

### 1.4.2 Field Investigation

The local scale geological and hydrogeological conditions at the Site were characterized using the observations from sixteen (16) boreholes drilled by TIL in February and March of 2019. The boreholes ranged in depth from 4.87 meters below ground surface (mbgs) to 20.88 mbgs.

Of the 16 boreholes, nine (9) were instrumented as monitoring wells to be used in this investigation. Additionally, three (3) extra monitoring wells were installed to improve the understanding of the underlying hydrogeology of the Site. All monitoring wells were installed with 51 mm riser pipe and 10-slot, 10-foot screens. Monitoring wells were used to measure static groundwater levels, to conduct in-situ hydraulic conductivity testing, and to collect representative groundwater quality samples. Monitoring wells were installed according to the relevant provisions of Regulation 903 (Reg. 903) by a specialized drilling contractor under the supervision of TIL field staff. Once it is determined that the monitoring wells installed within the Site are no longer required, they should be decommissioned by a licensed well contractor as per Reg. 903.

### 1.4.3 Data Analysis

The data analysis component of this study will include the following items:

- Determination of soil stratigraphy and hydrostratigraphy;
- Determination of groundwater elevations and seasonal variability;
- Determination of the hydraulic conductivity of screened soils;
- Evaluation of potential dewatering requirements;
- Identification of groundwater usage in the area and surrounding sensitive receptors; and
- Options for short-term and long-term mitigation of potential impacts to natural features, sensitive receptors, and vulnerable areas.

## 2 Relevant Regulations and Policies

Environmental regulations and policies which may be relevant to the development of the Site and this hydrogeological investigation are listed below and discussed briefly:

- Regional Municipality of Durham Official Plan (2017)
- Regional Municipality of Durham Sewer Use By-Law No. 55-2013
- Toronto and Region Conservation Authority (TRCA) Policies and Regulations (O.Reg. 166/06);
- Permit to Take Water, Section 34 of the Ontario Water Resource Act (1990); and
- The Clean Water Act (2006).

### Region Municipality of Durham Official Plan

The Regional Municipality of Durham (Durham Region) Official Plan identifies development and land-use objectives for Durham Region. Based on a review of Official Plan maps, the Site is located within "Living Areas". The Site is outside of the Durham Region's designated "Greenlands System".

### City of Pickering Official Plan

The City of Pickering (City) Official Plan identifies development and land-use objectives within the City and uses Durham Region's Official Plan as an overall framework. Based on a review of the City's Official Plan, the Site is located along the "Kingston Road Corridor" and is therefore subject to the urban design objectives and land development guidelines of the "Kingston Road Corridor Land Development Guidelines". The Kingston Road Land Development Guidelines should be reviewed during the preparation of land development proposals for the Site.

### Regional Municipality of Durham Sewer Use By-Law No. 55-2013

Durham Region's sewer use by-law controls discharges to their sanitary and storm sewers including the establishment of sewer discharge criteria. If any private water on the Site will require discharge to the sewer system during or following construction, written approval from Durham Region will be required as authorization and mutual agreement to the terms and limitations of the discharge.

### TRCA Policies and Regulations (O.Reg. 166/06)

Under Section 28 of the Conservation Authorities Act, the local conservation authorities are mandated to protect the health and integrity of the regional greenspace system and to maintain or improve the hydrological and ecological functions performed by valley and stream corridors. The TRCA, through its regulatory mandate, is responsible for issuing permits under Ontario Regulation (O.Reg.) 166/06, Development, Interference with Wetlands and Alterations to Shorelines and Watercourses for development proposals or site alteration works within regulated areas.

A preliminary review indicates that the Site is not within a TRCA regulated area. As such, a permit under O.Reg. 166/06 is not required for the proposed development.

### Permit to Take Water

A PTTW under Section 34 of the Ontario Water Resource Act (OWRA) is required from the MECP for any water taking that is greater than 50,000 L/day. For water takings related to construction site dewatering, water takings of more than 50,000 L/day but less than 400,000 L/day may be registered on the Environmental Activity and Sector Registry (EASR), while water takings of more than 400,000 L/day will require a PTTW issued by the MECP.

### The Clean Water Act, 2006

The MECP mandates the protection of existing and future sources of drinking water under the CWA. Initiatives undertaken under the CWA include the delineation vulnerable areas including: Wellhead Protection Areas (WHPAs); Significant Groundwater Recharge Areas (SGRAs); Intake Protection Zones (IPZs); and Highly Vulnerable Aquifer areas (HVAs). Other initiatives include the assessment of drinking water quantity threats (WHPA Q1 & Q2 and IPZ-Q) within Source Protection Regions. Source Protection Plans are developed under the CWA which include the restriction and prohibition of certain types of activities and land uses within WHPAs.

Based on a review of the MECP Source Water Protection Information Atlas, the Site falls within the Toronto and Region Source Protection Area (TRSPA) within the CTC Source Protection Region. Upon review of CTC Source Protection Plan mapping, the Site is not shown to be located within the boundary of areas affected by its policies.

# 3 Regional Geological and Hydrogeological Understanding

## 3.1 Topography and Drainage

The Site is located at the eastern extent of the Petticoat Creek watershed which is under the jurisdiction of the TRCA. This watershed is approximately 49 km in length and drains an approximate area of 27 km$^2$. The headwaters of the Petticoat Creek watershed originate south of the Oak Ridges Moraine and empty to Lake Ontario from the mouth of Petticoat Creek in the Petticoat Creek Conservation Area, which is west of the Site. The nearest water feature to the Site is the Petticoat Creek at approximately 800 m to the southwest. The Petticoat Creek watershed is highly urbanized in its southern reaches where the Site is located.

The regional topography slopes southward towards Lake Ontario. As the Site is currently developed, the local Site topography is relatively flat. There is slight grading from the outer boundaries of the Site towards the inside and to the south. The average ground elevation measured across the Site is approximately 105 meters above sea level (masl).

A topographic map of the Site and the surrounding area is presented in **Figure 2**.

## 3.2 Physiography

The Site is situated within the Iroquois Plain physiographic region. The Iroquois Plain is the low land that borders Lake Ontario and which was inundated by the historic Iroquois Lake in the late Pleistocene following the last glacial retreat. Iroquois Lake was a proglacial lake that existed 13,000 years ago and was a body of water slightly larger than present-day Lake Ontario. The Iroquois Plain stretches from the Niagara River to the Trent River, a distance of 300 km. Shoreline cliffs, sand bars, and beaches extend about 3 km inland and mark the inland extent of Iroquois Lake. Typically, the Iroquois Plan is characterized by layers of fine silty sand that were characteristic of the former lake bed and shoreline beaches of Iroquois Lake (Chapman and Putnam, 1984).

A physiographic map of the Site and the surrounding area is presented in **Figure 3**.

## 3.3 Regional Geology and Hydrogeology

The current understanding of the geological and hydrogeological environment was based on scientific work conducted by and information available from York, Peel, Durham, Toronto and The Conservation Authorities Moraine Coalition (YPDT-CAMC).

Based on regional hydrogeological mapping presented by YPDT-CAMC, the following units overlie the bedrock (from youngest to oldest):

A. Recent Deposits
B. Halton Till (Aquitard)
C. Oak Ridges Moraine (Aquifer)
D. Newmarket Till (Aquitard)
E. Thorncliffe Formation (Aquifer)
F. Sunnybrook Drift (Aquitard)
G. Scarborough Formation (Aquifer)

The following provides a description of the underlying hydrostratigraphic units in the area and their relevance to the Site based on the conceptual understanding of regional hydrostratigraphy offered by review of YPDT-CAMC mapping:

- **Recent Deposits** – The uppermost surficial geologic unit consists of glaciolacustrine deposits consisting of mainly silt and silty clay materials.
- **Halton Till** – The Halton Till was deposited approximately 13,000 years before present (B.P.) during the last glacial advance in the area. Based on the hydrostratigraphic cross-section presented by the YPDT-CAMC, the Halton Till is not present in the area.
- **Oak Ridges Moraine** – The Oak Ridges Moraine (ORM) was deposited approximately 12,000 to 13,000 years B.P. Regionally, the ORM is approximately 160 km long and 5 to 20 km wide. Based on the hydrostratigraphic cross-section presented by the YPDT-CAMC, the ORM is not present in the area.
- **Newmarket Till** – The Newmarket Till was deposited by the Laurentide ice sheet approximately 18,000 to 20,000 years B.P. It consists of mainly sandy silt to silty sand. The Newmarket Till can reach up to 60 m in thickness. Based on the hydrostratigraphic cross-section presented by the YPDT-CAMC, the Newmarket Till is present in the area.
- **Thorncliffe Formation** – The Thorncliffe Formation was deposited approximately 45,000 years B.P. and consists of glaciofluvial deposits containing silt, sand, and clay. Regionally, it acts as an aquifer with variable grain size and thickness. Based on the hydrostratigraphic cross-section by the YPDT-CAMC, the Thorncliffe Formation is present in the area.
- **Sunnybrook Drift** – The Sunnybrook Drift was deposited approximately 45,000 years B.P. It is interpreted to be a silt and clay formation with a thickness of 10 m to 20 m regionally. Based on the hydrostratigraphic cross-section presented by the YPDT-CAMC, the Sunnybrook Drift may be present as a thin layer in the area separating the overlying Thorncliffe aquitard from the underlying Scarborough aquifer.
- **Scarborough Formation** – The Scarborough Formation was deposited during the Wisconsin glaciation approximately 70,000 years to 90,000 years B.P. It is interpreted as a fluvial-deltaic system consisting of sand, silt, and clay deposits. Based on the geologic cross-section presented by the YPDT-CAMC, the Scarborough Formation is present in the area.
- **Bedrock** – Underlying the overburden will be bedrock of the Georgian Bay Formation, Blue Mountain Formation, Billings Formation, Collingwood Member, and the Eastview Member. These rocks are approximately 438 to 505 million years in age from the Upper Ordovician period. The main materials of these rocks are shale and limestone.

### 3.3.1 Regional Groundwater Flow

At a regional scale, groundwater flows from the topographic highs associated with the Oak Ridges Moraine, north of the Site, to the topographic lows associated with Lake Ontario to the south.

# 4 Local Geology and Hydrogeology

The current understanding of the local geological and hydrogeological conditions at the Site is based on the observations from the geotechnical investigation conducted by TIL and the studies undertaken as part of this hydrogeological investigation.

## 4.1 Overburden

A total of 16 boreholes were drilled across the Site to depths ranging from 4.87 mbgs to 20.88 mbgs in February and March of 2019. In summary, the soil characterizations in the borehole logs indicate the overburden at the Site consists of a layer of fill underlain predominantly by a thick and laterally extensive deposit of sandy silt. Additionally, an isolated sand and gravel deposit with a thickness of approximately 12.9 m was encountered at BH-10. Sand units of limited thickness were observed interrupting the sandy silt at various locations surrounding BH-10. A detailed description of soil stratigraphy is provided in the borehole logs from TIL's geotechnical investigation, which are provided in **Appendix B**.

Mapping from the OGS, accessed through OGSEarth (2010), indicates that the regional surficial geology across the Site is composed of fine-textured, glaciolacustrine deposits of silt and clay with sand and gravel. This description is consistent with observations made on the Site.

## 4.2 Quaternary Geology

Mapping from the OGS, accessed through OGSEarth (2000), indicates that the regional quaternary geology across the Site is composed of undifferentiated, predominantly sandy silt to silt textured tills. This description is consistent with observations made at the Site.

The quaternary geology of the Site and the surrounding area is presented in **Figure 5**.

## 4.3 Bedrock Geology

Bedrock was not encountered at the maximum terminal depth (20.88 mbgs) of the borehole investigation for this study. In an attempt to determine the true depth of bedrock in the area, a search was conducted for borehole records and well records from the surrounding area which extended beyond the depth of investigation for this study. The results were inconclusive in that only one (1) record identified the potential for bedrock at a depth of approximately 29.6 mbgs (Well ID 4601908). Mapping from the OGS, accessed through OGS Earth, indicates that shale bedrock of the Georgian Bay Formation underlies the overburden soils in this area. The top of bedrock elevation is expected to be at approximately 50 masl based on the regional hydrostratigraphic cross-section presented by the YPDT-CAMC.

The bedrock geology of the Site and the surrounding area is presented in **Figure 6**.

## 4.4 Groundwater Conditions

### 4.4.1 On-Site Monitoring Well Network

A monitoring network consisting of 12 monitoring wells was established spanning the entirety of the Site and all wells were completed within the sandy silt unit. Monitoring well locations are illustrated together with static groundwater elevations from a monitoring event on May 7, 2019, in plan view in **Figure 7** and in a northeast-southwest oriented geological cross-section in **Figure 8**.

All monitoring wells were drilled with solid stem augers with the exception of BH-7 which was drilled using hollow stem augers. A summary of the monitoring well construction details is provided in **Table 4-1** below.

**Table 4-1 Summary of Monitoring Well Details**

| Well ID | Ground Elevation (masl) | Depth to bottom of well (mbgs) | Well Diameter (m) | Screen Length (m) | Screened Unit |
|---|---|---|---|---|---|
| BH-1 | 105.35 | 9.20 | 0.051 | 3.048 | Sandy Silt |
| BH-5 | 104.76 | 9.20 | 0.051 | 3.048 | Sandy Silt |
| BH-6 S (MW-6) | 104.97 | 4.60 | 0.051 | 3.048 | Fill/ Sandy Silt |
| BH-6 D | 104.97 | 9.20 | 0.051 | 3.048 | Sandy Silt |
| BH-7 | 105.73 | 19.80 | 0.051 | 3.048 | Sandy Silt |
| BH-9 | 104.89 | 9.20 | 0.051 | 3.048 | Sandy Silt |
| BH-12 (MW-12) | 105.01 | 5.18 | 0.051 | 3.048 | Sandy Silt |
| BH-13 | 105.01 | 6.10 | 0.051 | 3.048 | Sandy Silt |
| BH-14 | 105.32 | 4.60 | 0.051 | 3.048 | Sandy Silt |
| BH-15S (MW-15) | 105.42 | 6.10 | 0.051 | 3.048 | Sandy Silt |
| BH-15 D | 105.42 | 9.20 | 0.051 | 3.048 | Sandy Silt |
| BH-16 | 105.00 | 19.80 | 0.051 | 3.048 | Sandy Silt |

### 4.4.2 Groundwater Levels

Static groundwater elevations were recorded in a long-term monitoring program spanning the period of March to June of 2019; manual measurements were taken approximately once every two weeks. Additionally, manual measurements were supplemented with continuous hourly recordings at two monitoring locations, BH-5 and BH-7, using pre-programmed dataloggers. The records from the monitoring program are presented in **Table 4-2** in meters below ground surface and in **Table 4-3** in meters above sea level. Groundwater depths are presented relative to the existing ground surface. A long-term water level monitoring hydrograph is presented in **Figure 9** to illustrate the spatial and seasonal variability of groundwater levels around the Site.

Groundwater elevations within the long-term monitoring period ranged in elevation from a low of 96.53 masl (8.89 mbgs) at BH-15S (MW-15) in northeast corner of the Site in late March, to a high of 103.57 masl (1.4 mbgs) at BH-6S (MW-6) in the southwest corner of the Site in late March. The variability in water levels over the long-term monitoring period was on average, approximately 0.39 m across the Site excluding wells that demonstrated uncharacteristic variability, which were located in the northeast corner of the Site. The range in groundwater elevations at each well over the monitoring period is presented in **Table 4-2** and in **Table 4-3**.

The shallow groundwater table will fluctuate with the change of seasons in response to periods of groundwater recharge resulting from frequent storm events and periods of snowmelt. In this regard, water levels at the Site are anticipated to be lowest in the Winter and highest in the Spring, while the Summer and Fall will have water levels that are intermediary between those extremes.

With that in mind, and based on the long-term monitoring results, the high groundwater table conditions for the Site are anticipated to occur in the month of May.

**Table 4-2 Water Level Depths – mbgs**

| ID | 15-Mar-19 | 29-Mar-19 | 24-Apr-19 | 07-May-19 | 15-May-19 | 31-May-19 | 06-Jun-19 | Variability (m) |
|---|---|---|---|---|---|---|---|---|
| BH-1 | 3.11 | NM | 3.15 | NM | 3.11 | 2.79 | 2.78 | 0.37 |
| BH-5 | 3.97 | 3.59 | 3.50 | 3.52 | 3.97 | 3.55 | 3.50 | 0.47 |
| BH-6 S (MW-6) | 2.09 | 1.40 | 1.41 | 1.51 | 2.09 | 1.64 | 1.79 | 0.69 |
| BH-6D | NM | 3.01 | 2.86 | 2.86 | NM | 2.90 | 2.92 | 0.15 |
| BH-7 | 4 | 3.92 | 3.78 | 3.67 | 4.00 | 3.78 | 3.75 | 0.25 |
| BH-9 | 3.12 | 3.06 | 3.10 | 3.06 | 3.12 | 2.99 | 2.97 | 0.15 |
| BH-12 (MW-12) | NM | 4.15 | 4.07 | 4.03 | NM | 3.78 | 3.72 | 0.43 |
| BH-13 | 2.67 | 2.30 | 2.18 | 2.24 | 2.67 | 2.20 | 2.20 | 0.49 |
| BH-14 | 4.52 | 4.54 | 4.29 | 4.10 | 4.52 | 4.00 | 4.00 | 0.54 |
| BH-15S (MW-15) | dry | 8.89 | 8.62 | 8.43 | dry | 3.17 | 2.92 | 2.56 |
| BH-15 D | dry | dry | 5.48 | 4.71 | dry | 8.05 | 7.94 | 0.95 |
| BH-16 | NM | 8.25 | 4.38 | 4.42 | NM | 4.28 | 4.24 | 4.01 |

**Notes:**

1. NM denotes not monitored due to obstruction.
2. Water depths relative to existing ground surface.

**Table 4-3 Water Level Measurements – masl**

| ID | 15-Mar-19 | 29-Mar-19 | 24-Apr-19 | 07-May-19 | 15-May-19 | 31-May-19 | 06-Jun-19 | Variability (m) |
|---|---|---|---|---|---|---|---|---|
| BH-1 | 102.24 | NM | 102.20 | NM | 102.24 | 102.56 | 102.57 | 0.37 |
| BH-5 | 100.79 | 101.17 | 101.26 | 101.24 | 100.79 | 101.21 | 101.26 | 0.47 |
| BH-6S (MW-6) | 102.88 | 103.57 | 103.56 | 103.46 | 102.88 | 103.33 | 103.18 | 0.69 |
| BH-6D | NM | 101.96 | 102.11 | 102.11 | NM | 102.07 | 102.05 | 0.15 |
| BH-7 | 101.73 | 101.81 | 101.95 | 102.06 | 101.73 | 101.95 | 101.98 | 0.25 |
| BH-9 | 101.77 | 101.83 | 101.79 | 101.83 | 101.77 | 101.90 | 101.92 | 0.15 |
| BH-12 (MW-12) | NM | 100.86 | 100.94 | 100.98 | NM | 101.23 | 101.29 | 0.43 |
| BH-13 | 102.22 | 102.59 | 102.71 | 102.65 | 102.22 | 102.69 | 102.69 | 0.49 |
| BH-14 | 100.80 | 100.78 | 101.03 | 101.22 | 100.80 | 101.32 | 101.32 | 0.54 |
| BH-15S (MW-15) | dry | 96.53 | 96.80 | 96.99 | dry | 102.25 | 102.50 | 2.56 |
| BH-15 D | dry | dry | 99.94 | 100.71 | dry | 97.37 | 97.48 | 0.95 |
| BH-16 | NM | 96.75 | 100.62 | 100.58 | NM | 100.72 | 100.76 | 4.01 |

**Notes:**

1. NM denotes not monitored due to obstruction.

### 4.4.3 Hydraulic Conductivity

Single well hydraulic response testing in the form of rising-head tests was conducted in March of 2019 at select monitoring wells to measure the in-situ hydraulic conductivity (K) of the screened overburden materials. Prior to testing, each well was developed in order to mitigate potential influences from impacts to the native, near-well materials disturbed by drilling.

During the rising head test, a pseudo-instantaneous drop in the water level was achieved by extracting water from the well using a manual inertial pump. The water level recovery was measured by a datalogger taking readings at pre-programmed intervals and left in place to record recovery. For the purposes of the test, recovery was considered to be complete at or above approximately 85% of the pre-test water column.

The hydraulic conductivity was estimated using the Hvorslev (1951) method with the recovery data recorded by the dataloggers. Where available, hydraulic conductivity was also calculated using data from grainsize analyses using the Hazen (1911) method. The corresponding analyses are presented in **Appendix C**.

A summary of hydraulic conductivities obtained from the rising head tests and grainsize analyses is presented in **Table 4-4**.

**Table 4-4 Summary of Hydraulic Conductivity Tests**

| Well ID | Screen Interval (masl) / Sample Depth (masl) | Material Tested | Hvorslev Method K (m/s) | Hazen Method K (m/s) |
|---|---|---|---|---|
| BH-1 | 96.15 – 99.20 | Sandy Silt | 5.5 x $10^{-8}$ | - |
| | 96.25 | | | 1.4 x $10^{-7}$ |
| BH-5 | 96.15 – 99.20 | Sandy Silt | 8.7 x $10^{-8}$ – 1.0 x $10^{-7}$ | - |
| BH-6 S /(MW-6) | 100.85 – 103.90 | Sandy Silt | 2.7 x $10^{-8}$ – 7.3 x $10^{-8}$ | - |
| BH-7 | 85.55 – 88.60 | Sandy Silt | 1.8 x $10^{-7}$ | - |
| BH-9 | 96.15 – 99.20 | Sandy Silt | 1.0 x $10^{-7}$ – 1.4 x $10^{-7}$ | - |
| BH-10 | 96.88 | Sand and Gravel | - | 7.7 x $10^{-5}$ |
| BH-13 | 99.25 – 102.30 | Sandy Silt | 2.3 x $10^{-8}$ – 3.6 x $10^{-8}$ | - |
| BH-16 | 85.55 – 88.60 | Sandy Silt | 1.6 x $10^{-8}$ | - |

Notes:

1. – indicates not applicable

The hydraulic conductivity of the sandy silt ranged between 1.6 x $10^{-8}$ m/s and 1.8 x $10^{-7}$ m/s with a geometric mean of 6.0 x $10^{-8}$ m/s. The range in reported in-situ hydraulic conductivity values falls within the literature range for sandy silt materials. The observed variability in values reported is expected to be a result of the heterogeneous and anisotropic nature of the materials tested.

The sand and gravel deposit, with an estimated hydraulic conductivity of 7.7 x $10^{-5}$ m/s from grainsize analysis, represents the most conductive unit at the Site. It should be noted that measures of hydraulic conductivity obtained using the Hazen (1911) method are determined using a grab sample and are therefore considered representative only of the micro-scale area where the sample was collected. As a result, the estimated hydraulic conductivity may not be representative of the larger unit itself on a macro scale and typically provides overly conservative estimates of hydraulic conductivity. For the purposes of the investigation, the sand and gravel unit is estimated to have a hydraulic conductivity equivalent to 5 x $10^{-6}$ m/s.

### 4.4.4 Groundwater Flow

Based on the groundwater elevations and trends observed over the long-term monitoring period, the local groundwater flow direction in the shallow water table system is a subdued reflection of the local topographic relief in that the groundwater flows towards the inside of the Site from the perimeter and to the south towards Lake Ontario.

### 4.4.5 Groundwater Quality

Unfiltered groundwater samples were collected from BH-7 on March 12, 2019. The collected samples were sent to SGS Environmental Services in Lakefield, ON. The samples were analyzed for the parameters and corresponding sewer discharge criteria of the *Regional Municipality of Durham Sewer Use By-Law No. 55-2013* (By-Law 55-2013).

Based on the laboratory analytical results, the results for all parameters, with the exception of Total Suspended Solids (TSS), were within the criteria outlined in *Table 2 – Limits for Storm Sewer Discharge* of By-Law 55-2013. Additionally, all parameters, including TSS, were found to have met the criteria for *Table 1 – Limits for Sanitary Sewer Discharge* of By-Law 55-2013*.* Use of the municipal sewers for disposal of groundwater is contingent on approval from Durham Region and the quality of the discharge relative to the criteria of the receiving sewer, among others, is satisfied.

The laboratory analytical results and Certificate of Analysis are included in **Appendix D** and a tabulated summary is provided in **Table 4-5** below.

**Table 4-5 Groundwater Quality Results**

| Analysis | Units | Durham Sanitary By-law Limit | Durham Storm By-law Limit | RL | BH-7 |
|---|---|---|---|---|---|
| **General Chemistry** | | | | | |
| Total BOD | mg/L | 300 | 15 | 2 | < 4 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 100 | - | 0.5 | 0.6 |
| pH | pH | 6.0-11.5 | 6.0-9.5 | 0.05 | 8.15 |
| Phenols-4AAP | mg/L | 1 | 0.008 | 0.002 | < 0.002 |
| Total Suspended Solids (TSS) | mg/L | 350 | 15 | 2 | 48 |
| Total Phosphorus (P) | mg/L | 10 | 0.4 | 0.003 | 0.055 |
| Sulphate | mg/L | 1500 | - | 2 | 15 |
| **Oil and Grease** | | | | | |
| Total Animal / Vegetable Oil and Grease | mg/L | 150 | - | 4 | < 4 |
| Total Oil & Grease Mineral / Synthetic | mg/L | 15 | - | 4 | < 4 |
| **Nonylphenol and Ethoxylates** | | | | | |
| Nonylphenol Ethoxylate (Total) | mg/L | 0.2 | 0.01 | 0.01 | < 0.01 |
| Nonylphenol (Total) | mg/L | 0.02 | 0.001 | 0.001 | < 0.001 |
| **Metals and Inorganics** | | | | | |

**Table 4-5 Groundwater Quality Results**

| Analysis | Units | Durham Sanitary By-law Limit | Durham Storm By-law Limit | RL | BH-7 |
|---|---|---|---|---|---|
| Total Aluminum (Al) | mg/L | 50 | - | 0.001 | 0.335 |
| Total Antimony (Sb) | mg/L | 5 | - | 0.0009 | < 0.0009 |
| Total Arsenic (As) | mg/L | 1 | 0.02 | 0.0002 | 0.00021 |
| Total Cadmium (Cd) | mg/L | 0.7 | 0.008 | 0.000003 | 0.00001 |
| Total Chromium (Cr) | mg/L | 2 | 0.08 | 0.00008 | 0.00209 |
| Total Cobalt (Co) | mg/L | 5 | - | 0.000004 | 0.000312 |
| Total Copper (Cu) | mg/L | 3 | 0.05 | 0.0002 | 0.0061 |
| Total Cyanide (CN) | mg/L | 2 | 0.02 | 0.01 | < 0.01 |
| Total Fluoride (F-) | mg/L | 10 | - | 0.06 | 0.39 |
| Total Lead (Pb) | mg/L | 1 | 0.12 | 0.00001 | 0.00056 |
| Total Manganese (Mn) | mg/L | 5 | 0.15 | 0.00001 | 0.0391 |
| Total Mercury (Hg) | mg/L | 0.01 | 0.0004 | 0.00001 | < 0.00001 |
| Total Molybdenum (Mo) | mg/L | 5 | - | 0.00004 | 0.0261 |
| Total Nickel (Ni) | mg/L | 2 | 0.08 | 0.0001 | 0.0009 |
| Total Selenium (Se) | mg/L | 1 | 0.02 | 0.00004 | 0.00005 |
| Total Silver (Ag) | mg/L | 5 | 0.12 | 0.00005 | < 0.00005 |
| Total Tin (Sn) | mg/L | 5 | - | 0.00006 | 0.00056 |
| Total Titanium (Ti) | mg/L | 5 | - | 0.00005 | 0.0121 |
| Total Zinc (Zn) | mg/L | 2 | 0.04 | 0.002 | 0.003 |
| **Semivolatile Organics** | | | | | |
| Di-N-butyl phthalate | mg/L | 0.08 | 0.015 | 0.002 | < 0.002 |
| Bis(2-ethylhexyl)phthalate | mg/L | 0.012 | 0.0088 | 0.002 | < 0.002 |
| **Volatile Organics** | | | | | |
| Chloroform | mg/L | 0.04 | 0.002 | 0.0005 | < 0.0005 |
| 1,2-Dichlorobenzene | mg/L | 0.05 | 0.0056 | 0.0005 | < 0.0005 |
| 1,4-Dichlorobenzene | mg/L | 0.08 | 0.0068 | 0.0005 | < 0.0005 |
| cis-1,2-Dichloroethylene | mg/L | 4 | 0.0056 | 0.0005 | < 0.0005 |
| trans-1,3-Dichloropropene | mg/L | 0.14 | 0.0056 | 0.0005 | < 0.0005 |
| Methylene Chloride | mg/L | 2 | 0.0052 | 0.0005 | < 0.0005 |
| 1,1,2,2-Tetrachloroethane | mg/L | 1.4 | 0.017 | 0.0005 | < 0.0005 |
| Tetrachloroethylene | mg/L | 1 | 0.0044 | 0.0005 | < 0.0005 |
| Trichloroethylene | mg/L | 0.4 | 0.0076 | 0.0005 | < 0.0005 |
| Methyl Ethyl Ketone | mg/L | 8 | - | 0.02 | 0.18 |
| Styrene | mg/L | 0.2 | - | 0.0005 | < 0.0005 |
| **Volatile Organics - BTEX** | | | | | |
| Benzene | mg/L | 0.01 | 0.002 | 0.0005 | < 0.0005 |
| Ethylbenzene | mg/L | 0.16 | 0.002 | 0.0005 | < 0.0005 |
| Toluene | mg/L | 0.016 | 0.002 | 0.0005 | < 0.0005 |

**Table 4-5 Groundwater Quality Results**

| Analysis | Units | Durham Sanitary By-law Limit | Durham Storm By-law Limit | RL | BH-7 |
|---|---|---|---|---|---|
| Total Xylenes | mg/L | 1.4 | 0.0044 | 0.0005 | < 0.0005 |
| **PCBs** | | | | | |
| Total PCB | mg/L | 0.001 | 0.0004 | 0.0001 | < 0.0001 |
| **Microbiological** | | | | | |
| Escherichia coli (E.Coli) | CFU/100mL | - | 200 | - | < 2 |

Notes: Highlighted cells indicate an exceedance of Table 2 criteria.

# 5 Calculation of Dewatering Rates and Estimation of Zone of Influence

Dewatering rates were estimated based on TIL's interpretation of the hydrogeological conditions of the Site and the proposed development details outlined in the Site Plan which is included in **Appendix A**. At the time of preparation of this report, the proposed top-of-slab elevations for the underground parking levels in each parking facility were not known. For the purposes of the dewatering assessment, each 1-storey underground parking facility was assumed to have a top-of-slab depth of 3 mbgs. Similarly, each 2-storey underground parking facility was assumed to have a top-of-slab depth of 6 mbgs. If these assumptions are proven to be inaccurate, TIL should be contacted to re-evaluate the dewatering requirements for the proposed parking facilities in conjunction with potential groundwater control requirements for Site services prior to the submission of applications for dewatering and/or discharge permits, as the case may be.

Estimates are based on groundwater elevations observed during monitoring events and the hydraulic properties of the soils determined by in-situ hydraulic conductivity tests and grainsize analyses. This section does not provide a design of dewatering operations, instead, it provides an estimate of the expected dewatering rate required to obtain the desired drawdown. The most effective dewatering measures for the prevalent ground conditions and the design of the dewatering operations are the sole responsibility of the dewatering contractor on-Site.

## 5.1 Aquifer Characteristics

The underlying geology of the Site was determined to consist primarily of sandy silt with intermittent layers of sand. However, a significant sand and gravel deposit with an approximate thickness of 12.9 m was encountered at BH-10. This deposit should be expected to contribute increased flows in comparison to the poorly graded tills which have higher proportions of fine-grained material. However, as it is anticipated that this unit is not laterally extensive, it is expected to drain relatively quickly in comparison to the sandy silt materials.

Groundwater elevations within the overburden over the long-term monitoring program were observed to range between a low of 96.53 masl (8.89 mbgs) and a high of 103.57 masl (1.4 mbgs). Considering the distribution of proposed parking facilities at the Site, the groundwater elevation considered in the dewatering analysis of each facility corresponds to the groundwater level from the nearest monitoring well to the location of that facility.

Based on the estimates of hydraulic conductivity and anticipated depth of excavation required for each parking facility, the hydraulic conductivity of the sandy silt considered in the estimation of dewatering rates for facilities in this material was $6.0 \times 10^{-8}$ m/s. Similarly, the dewatering rates for parking facilities that are anticipated to contact the sand and gravel unit were estimated using a hydraulic conductivity of $5.0 \times 10^{-6}$ m/s.

## 5.2 Required Drawdown

Dewatering will be required to draw the water level down to below the depth of excavation required for the parking and building foundations or in the case of relatively impermeable material, to control groundwater seepage in the excavation. An additional 1 m of water will be added as a factor of safety since it is expected that the water levels may fluctuate seasonally.

For the purposes of the dewatering calculations, the rate of dewatering was calculated separately for each individual parking facility assuming each building would be constructed in a staged approach. If the underground levels will be constructed concurrently, there could be a reduction in the dewatering rates as a whole according to the principle of superposition of drawdowns between dewatering systems where their respective areas of influence overlap.

The dewatering requirements for the Site are summarized in **Table 5-1** below.

**Table 5-1 Summary of Dewatering Requirements**

| Parking Facility | Ground Surface (masl) | Depth of Excavation (mbgs/masl) | Width of Excavation (m) | Length of Excavation (m) | Water Level Elevation (masl) | Maximum Required Drawdown (m) | Drawdown Water Level (masl) |
|---|---|---|---|---|---|---|---|
| Podium 1 | 105.20 | 4 / 101.20 | 35 | 170 | 103.57 | 3.38 | 100.20 |
| Podium 4 | 104.85 | 7 / 97.85 | 36 | 123 | 101.50 | 4.66 | 96.85 |
| Block 1, Block 2, Tower 4 | 105.25 | 7 / 98.25 | 60 | 150 | 102.00 | 4.75 | 97.25 |
| Block 3, Block 4, Tower 5, Tower 8 | 104.76 | 7 / 97.76 | 60 | 230 | 101.88 | 5.12 | 96.76 |

## 5.3 Radius of Influence

### 5.3.1 Unconfined Aquifers

An estimate of the Radius of Influence (ROI) for dewatering excavations in unconfined aquifers can be calculated using the following equation (Bear, 1979):

$$R_{01} = 2.45\sqrt{\frac{HK}{S_y}t}$$

where,

$R_{01}$ = Radius of Influence, beyond which there is negligible drawdown (m)

$H$ = Distance from initial static water level to assumed bottom of saturated aquifer contributing flows (m)

$S_y$ = Specific Yield of the aquifer formation (based on Johnson (1967))

$t$ = Time, in seconds, required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

$K$ = Hydraulic Conductivity of aquifer formation (m/s)

A summary of the ROI of dewatering estimated for each parking facility is presented in **Table 5-2** below.

**Table 5-2 ROI Estimate**

| Parking Facility | H (m) | $S_y$ [-] | K (m/s) | t (s) | $R_{01}$ (m) |
|---|---|---|---|---|---|
| Podium 1 | 12 | 0.20 | $6.0 \times 10^{-8}$ | 1,209,600 | 6 |
| Podium 4 | 14 | 0.25 | $5.0 \times 10^{-6}$ | 1,209,600 | 45 |
| Block 1, Block 2, Tower 4 | 9 | 0.20 | $6.0 \times 10^{-8}$ | 1,209,600 | 5 |
| Block 3, Block 4, Tower 5, Tower 8 | 9 | 0.20 | $6.0 \times 10^{-8}$ | 1,209,600 | 5 |

## 5.4 Dewatering Rate Calculations

Dewatering calculations are based on equations of radial and planar flow where the system can be approximated as a well with equivalent radius. The dewatering equations referenced in the completion of this analysis are provided in *Construction Dewatering and Groundwater Control: New Methods and Applications* – Third Edition. New York, New York: John Wiley & Sons (Powers et. al., 2007).

The analytical assessment assumes steady-state flow into an open excavation; however, it should be recognized that a transient condition will exist at the start of dewatering and that during this time, flows can be expected to be higher but will dissipate over time to steady-state conditions as aquifer storage is depleted. The equations of radial flow have the following assumptions:

- Ideal aquifer conditions (homogeneous, isotropic, uniform thickness, and has infinite areal extent);
- Fully penetrating pumping well;
- Only horizontal flow to the pumping well; and
- Constant pumping rate with the flow to the pumping well corresponding to steady-state conditions.

The following equation was used for square excavations and is based on unconfined aquifer conditions (Powers et. al., 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(\ R_{02}/r_s)}$$

In order to estimate dewatering rates for the excavations required for the construction of the underground parking garages for Podium 1, for Podium 4, and for Block 3, Block 4, Tower 5, and Tower 8, flow should be assumed to occur radially at both ends as well as planar along both sides. The following equation was used for rectangular excavations and is based on unconfined aquifer conditions (Powers et. al., 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(\ R_{02}/r_s)} + \ 2\left[\frac{xK(H^2 - h^{2)}}{2L}\right]$$

where,

$Q$ = Anticipated pumping rate ($m^3$/day)
$K$ = Hydraulic conductivity (m/day)
$H$ = Distance from the static water level to the bottom of the saturated aquifer (m)
$H$ = Depth of water in the well while pumping (m)
$R_{02}$ = Radius of Influence (m) from excavation, beyond which there is negligible drawdown. Equivalent to the sum of $R_{01}$ and $r_s$. (m)
$r_s$ = Equivalent well radius determined by equivalent perimeter approximation of a rectangular excavation (m)
$x$ = Length of excavation (m)
$L$ = Distance from a line source to the long side of the excavation, equivalent to $R_{02}$ (m)

## Allowance for Precipitation

While the excavation remains open it is anticipated that it will be necessary to dewater incident stormwater from direct precipitation over the Site. Accounting for rainfall is considered to provide an estimate of the worst-case dewatering scenario for applying for dewatering discharge permits and approvals. To account for additional dewatering volumes from precipitation, a design storm with a 24-hour depth of accumulation of 10 mm was considered, which represents the 80th percentile of all rainfall volumes recorded at the Oshawa Climate Station (ID 6155875) in 2019.

A summary of the dewatering rates estimated for each parking facility is presented in **Table 5-3** below.

**Table 5-3 Dewatering Rate Summary**

| Parking Facility | H | h | K | $r_s$ | Radius of Influence $R_{01} + r_s$ | Short-Term Pumping Rate Q | | | Long-Term Pumping Rate Q |
|---|---|---|---|---|---|---|---|---|---|
| | m | m | m/day | m | m | $m^3$/day | L/day | L/s | L/day |
| Podium 1 (Tower 1 Tower 2 Tower 3) | 12 | 9 | 5.2 x $10^{-3}$ | 66 | 72 | 28.771 | 28,771 | 0.33 | 9,590 |
| | Precipitation | | | | | 59.500 | 59,500 | 0.69 | - |
| | Sub-Total | | | | | 88.271 | 88,271 | 1.02 | 9,590 |
| Podium 4 (Tower 6 Tower 7) | 14 | 9 | 4.3 x $10^{-1}$ | 51 | 96 | 569.298 | 569,298 | 6.59 | 189,766 |
| | Precipitation | | | | | 43.050 | 43,050 | 0.50 | - |
| | Sub-Total | | | | | 612.348 | 612,348 | 7.09 | 189,766 |
| Block 1 Block 2 Tower 4 | 9 | 4 | 5.2 x $10^{-3}$ | 67 | 72 | 27.408 | 27,408 | 0.32 | 9,136 |
| | Precipitation | | | | | 90.000 | 90,000 | 1.04 | - |
| | Sub-Total | | | | | 117.408 | 117,408 | 1.36 | 9,136 |
| Block 3 Block 4 Tower 5 Tower 8 | 9 | 4 | 5.2 x $10^{-3}$ | 64 | 69 | 43.416 | 43,416 | 0.50 | 14,472 |
| | Precipitation | | | | | 140.300 | 140,300 | 1.62 | - |
| | Sub-Total | | | | | 183.716 | 183,716 | 2.13 | 14,472 |
| **Summary** | | | | | | 1,001.743 | 1,001,743 | 11.59 | 222,964 |

**** Pumping rates include a factor of safety of 2.**

To account for uncertainties and the natural variability in the range of hydraulic conductivity that can be encountered during dewatering, the calculated groundwater pumping rates were multiplied by a factor of safety of 2. Incorporating the factor of safety in the dewatering calculations also provides flexibility to the dewatering contractor in meeting project schedules and helps to account for the initial pumping period under transient conditions when dewatering volumes are expected to be higher as groundwater storage is depleted. Following the initial transient period, dewatering rates are expected to stabilize. The complete dewatering analysis can be found in **Appendix E**.

As was mentioned previously, this dewatering analysis has been prepared for permitting requirements only. As such, the dewatering rates are not meant to be solely relied upon in the determination of the approach used in the design of the dewatering system. The dewatering contractor is ultimately responsible for ensuring project timelines with respect to dewatering are met and that the open excavations are safe from a groundwater seepage perspective.

## 5.5 Options for Dewatering Discharge and Permitting

### 5.5.1 Dewatering Permit Requirements

The estimated maximum cumulative groundwater dewatering rate required during construction to achieve the desired conditions within the excavations is 668,893 L/day. Additionally, it is recommended to account for incident precipitation when applying for potential dewatering and discharge approvals to ensure there is contingency available for maintaining a dry excavation during periods of rain. An accumulation of 10 mm over 24 hours within each excavation was considered in this investigation, which requires accounting for an additional 332,850 L/day above the estimated groundwater dewatering rates.

Considering both groundwater and stormwater control requirements, the cumulative rate of dewatering is then 1,001,743 L/day. Since this rate is greater than 400,000 L/day and may include combinations of groundwater and stormwater, a PTTW issued by the MECP will be required to facilitate construction dewatering if all excavations are to be opened at once. Since the dewatering rates between all blocks are variable, consideration of the approach to construction phasing in the context of potential dewatering permitting requirements is warranted to determine the maximum dewatering rate that should be requested in the PTTW application. Since the estimated dewatering rate for Podium 4 exceeds 400,000 L/day, the amalgamated rate requested in the PTTW application should consider the dewatering rate from Podium 4 as the minimum and that any additional dewatering requirements for other blocks be added to calculate the total permitting rate if they will be completed concurrently.

Since the foundations for all parking facilities will extend below the water table, it is anticipated that a method of groundwater control will be required over the long-term to manage hydrostatic pressure and groundwater seepage around the foundation floor and walls. If foundation drains and sumps are proposed for long-term groundwater control, the estimated rate of dewatering will be approximately 1/3rd the maximum cumulative rate of short-term groundwater dewatering, or approximately 222,964 L/day. Since the estimated rate of groundwater dewatering in the long-term is greater than 50,000 L/day, a Category 3 PTTW issued by the MECP will be required if long-term groundwater takings are proposed. It will be necessary to demonstrate in the permit application that no unacceptable impacts over the long-term are expected.

Separate applications for PTTWs will be needed to satisfy both the short-term and the long-term permitting requirements on the project. In each case, the PTTW application will require preparation of a hydrogeological report to support the application that includes the permitting rate required, identification of potential unacceptable impacts of the water taking, monitoring requirements, and a contingency plan to mitigate unacceptable impacts in the event they were to occur. It is recommended that a minimum of six (6) months lead time be provided for the MECP PTTW application review and approval process if PTTWs for construction dewatering and long-term operation of the Site will be pursued.

### 5.5.2 Disposal Options for Discharge Water

At this time, the groundwater quality, as it relates to By-Law 55-2013, does not meet the discharge criteria in the *Table 2 – Limits for Storm Sewer Discharge*; however, it does meet the *Table 1 – Limits for Sanitary Sewer Discharge.* With approval from Durham Region, excess groundwater can be directed to the municipal sanitary sewers without requiring additional treatment. Disposal options for excess groundwater should be considered prior to construction as a discharge agreement will be required from Durham Region to authorize the discharge of dewatering effluent to municipal sewers. Consultation with Durham Region is recommended to determine the requirements for dewatering discharge agreements on this project.

If dewatering discharge during construction is directed to a Durham Region municipal sewer, By-Law 55-2013 provides that dewatering operations must comply with the *Construction Specifications for Control of Water from Dewatering Operations, OPSS 518, November 2006.* If disposal to a Durham Region municipal sewer is proposed during construction, the treatment of dewatering discharge is the responsibility of the dewatering contractor on-Site. It is incumbent upon them to ensure that the dewatering discharge effluent meets the discharge criteria in By-Law 55-2013 for the receiving sewer and is in accordance with any and all terms and/or conditions of their discharge approval.

If a Private Water Drainage System (PWDS) is required for managing groundwater seepage over the long-term, approval for the connection to municipal sewers will be required from Durham Region. Alternatively, waterproofing of the foundation can be undertaken as an alternative to a PWDS. The option of waterproofing versus installing a PWDS and connecting to a municipal sewer should be considered prior to construction as approval for the connection from Durham Region will be required and may include separate agreements for each building complex. Further consultation with Durham Region is recommended if the discharge of groundwater to a municipal sewer is proposed over the long-term.

# 6 Potential Receptors

As part of this program, potential groundwater receptors including domestic or permitted water supplies were identified. Additionally, the surrounding area was evaluated for potential ecological receptors to construction and dewatering.

An understanding of typical groundwater usage in the area was obtained by:

- Querying MECP water well records within a 1 km radius of the Site;
- Identifying permitted water takers within a 1 km radius of the Site.

## 6.1 MECP Water Well Record Search

A search of the MECP well records database was conducted within a 1 km radius of the study area. The search results showed a total of 73 drilled or dug wells within the search area. Water well usage details are summarized in **Table 6-1**. **Appendix F** provides the list of MECP well records returned by the search.

**Table 6-1 MECP Well Records within 1 km Radius**

| Primary Well Use | Number of Wells within 1 km Buffer of Study Area | Percentage of Total |
|---|---|---|
| Dewatering - Commercial | 3 | 4% |
| Water Supply - Domestic | 14 | 19% |
| Test/Observation/Monitoring Well | 26 | 36% |
| Abandoned/Unknown | 30 | 41% |
| **Total** | **73** | |

The primary well usage in this area (other than for abandoned/unknown) is for test/ observation/ monitoring well purposes (36%). Of the well records queried, 14 (19%) were shown to be used for domestic water supply. A review of these records shows that they were filed in the 1950s to 1970s. As the area surrounding the Site is developed and there no rural dwellings, in addition to the availability of municipal water, it is expected that the domestic water supplies are no longer in use. The locations of MECP well records within the 1 km search radius are shown in **Figure 11**.

## 6.2 Permitted Water Users

A search was conducted to identify the permitted groundwater users within 1 km of the study area. No active PTTWs were identified within the 1 km boundary as illustrated in **Figure 11**.

## 6.3 Ecological Receptors

Based on a review of MNRF's Natural Heritage Areas mapping portal, the Site is not located within 500 m of Provincially Significant Wetlands, woodlots, and major watercourses. Furthermore, the Site is not located within an Area of Natural Scientific Interest (ANSI).

Considering the anticipated radius of influence for dewatering activities on-Site and degree of urbanization in the area, there are no anticipated ecological receptors to construction or dewatering activities at the Site that cannot be managed by proper implementation of barrier controls to restrict off-Site releases of construction debris and/or sediment.

# 7 Potential Impacts and Proposed Mitigation

## 7.1 Identification and Mitigation of Short-Term Impacts

### 7.1.1 Potential Short-Term Impacts to the Groundwater System

Dewatering activities may cause the local water level to drop temporarily. The Site is not located within a WHPA, an SGRA, or an HVA area. As such, short-term impacts to the groundwater system will be limited to the temporary drawdown resulting from construction dewatering. Following construction dewatering, the water table is expected to recover to pre-construction conditions.

### 7.1.2 Potential Short-Term Impacts to the Surface Water System

Dewatering can result in a decline in the groundwater level in shallow unconfined aquifers and change how the groundwater and surface water systems interact. There are no surface water features within the anticipated ROI of dewatering and as such, dewatering activities are unlikely to have an impact on surrounding surface water features.

### 7.1.3 Potential Short-Term Impacts to Other Groundwater Users

Dewatering can result in a decline in the groundwater level in shallow unconfined aquifers, reducing the available groundwater for nearby groundwater takers. Based on the results of the water well records and PTTWs review, there are no active groundwater takers within the anticipated ROI of dewatering or the 1 km search radius for these receptors. Considering the availability of municipal servicing in the area, no short-term impacts to other groundwater users are anticipated.

### 7.1.4 Potential Short-Term Impacts to Land Stability

Dewatering activities remove groundwater from the soil thereby increasing the effective stress of those soils whose porespaces were once occupied by water. The increase in effective stress can naturally lead to settlement in subsurface materials which can manifest at the ground surface as and damage local infrastructure. Ground settlement related to construction dewatering should be reviewed by a geotechnical engineer prior to construction to evaluate and mitigate potential risks.

### 7.1.5 Mitigation of Short-Term Impacts

There are no sensitive receivers identified within the anticipated ROI for dewatering. Therefore, impacts to the groundwater system and other groundwater users are not expected and mitigative measures will therefore not be required except where mandated by dewatering permits or approvals.

A Spill Prevention and Response Plan, as well as an Erosion and Sediment Control (ESC) Plan, should be implemented during construction to limit the possibility of downward percolation of spilled contaminants to the groundwater table or to off-Site receptors during construction.

## 7.2 Identification and Mitigation of Long-Term Impacts

### 7.2.1 Potential Long-Term Impacts to the Groundwater System

The Site is not located within a WHPA, an SGRA, or an HVA. As such, unacceptable impacts to the groundwater system over the long-term are not expected.

When there exists a possibility that groundwater may be diverted and follow the path of new utilities or services, groundwater barriers may be used to prevent groundwater migration within utility or service networks. Should the groundwater and soil conditions require the need for clay seals, it should be discussed on a specific pipe location basis with the engineer responsible for the design. For details and additional design information, see OPSD 802.095 and OPSS 1205.

### 7.2.2 Potential Long-Term Impacts to the Surface Water System

The Site is not located within an IPZ nor near to any water bodies or watercourses and therefore no unacceptable long-term impacts to the surface water system are expected.

### 7.2.3 Potential Long-Term Impacts to Other Groundwater Users

Long-term dewatering can result in a decline in the groundwater level in shallow unconfined aquifers, reducing the available groundwater for nearby groundwater takers. However, based on the results of the water well records and PTTWs review, there are no active groundwater takers within 1 km of the Site. As a result, no long-term impacts to other groundwater users are expected.

### 7.2.4 Mitigation of Long-Term Impacts

Long-term impacts to the groundwater system, surface water system, and other groundwater users are not expected and therefore no mitigative measures are considered necessary at this time. Considering the size of the Site, a Salt Management Plan is recommended over the long-term.

# 8 Summary

A summary of the hydrogeological investigation is provided below:

- The Site is located within the Toronto and Region Source Protection Area and CTC Source Protection Region. A review of the CTC Source Protection Plan policy boundaries indicates that no specific CTC Source Water Protection Plan policies will apply to the development of the Site.
- The Site is located within the Petticoat Creek Watershed under the jurisdiction of the TRCA and it is not located within TRCA regulated areas. The nearest surface water feature to the Site is the Petticoat Creek at approximately 800 m to the southwest.
- The Site slopes to the south with an approximate average flat surface elevation of 105.19 masl.
- The Site is situated in the Iroquois Plain physiographic region.
- The subsurface geology consists mainly of fill underlain by a layer of sandy silt to a known depth of 22.88 mbgs. Intermixed within the sandy silt unit are thin units of sand, with a sand and gravel deposit approximately 12.9 m thick observed along the south-central area of the Site's southern development boundary.
- Groundwater level elevations have been measured during the period of March to June of 2019. The groundwater levels over this time ranged in elevation from a low of 96.53 masl (8.89 mbgs) in the northeast corner of the Site in late March, to a high of 103.57 masl (1.4 mbgs) in the southwest corner of the Site in late March. It is expected that there will be some seasonal variability in groundwater levels resulting from periods of regional groundwater recharge and more frequent storm events. Groundwater levels are typically highest in the Spring and lowest in the Fall to early Winter. Based on the monitoring results, high water table conditions for the Site are anticipated to take place in the month of May.
- In-situ rising head tests were conducted in the sandy silt material at select monitoring wells in March of 2019 to determine in-situ hydraulic conductivities across the Site. The hydraulic conductivity of the sandy silt is estimated to range between 1.6 x $10^{-8}$ m/s and 1.8 x $10^{-7}$ m/s. The hydraulic conductivity of the sand and gravel unit is assumed to be 5 x $10^{-6}$ m/s. The range in reported in-situ hydraulic conductivity values falls within the literature ranges of the materials tested.
- A non-filtered groundwater quality sample was collected from BH-7 and analyzed for sewer discharge criteria in By-Law 55-2013. All parameters, with the exception of TSS, were found to be within the discharge criteria of the Table 2 – Limits for Storm Sewer Discharge of By-Law 55-2013. Additionally, all parameters, including TSS, were found to meet the Table 1 – Limits for Sanitary Sewer Discharge of By-Law 55-2013.
- Dewatering needs were assessed for each parking facility assuming the excavations required for each would be completed simultaneously. In this scenario, the maximum cumulative dewatering rate required to achieve the desired conditions within all excavations is approximately 1,001,743 L/day, which considers dewatering rates for groundwater and a stormwater accumulation of 10 mm. As the cumulative dewatering rate is greater than 400,000 L/day, a PTTW issued by the MECP will be required to facilitate dewatering activities during construction. Since the dewatering rates between all blocks are variable, consideration of the construction phasing approach in the context

of potential dewatering permitting requirements is warranted to determine the maximum dewatering rate that should be requested in the PTTW application.

- Dewatering activities remove groundwater from the soil thereby increasing the effective stress which could lead to soil settlement. The potential risks associated with dewatering settlement should be reviewed by a geotechnical engineer prior to construction.
- As the foundations for all parking facilities will extend below the seasonal high groundwater table, it is anticipated that a method of long-term groundwater control will be required. If a PWDS system is proposed to collect and discharge groundwater, the maximum cumulative dewatering rate will likely be 1/3rd the rates calculated for the short-term, equating to approximately 222,964 L/day. Since the anticipated rate of dewatering in the long-term is greater than 50,000 L/day, a PTTW issued by the MECP will be required if water takings are proposed in the long-term.
- If excess groundwater/stormwater encountered during construction or collected in a dedicated foundation drainage system over the long-term is proposed to be discharged to a municipal sewer, approval from Durham Region will be required. Consultation with Durham Region is recommended to determine the requirements for the discharge approvals during construction and permanent sewer connections for groundwater discharge over the long-term.
- A search of the MECP well records for a 1 km radius of the Site returned 73 records and no active PTTWs. The primary well usage in the area was for test/observation/monitoring well purposes (36%).
- There are no anticipated short-term or long-term impacts to the groundwater system, other groundwater users, the surface water system or ecological receptors resulting from dewatering or construction activities. However, it is recommended to implement a Spill Prevention and Response Plan as well as an ESC Plan during construction to limit potential impacts to the groundwater system and the off-Site release of sediment. Considering the size of the Site, a Salt Management Plan is recommended over the long-term.

# 9 References

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## 10 General Statement of Limitations

The comments presented in this report are based on the soil and groundwater samples gathered from the borehole/monitoring well locations indicated on the plan of this report. There is no warranty expressed or implied or representations made by Toronto Inspection Ltd. that this program has discovered all potential environmental risks or liabilities associated with the subject site.

Although we consider this report to be representative of the subsurface conditions at the subject property in the areas investigated, any interpretation of factual data or unexpected soil conditions which exhibit noticeable discolouration, odour, etc. in areas not investigated in this report, should be discussed in consultation with us prior to any initiation of activity. Our responsibility is limited to an accurate assessment of the soil condition prevailing at the locations investigated at the time of the study.

To the fullest extent permitted by law, the clients maximum aggregate recovery against Toronto Inspection Ltd., its directors, employees, sub-contractors and representatives, for any and all claims by Director Industrial Holdings Limited for all causes including, but not limited to, claims of breach of contract, breach of warranty and/or negligence, shall be the amount of fees paid to Toronto Inspection Ltd. for its professional engineering services rendered with respect to the particular site which is the subject of the claim by the client.

Any use and/or interpretation of the data presented in this report, and any decisions made on it by the third party are responsibility of the third party. Toronto Inspection Ltd. accepts no responsibility for loss of time and damages, if any, suffered by the third party as a result of decisions or actions based on this report.

Any legal actions arising directly or indirectly from this work and/or Toronto Inspection Ltd.'s performance of the services shall be filed no longer than two years from the date of Toronto Inspection Ltd.'s substantial completion of the services. Toronto Inspection Ltd. shall not be responsible to the client for lost revenues, loss of profits, cost of content, claims of customers, or other special indirect, consequential, or punitive damages.

Yours truly,

Toronto Inspection Ltd.

LICENSED PROFESSIONAL ENGINEER
T. LEE
100042393
March 23,2020
PROVINCE OF ONTARIO

Sanjay Goel, B.E.S.
Environmental Scientist
Vice-President

Tabitha Lee, M.A.Sc., P.Eng.
Senior Hydrogeologist

# FIGURES

**TorontoInspection** LTD.
GEO-ENVIRONMENTAL CONSULTANTS

110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Site Location

LOCATION:
603-643, 645-699 Kingston Road, Pickering, Ontario

PROJECT NO.
4986-19-HD

DATE:
March 2020

FIGURE NO.
1

REFERENCE
Service Layer Credits: Source: ESRI, DigitalGlobe, GeoEye, and Earthstar Geographics.
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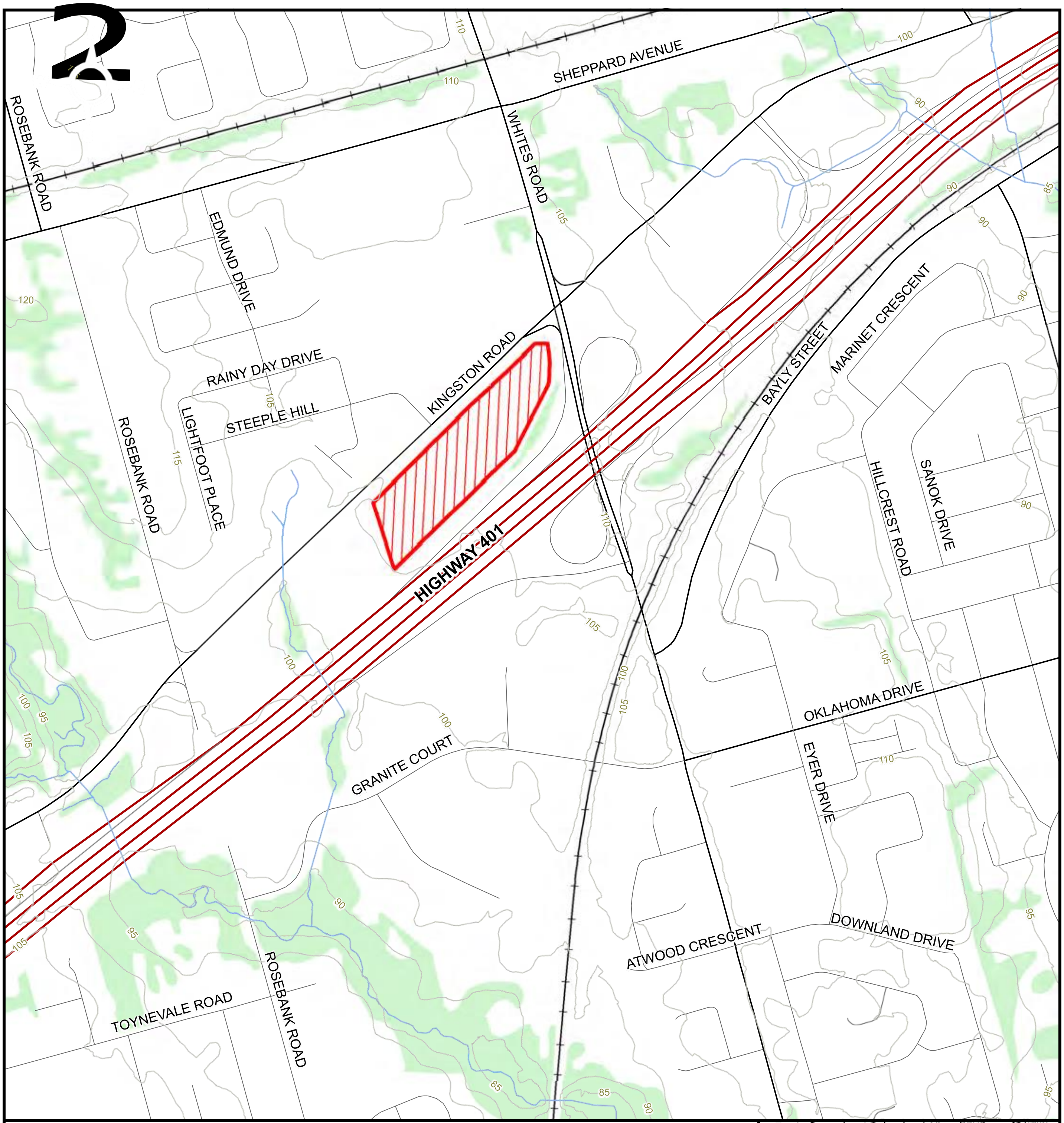

**Legend**

- 5m Contour
- Highway
- Arterial Road
- Local Road
- Railway
- Watercourse
- 🟩 Wooded Area
- ▥ Site Location

0 50 100 200 300 400 m

1:10,000

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110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Topography

LOCATION:
603-643, 645-699 Kingston Road, Pickering, Ontario

| PROJECT NO. | DATE: | FIGURE NO. |
|---|---|---|
| 4986-19-HD | March 2020 | 2 |

REFERENCE
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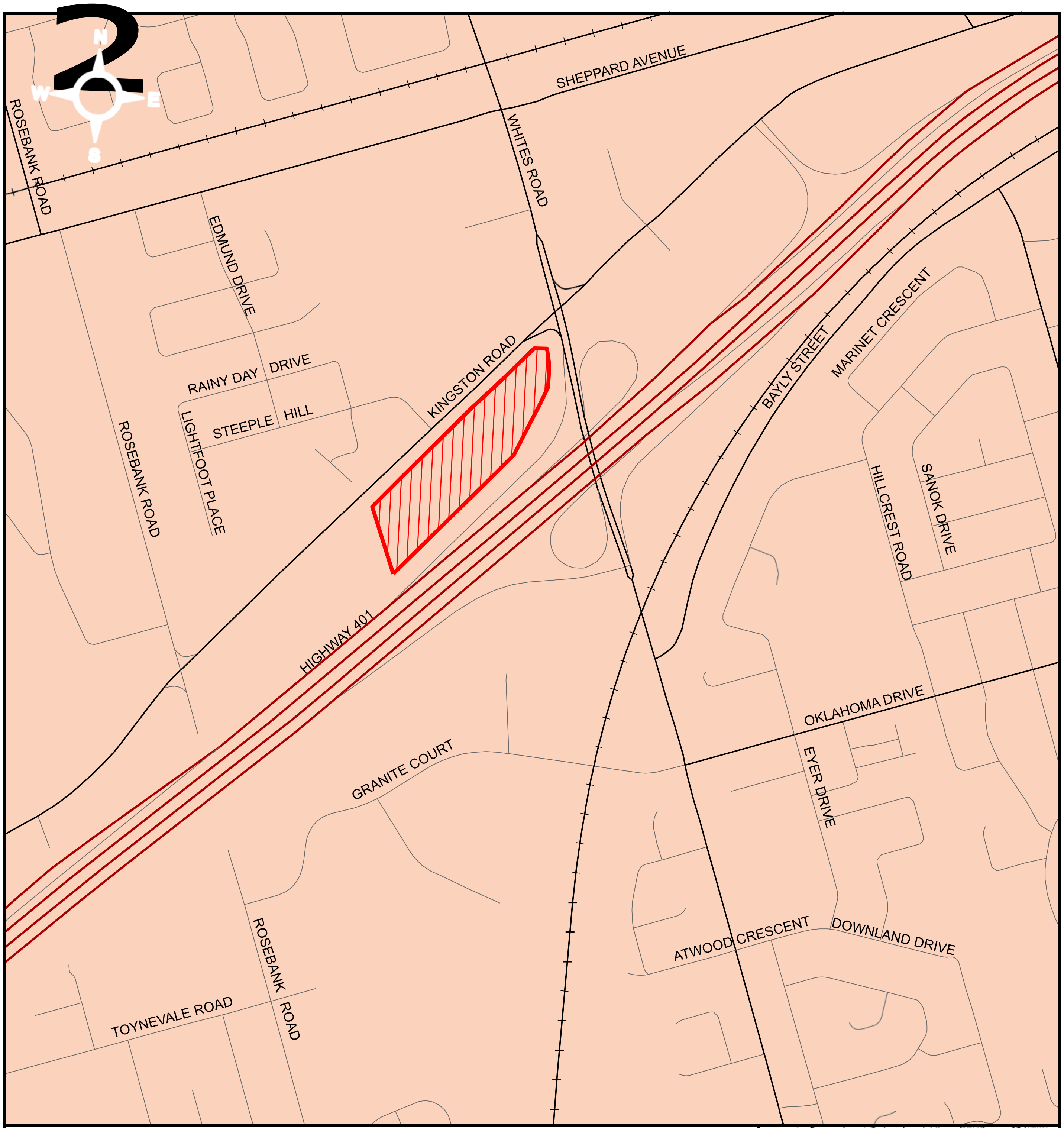

**Legend**

┼ Railway

— Highway

— Arterial Road

— Local Road

▨ Site Location

**Physiography**

🟧 Iroquois Plain

0 50 100 200 300 400 m

1:10,000

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Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Physiography

LOCATION:
603-643, 645-699 Kingston Road, Pickering, Ontario

| PROJECT NO. | DATE: | FIGURE NO. |
|---|---|---|
| 4986-19-HD | March 2020 | 3 |

REFERENCE
Service Layer Credits: Source: Chapman, L.J. and Putnam, D.F. 2007. Physiography of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 228.
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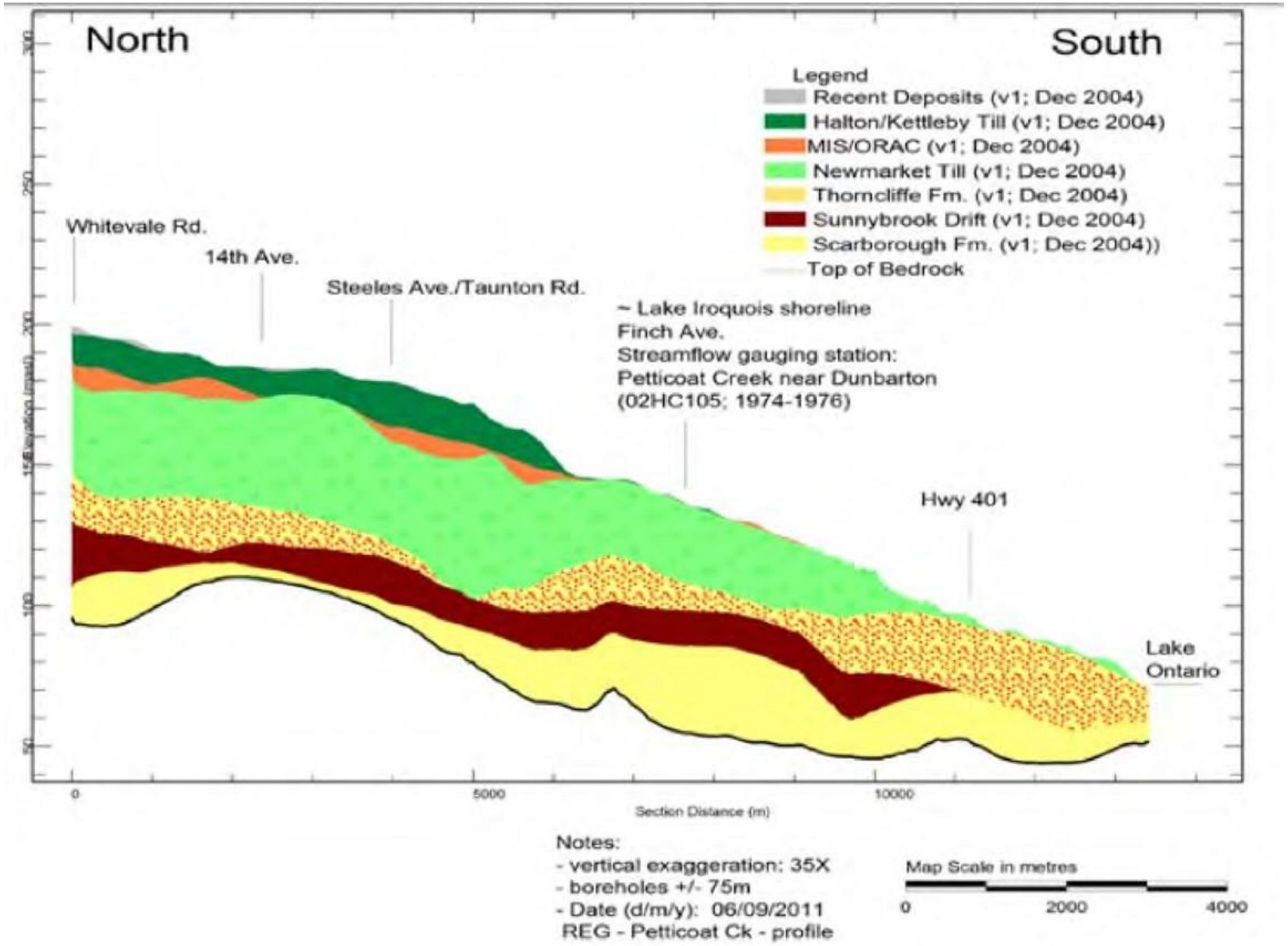

Notes:
- vertical exaggeration: 35X
- boreholes +/- 75m
- Date (d/m/y): 06/09/2011
REG - Petticoat Ck - profile

LEGEND

REFERENCE:
Petticoat Creek Watershed Action Plan, TRCA, August 2012.

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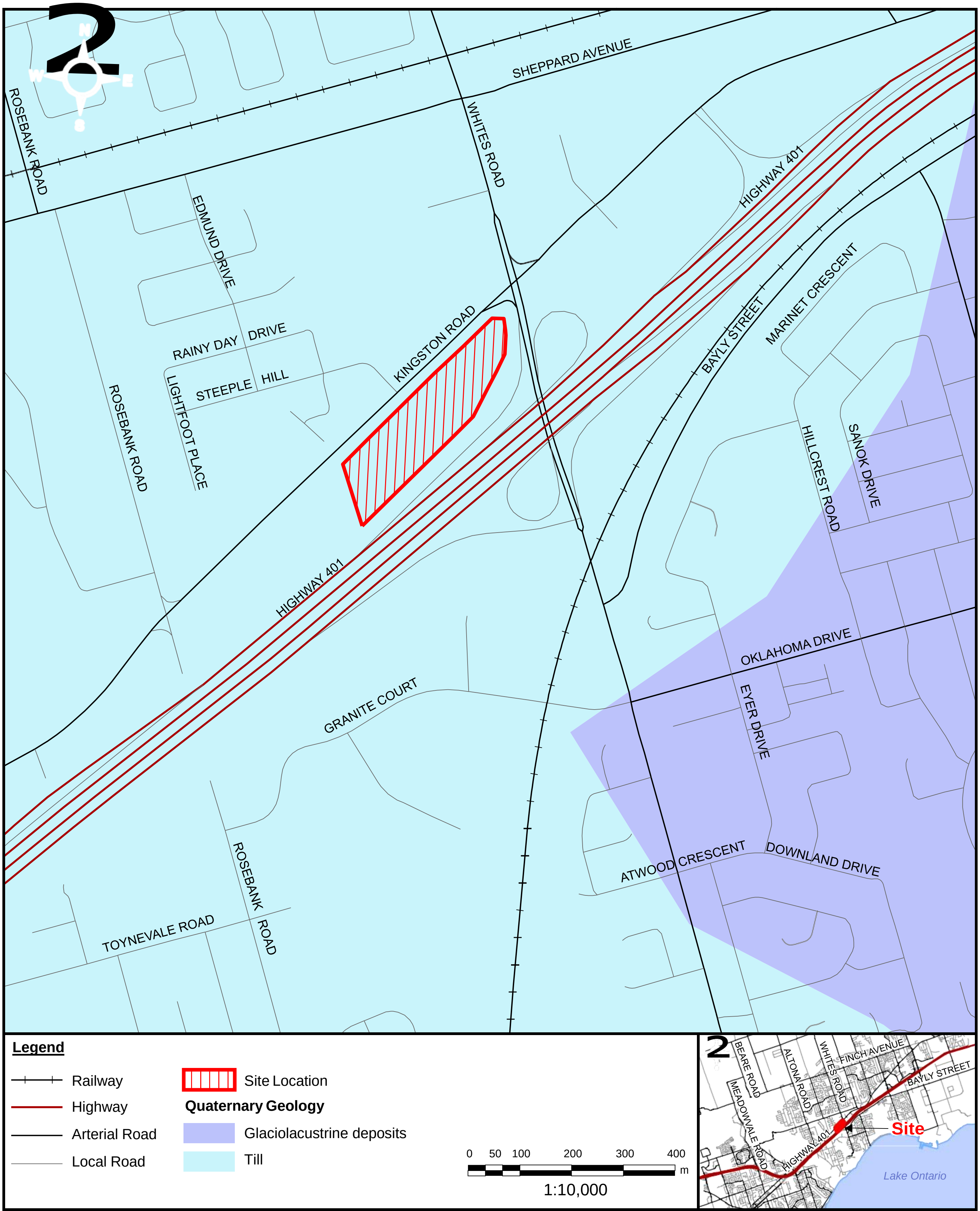
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Regional Hydrostratigraphic Cross-Section

LOCATION:
603-643, 645-699 Kingston Road,
Pickering, Ontario

| PROJECT NO.: | DATE: | FIGURE NO.: |
|---|---|---|
| 4986-19-HD | March 2020 | 4 |



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110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Quaternary Geology

LOCATION:
603-643, 645-699 Kingston Road, Pickering, Ontario

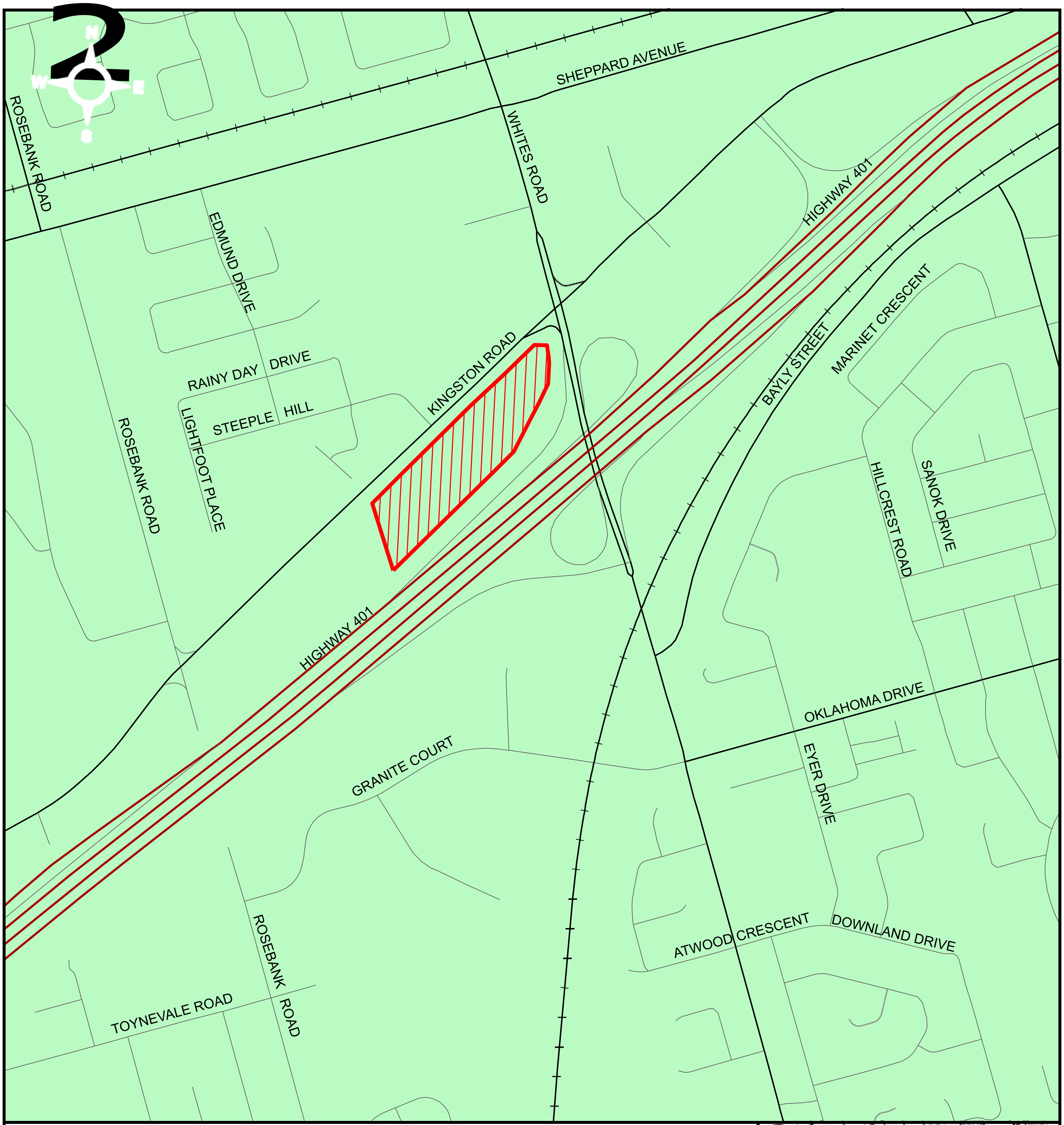
PROJECT NO.
4986-19-HD

DATE:
March 2020

FIGURE NO.
5

REFERENCE

Service Layer Credits: Source: Ontario Geological Survey, Ministry of Northern Development and Mines, and Northeast Science and Information Section, Ministry of Natural Resources 2005. Digital Northern Ontario Engineering Geology Terrain Study (NOEGTS); Ontario Geological Survey, Miscellaneous Release--Data 160. Produced for the District of Muskoka under license from the Ontario Ministry of Natural Resources. Copyright (c) Queens Printer 2017.



**Legend**

| | | | |
|---|---|---|---|
| ─┼─┼─ | Railway | 🟥 | Site Location |
| ─── | Highway | | **Bedrock Geology** |
| ─── | Arterial Road | 🟩 | Georgian bay Fm.; Blue Mountain Fm.; Billings Fm.; Collingwood Mb.; Eastview Mb. |
| ─── | Local Road | | |

0 50 100 200 300 400 m

1:10,000

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Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Bedrock Geology

LOCATION:
603-643, 645-699 Kingston Road, Pickering, Ontario

| PROJECT NO. | DATE: | FIGURE NO. |
|---|---|---|
| 4986-19-HD | March 2020 | 6 |

REFERENCE
Service Layer Credits: Source: Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1.
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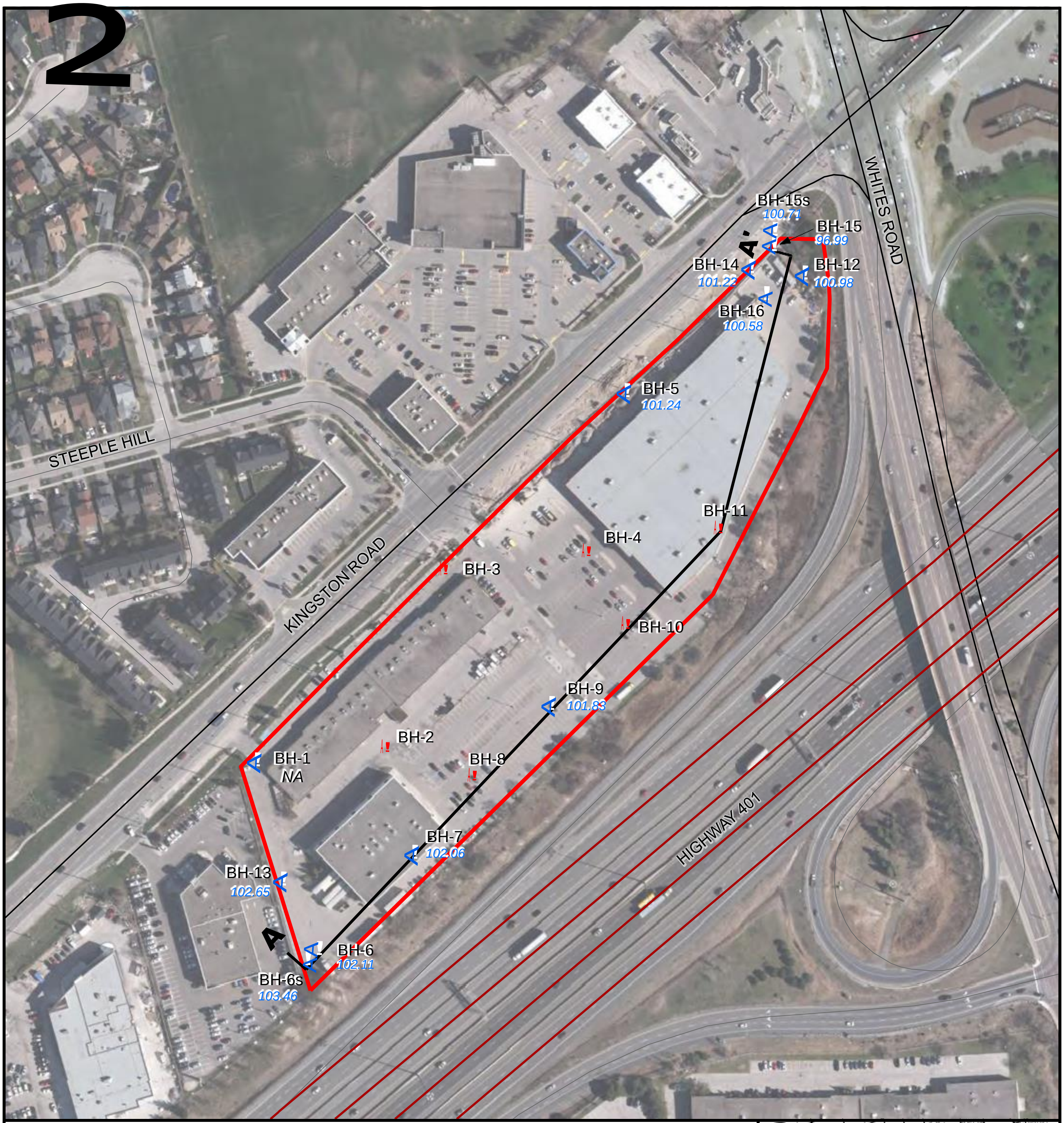

**Legend**

| | |
|---|---|
| ▲ | Borehole Location |
| ∢ | Monitoring Well Location |
| ⌴ | Cross-Section A-A' |
| 1XX.XX | Water Level (May 7, 2019) |
| — | Highway |
| — | Arterial Road |
| — | Local Road |
| ☐ | Site Location |

0 12.5 25 50 75 100 m

1:3,000

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Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Borehole and Monitoring Well Locations

LOCATION:
603-643, 645-699 Kingston Road, Pickering, Ontario

| PROJECT NO. | DATE: | FIGURE NO. |
|---|---|---|
| 4986-19-HD | March 2020 | 7 |

REFERENCE
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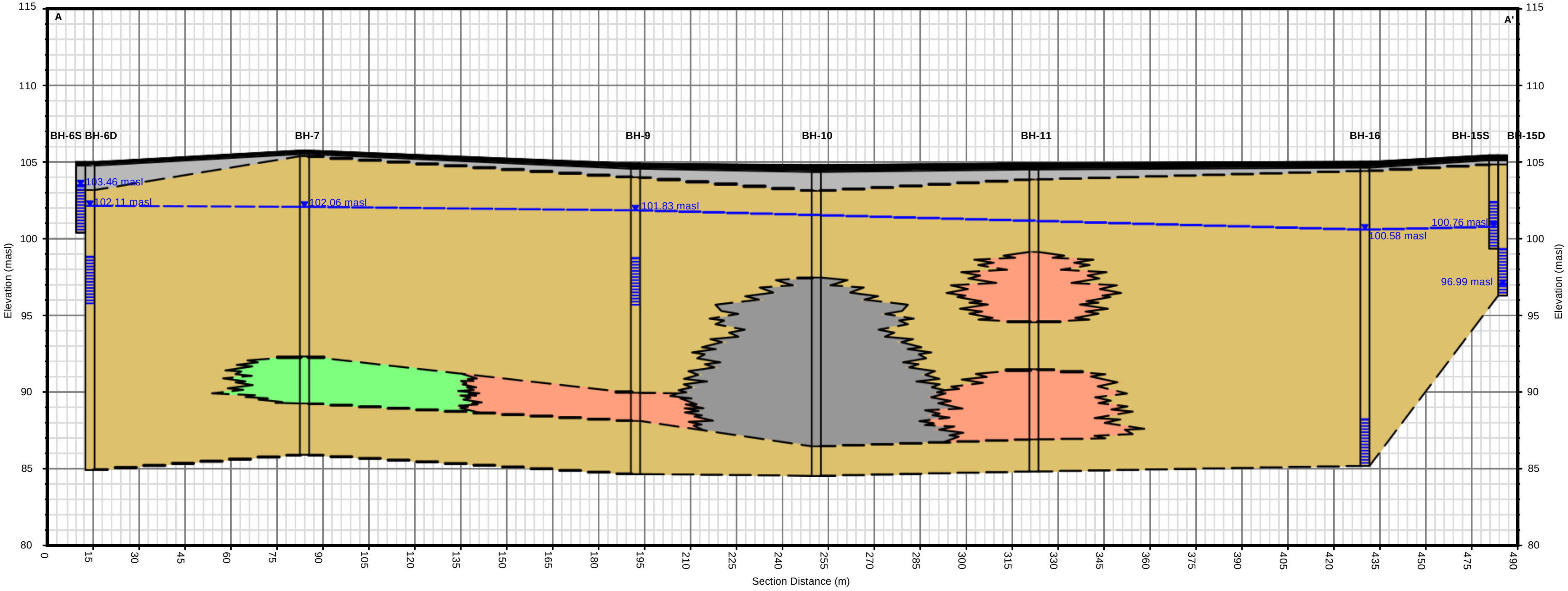

## LEGEND

**Simplified Stratigraphy**

- ⬛ Asphalt/Granular Base
- ▨ Fill
- 🟨 Sandy Silt Till
- 🟩 Silty Sand
- 🟧 Sand
- ▨ Sand and Gravel

* For detailed description, see borehole records

▼ Water Level (May 07, 2019)

▤ Monitoring Well Screen

\- Inferred Water Table

— · — · — Inferred Geological Boundary

**Drawing Notes**

All locations are approximate
Vertical Exaggeration: 10x
Drawn By: I.G. 05/28/2019
Reviewed By: T.L. 05/28/2019

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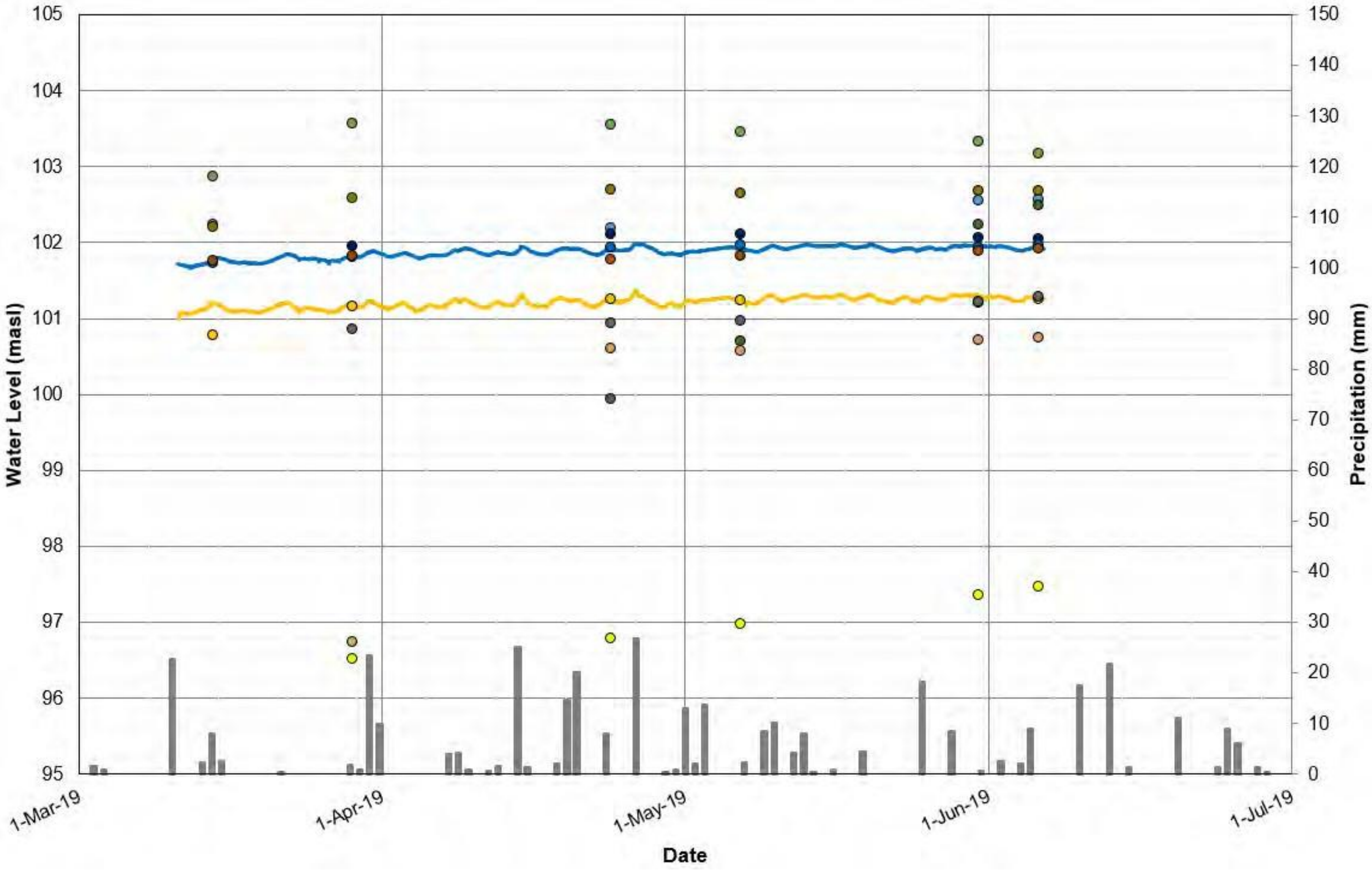
GEO-ENVIRONMENTAL CONSULTANTS
110 Konrad Crescent, Unit 16, Markham, Ontario L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Local Geological Cross-Section
A - A'

LOCATION:
603-643, 645-699 Kingston Road,
Pickering, Ontario

| PROJECT NO.: | DATE: | FIGURE NO.: |
|---|---|---|
| 4986-19-HD | March 2020 | 8 |



LEGEND

| | | | |
|---|---|---|---|
| — BH-7 Logger | ● BH-1 | — BH-5 Logger | ● BH-5 Manual |
| ● BH-6 S | ● BH-6 D | ● BH-7 Manual | ● BH-9 |
| ● BH-12 | ● BH-13 | ● BH-14 | ● BH-15 S |
| ● BH-15 D | ● BH-16 | | |

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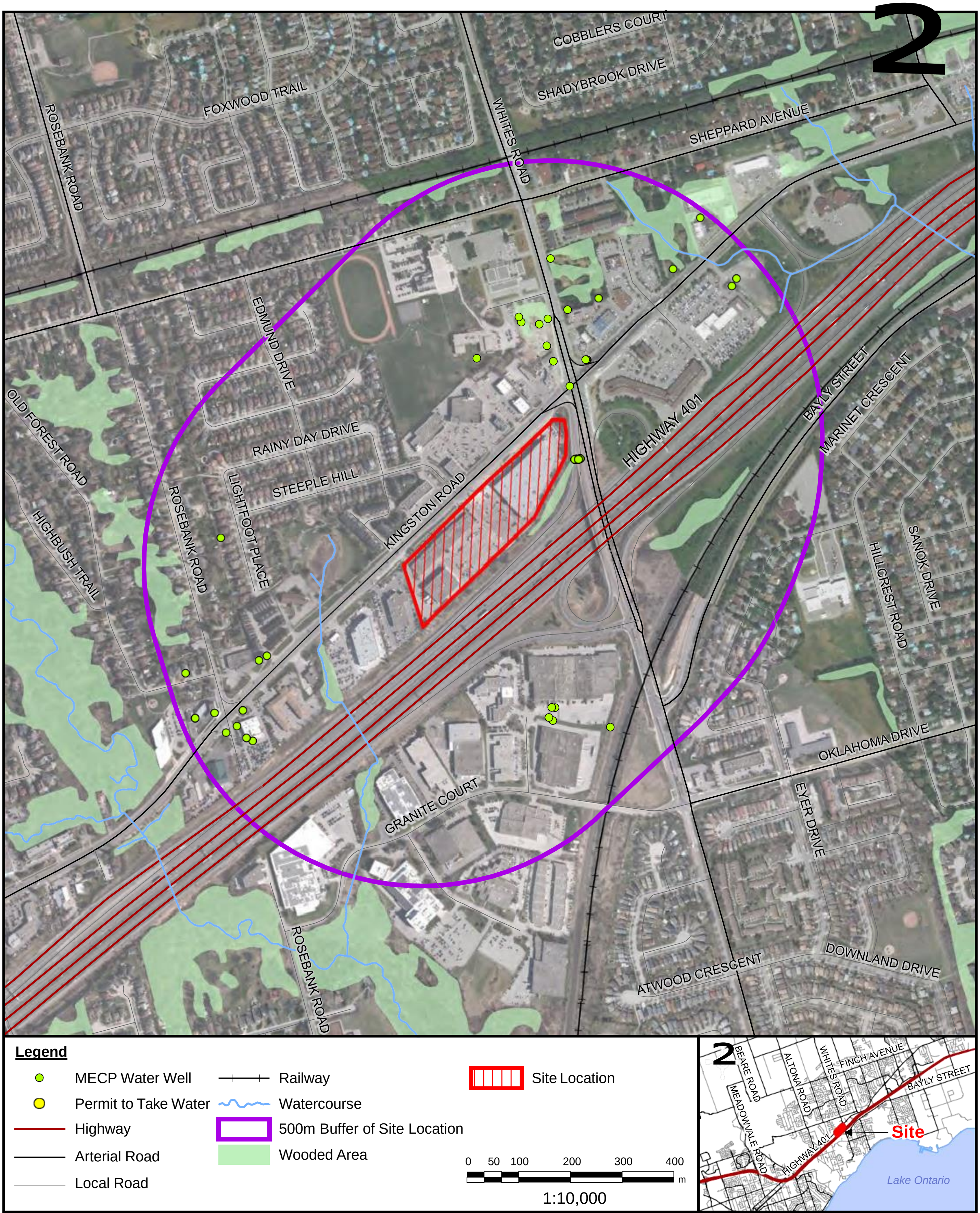
TITLE:
Long-term Water Level Monitoring Hydrograph

LOCATION:
603-643, 645-699 Kingston Road,
Pickering, Ontario

| PROJECT NO.: | DATE: | FIGURE NO.: |
|---|---|---|
| 4986-19-HD | March 2020 | 9 |



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110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
MECP Water Wells and Permits to Take Water

LOCATION:
603-643, 645-699 Kingston Road, Pickering, Ontario

| PROJECT NO. | DATE: | FIGURE NO. |
|---|---|---|
| 4986-19-HD | March 2019 | 11 |

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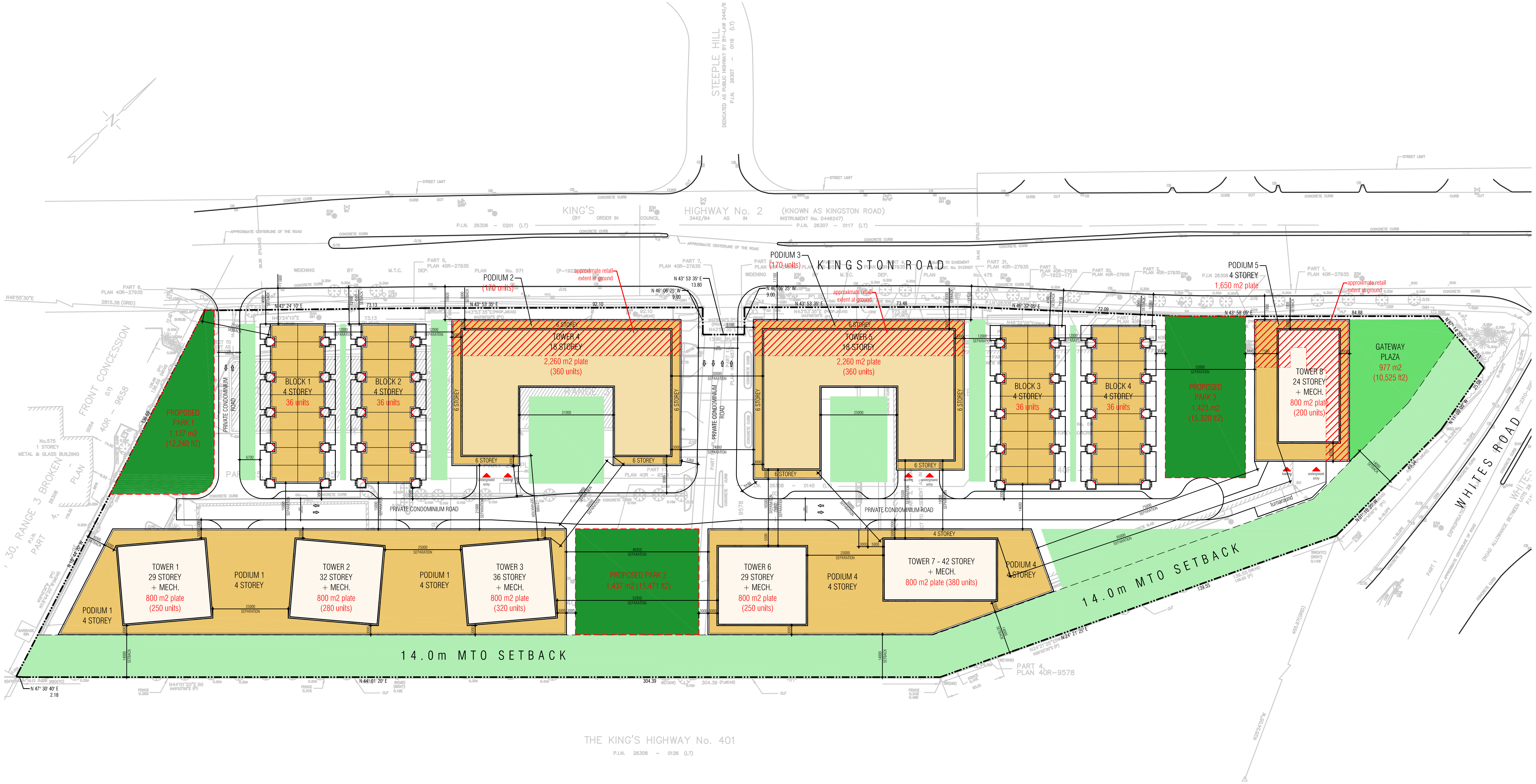
# APPENDIX A

## Conceptual Site Plan



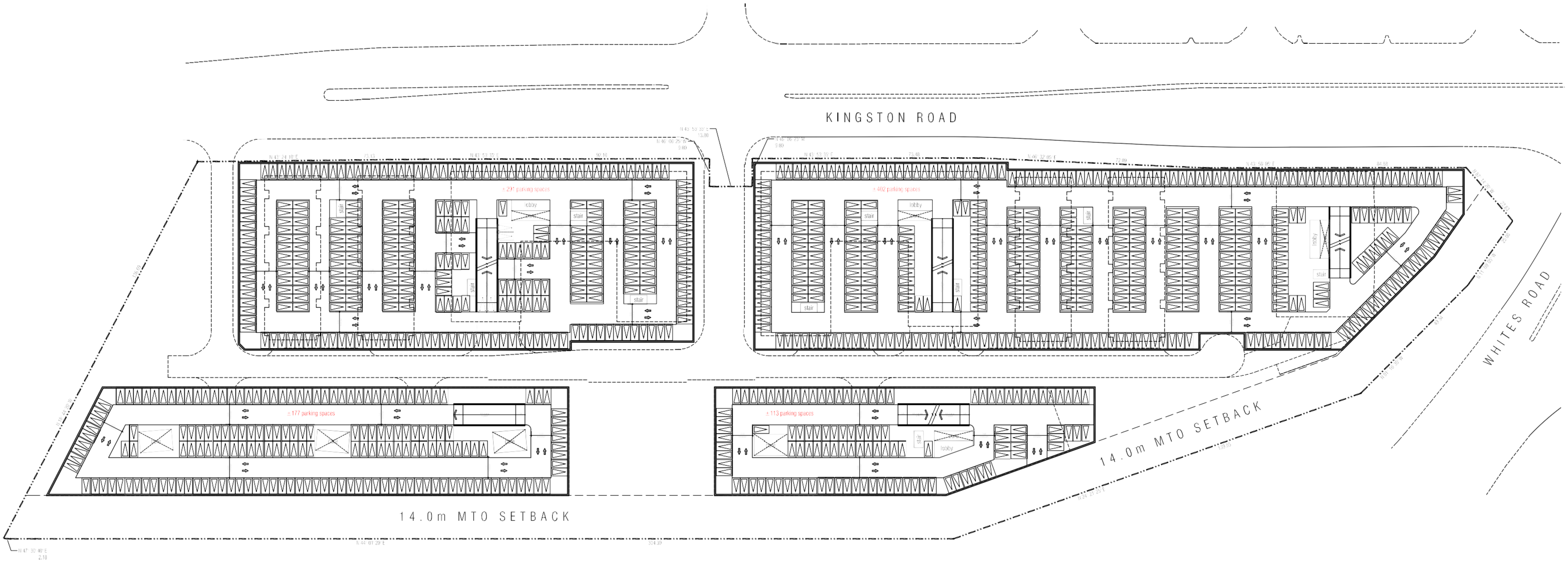
# CONCEPTUAL SITE PLAN

• Sorbara Group of Companies • Whites Road & Hwy 401 • 1682.19 • Apr. 6, 2020

PROPOSED

1:1200

GRAZIANI + CORAZZA ARCHITECTS



# UNDERGROUND PLAN

• Sorbara Group of Companies • Whites Road & Hwy 401 • 1682.19 • Mar. 16, 2020

GRAZIANI + CORAZZA ARCHITECTS

# APPENDIX B

## Borehole Logs

Project No. 4986-19-GC

# Log of Borehole BH-1

Dwg No. 2

Sheet No. 1 of 1

Project: Geotechnical investigation

Location: 603-699 Kingston Road, Pickering, Ontario

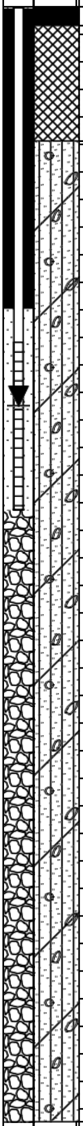
Date Drilled: 2/11/19

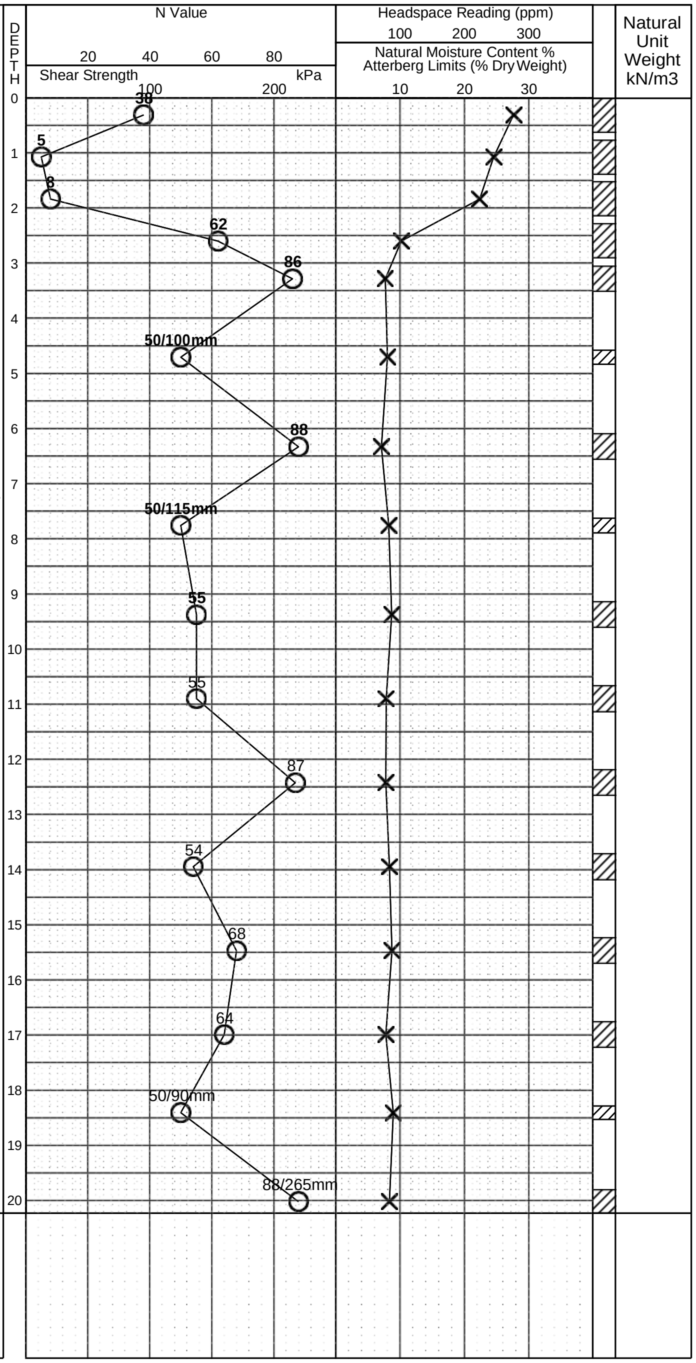
Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ☒ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | ✕ |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├─┤ |
| Shelby Tube | ■ | Unconfined Compression<br>% Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |

| GWL | SYMBOL | Soil Description | ELEV. m | DEPTH |
|---|---|---|---|---|
| | | Ground Surface | 105.35 | 0 |
| | | **ASPHALT PAVEMENT**<br>- 115mm asphalt over granular bases. | 105.01 | |
| | | FILL<br>- dark brown to brown clayey silt to sandy silt,<br>- some gravel, some organics to 1.5m,<br>- some sand & gravel at 1.5m to 1.9m,<br>- very moist, wet at 1.5m. | 102.91 | |
| | | SANDY SILT TILL<br>- very dense, grey,<br>- some gravel,<br>- some silty sand,<br>- some clayey silt,<br>- moist to very moist. | | |
| ▼ | | | **98.04** | |
| | | | 85.12 | 20 |
| | | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 1.8m,<br>- cave-in at 13.4m. | | |





LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 7, 2019 | 3.11m | |
| March 11, 2019 | 7.31m | |
| March 26, 2019 | Blocked | |

Project No. 4976-19-GC

# Log of Borehole BH-2

Dwg No. 3

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

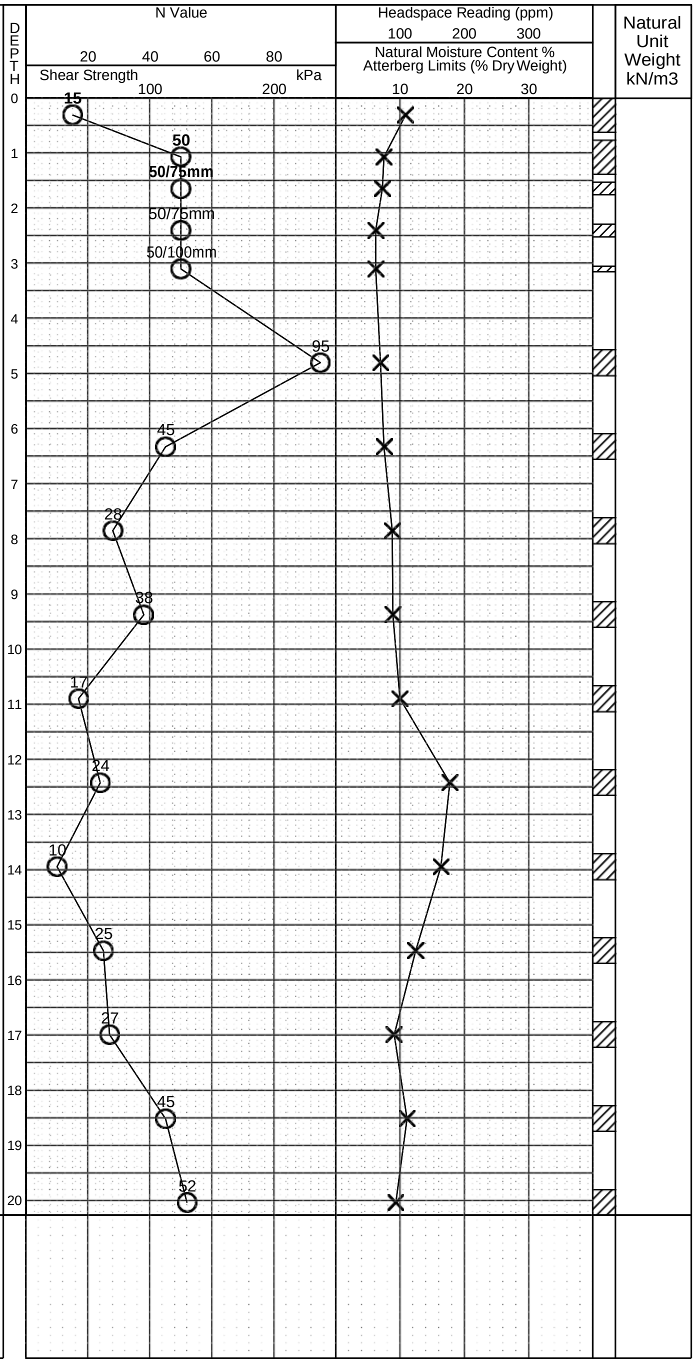
Date Drilled: 2/8/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | |
|---|---|
| Auger Sample | ☒ |
| SPT (N) Value | ○ ▨ |
| Dynamic Cone Test | — |
| Shelby Tube | ■ |
| Field Vane Test | ✚ S |
| Headspace Reading (ppm) | ● |
| Natural Moisture | × |
| Plastic and Liquid Limit | ├─┤ |
| Unconfined Compression % Strain at Failure | ⊗ |
| Penetrometer | ▲ |

| GWL | SYMBOL | Soil Description | ELEV. m |
|---|---|---|---|
| | | Ground Surface | 105.55 |
| | | **ASPHALT PAVEMENT**<br>- 100mm asphalt over granular bases. | 105.24<br>105.17 |
| | | FILL<br>- brown sandy silt,<br>- some gravel, some clayey silt,<br>- moist. | |
| | | SANDY SILT TILL<br>- compact to very dense,<br>- brown, grey below 2.3m,<br>- some gravel,<br>- some silty sand,<br>- some clayey silt,<br>- layers of sand at 1.5m, and below18m,<br>- occasional thin layers fo clayey silt,<br>- moist to wet. | |
| ▼ | | | **97.65** |
| | | | 85.28 |
| | | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 7.9m,<br>- cave-in at 13.5m. | |



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| | | |

Project No. 4986-19-GC

# Log of Borehole BH-3

Dwg No. 4

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

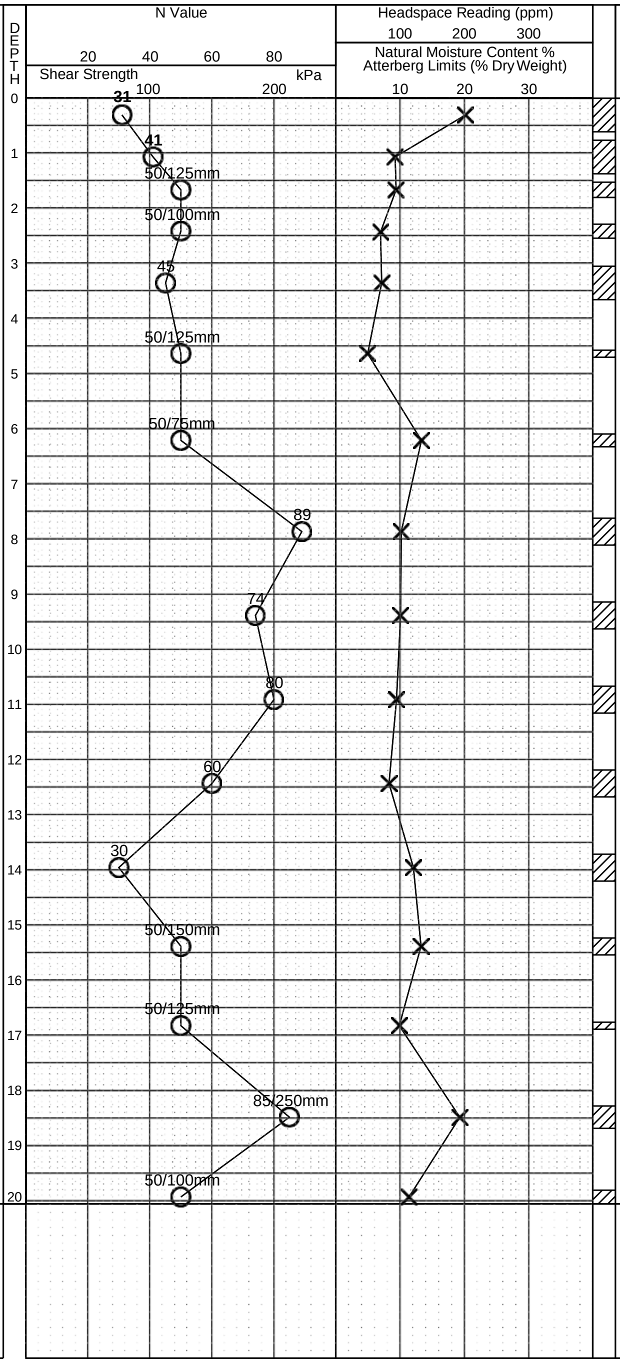
Date Drilled: 2/12/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ☒ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | × |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├─┤ |
| Shelby Tube | ■ | Unconfined Compression<br>% Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |

| GWL | Soil Description | ELEV. m |
|---|---|---|
| | Ground Surface | 105.42 |
| | **ASPHALT PAVEMENT** | 105.14 |
| | - 50mm asphalt over granular bases. | 105.02 |
| | FILL<br>- brown sandy silt to clayey silt,<br>- some gravel,<br>- very moist. | |
| | SANDY SILT TILL<br>- dense to very dense,<br>- brown, grey below 3.0m,<br>- some gravel,<br>- some silty sand,<br>- some clayey silt,<br>- a layer of silty sand at 2.3m and 13.5m,<br>- moist to wet. | |
| ▼ | | **98.02** |
| | | 87.44 |
| | SAND AND GRAVEL<br>- very dense, grey,<br>- a thin layer of fine sand at 18.6m,<br>- wet. | |
| | | 85.36 |
| | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 7.4m,<br>- cave-in at 17.7m. | |



Natural Unit Weight kN/m3

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| | | |

Project No. 4986-19-GC

# Log of Borehole BH-4

Dwg No. 5

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

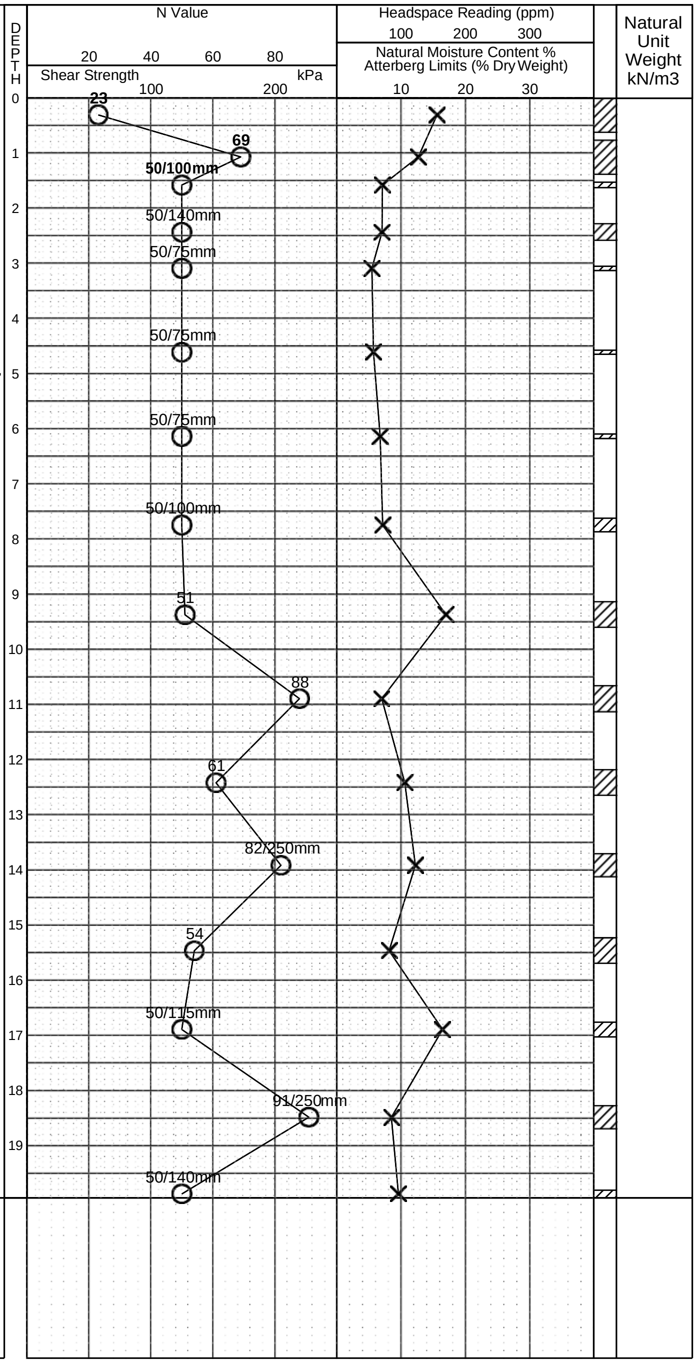
Date Drilled: 2/15/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | |
|---|---|
| Auger Sample | ☒ |
| SPT (N) Value | ○ ▨ |
| Dynamic Cone Test | — |
| Shelby Tube | ■ |
| Field Vane Test | ✚ S |
| Headspace Reading (ppm) | • |
| Natural Moisture | × |
| Plastic and Liquid Limit | ├─┤ |
| Unconfined Compression % Strain at Failure | ⊗ |
| Penetrometer | ▲ |

| GWL | SYMBOL | Soil Description | ELEV. m |
|---|---|---|---|
| | | Ground Surface | 105.77 |
| | | **ASPHALT PAVEMENT**<br>- 100mm asphalt over granular bases. | 105.41<br>104.85 |
| | | FILL<br>- dark brown sandy silt,<br>- some gravel, some clayey silt,<br>- some organics,<br>- moist. | |
| ▼ | | SANDY SILT TILL<br>- very dense,<br>- brown, grey below 3.0m,<br>- some gravel,<br>- some clayey silt,<br>- moist. | **100.57** |
| | | SAND<br>- very dense, grey,<br>- medium grained,<br>- some gravel,<br>- some silty sand to sandy silt at 10.8m,<br>- very moist to wet. | **96.93**<br>94.87 |
| | | SANDY SILT TILL<br>- very dense, grey,<br>- some gravel,<br>- trace clayey silt,<br>- moist. | 93.58 |
| | | SAND<br>- very dense, grey,<br>- fine to coarse grained,<br>- some gravel,<br>- some silty sand,<br>- thin layers of sandy silt at 15.3m, 18.3m, 19.8m,<br>- wet, moist to very moist pockets. | 85.82 |
| | | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 5.2m,<br>- cave-in at 8.0m. | |



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| | | |

Project No. 4986-19-GC

# Log of Borehole BH-5

Dwg No. 6

Project: Geotechnical investigation

Sheet No. 1 of 1

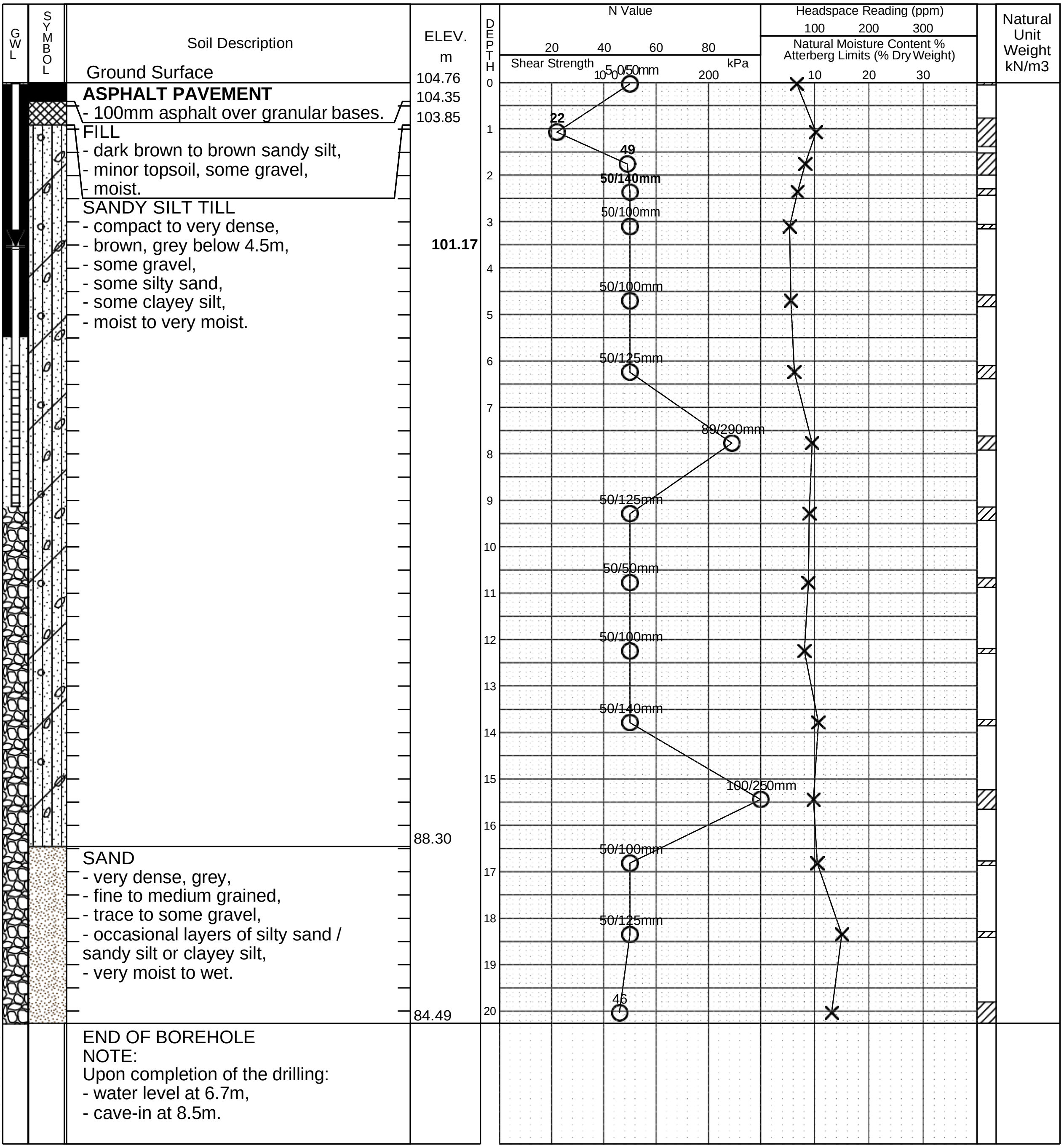
Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/13/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ☒ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | × |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├─┤ |
| Shelby Tube | ■ | Unconfined Compression<br>% Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |



| Soil Description | ELEV. m |
|---|---|
| Ground Surface | 104.76 |
| **ASPHALT PAVEMENT**<br>- 100mm asphalt over granular bases. | 104.35 |
| FILL<br>- dark brown to brown sandy silt,<br>- minor topsoil, some gravel,<br>- moist. | 103.85 |
| SANDY SILT TILL<br>- compact to very dense,<br>- brown, grey below 4.5m,<br>- some gravel,<br>- some silty sand,<br>- some clayey silt,<br>- moist to very moist. | |
| SAND<br>- very dense, grey,<br>- fine to medium grained,<br>- trace to some gravel,<br>- occasional layers of silty sand / sandy silt or clayey silt,<br>- very moist to wet. | 88.30 |
| END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 6.7m,<br>- cave-in at 8.5m. | 84.49 |

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 7, 2019 | 3.62m | |
| March 11, 2019 | 4.37m | |
| March 26, 2019 | 3.59m | |

Project No. 4986-19-GC

# Log of Borehole MW-6

Dwg No. 18

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/4/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | |
|---|---|
| Auger Sample | ☒ |
| SPT (N) Value | ○ ▨ |
| Dynamic Cone Test | — |
| Shelby Tube | ■ |
| Field Vane Test | ✚ S |
| Headspace Reading (ppm) | • |
| Natural Moisture | × |
| Plastic and Liquid Limit | ├─┤ |
| Unconfined Compression % Strain at Failure | ⊗ |
| Penetrometer | ▲ |

| GWL | SYMBOL | Soil Description | ELEV. m | DEPTH | N Value 20 40 60 80<br>Shear Strength 100 200 kPa | Headspace Reading (ppm) 100 200 300<br>Natural Moisture Content %<br>Atterberg Limits (% Dry Weight) 10 20 30 | | Natural Unit Weight kN/m3 |
|---|---|---|---|---|---|---|---|---|
| | | Ground Surface | 104.97 | 0 | | | | |
| | | NO SAMPLING | | | | | | |
| | | | | 1 | | | | |
| | | | 103.57 | | | | | |
| | | | | 2 | | | | |
| | | | | 3 | | | | |
| | | | | 4 | | | | |
| | | | 100.40 | | | | | |
| | | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- no free water. | | | | | | |

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

**Toronto Inspection Ltd.**

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 7, 2019 | 2.08m | |
| March 11, 2019 | 2.07m | |
| March 26, 2019 | 1.40m | |

Project No. 4986-19-GC

# Log of Borehole BH-6

Dwg No. 7

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

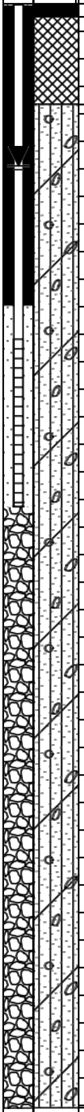
Date Drilled: 2/4/19

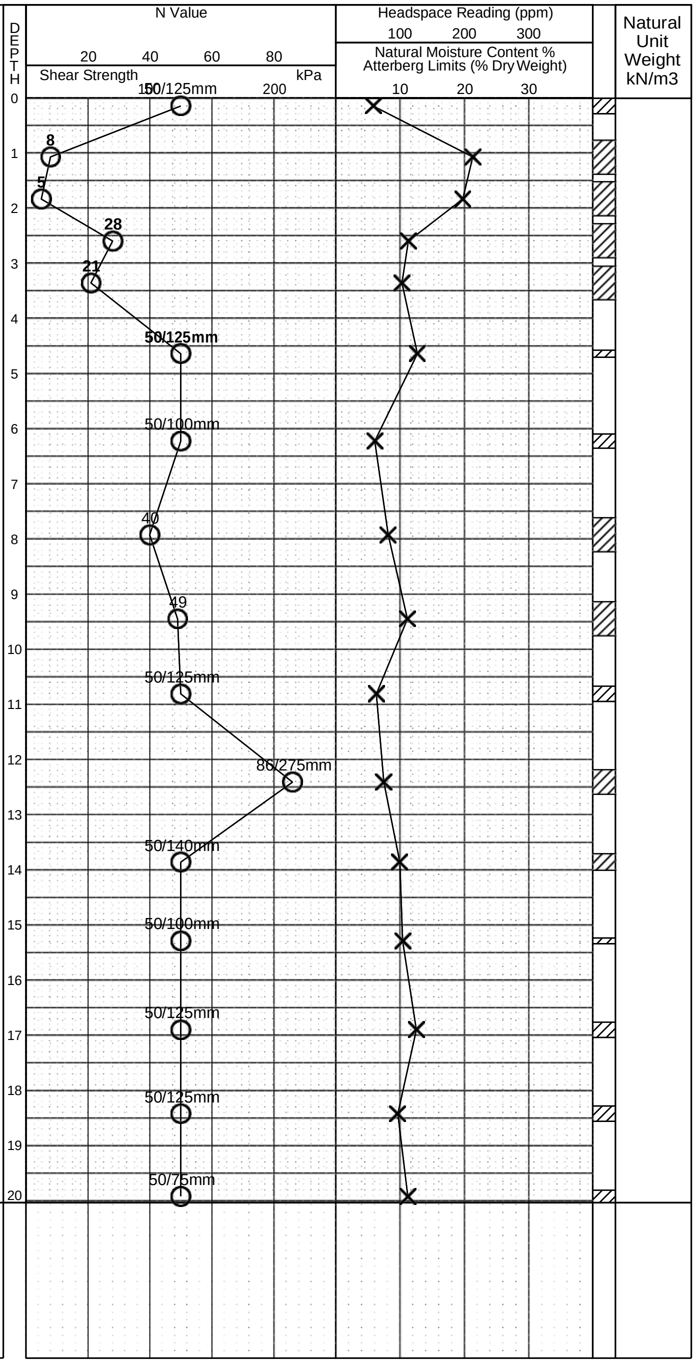
Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ☒ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | ✕ |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├─┤ |
| Shelby Tube | ■ | Unconfined Compression<br>% Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |

| GWL | SYMBOL | Soil Description | ELEV. m | DEPTH |
|---|---|---|---|---|
| | | Ground Surface | 104.97 | 0 |
| | | **ASPHALT PAVEMENT**<br>- 90mm asphalt over granular bases. | 104.73 | |
| | | FILL<br>- dark brwon to brown sandy silt to clayey silt,<br>- some organics, wood pieces at 0.8m,<br>- trace gravel,<br>- very moist. | 103.14 | |
| | | SANDY SILT TILL<br>- compact to very dense,<br>- brown, grey below 7.8m,<br>- some gravel,<br>- some sandy silt,<br>- some clayey silt,<br>- a layer of slity sand at 18m,<br>- occasional thin layers fo clayey silt,<br>- moist to very moist, wet pockets. | **101.96** | |
| | | | 84.93 | 20 |





END OF BOREHOLE
NOTE:
Upon completion of the drilling:
- water level at 7.0m,
- cave-in at 9.7m.

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 26, 2019 | 3.01m | |

Project No. 4986-19-GC

# Log of Borehole BH-7

Dwg No. 8

Project: Geotechnical investigation

Sheet No. 1 of 1

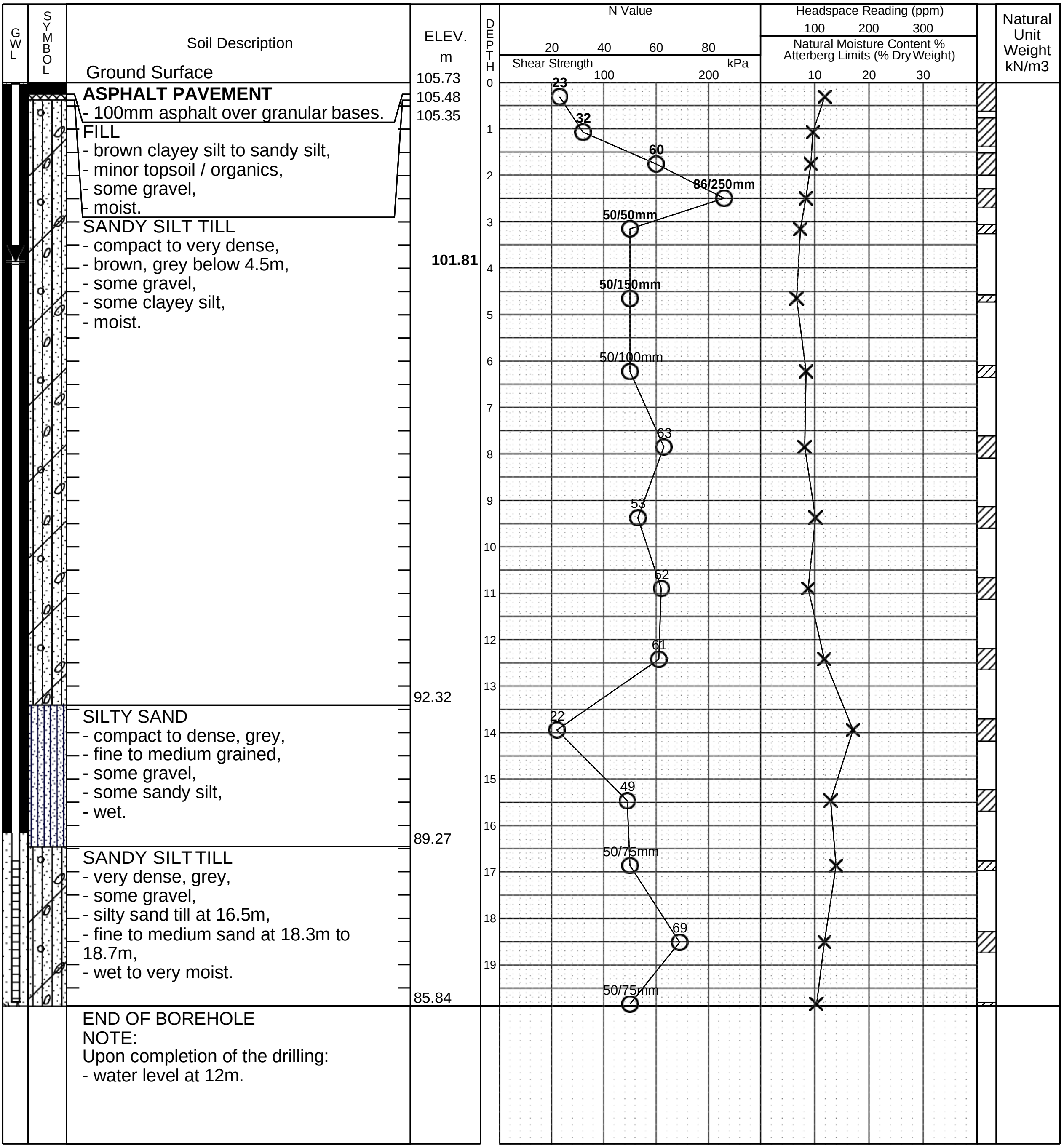
Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/5/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ⊠ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | × |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├─┤ |
| Shelby Tube | ■ | Unconfined Compression<br>% Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |



| Soil Description | ELEV. m |
|---|---|
| Ground Surface | 105.73 |
| **ASPHALT PAVEMENT**<br>- 100mm asphalt over granular bases. | 105.48 |
| FILL<br>- brown clayey silt to sandy silt,<br>- minor topsoil / organics,<br>- some gravel,<br>- moist. | 105.35 |
| SANDY SILT TILL<br>- compact to very dense,<br>- brown, grey below 4.5m,<br>- some gravel,<br>- some clayey silt,<br>- moist. | **101.81** |
| SILTY SAND<br>- compact to dense, grey,<br>- fine to medium grained,<br>- some gravel,<br>- some sandy silt,<br>- wet. | 92.32 |
| SANDY SILT TILL<br>- very dense, grey,<br>- some gravel,<br>- silty sand till at 16.5m,<br>- fine to medium sand at 18.3m to 18.7m,<br>- wet to very moist. | 89.27 |
| END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 12m. | 85.84 |

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 7, 2019 | 3.98m | |
| March 11, 2019 | 4.00m | |
| March 26, 2019 | 3.92m | |

Project No. 4986-19-GC

# Log of Borehole BH-8

Dwg No. 9

Project: Geotechnical investigation

Sheet No. 1 of 1

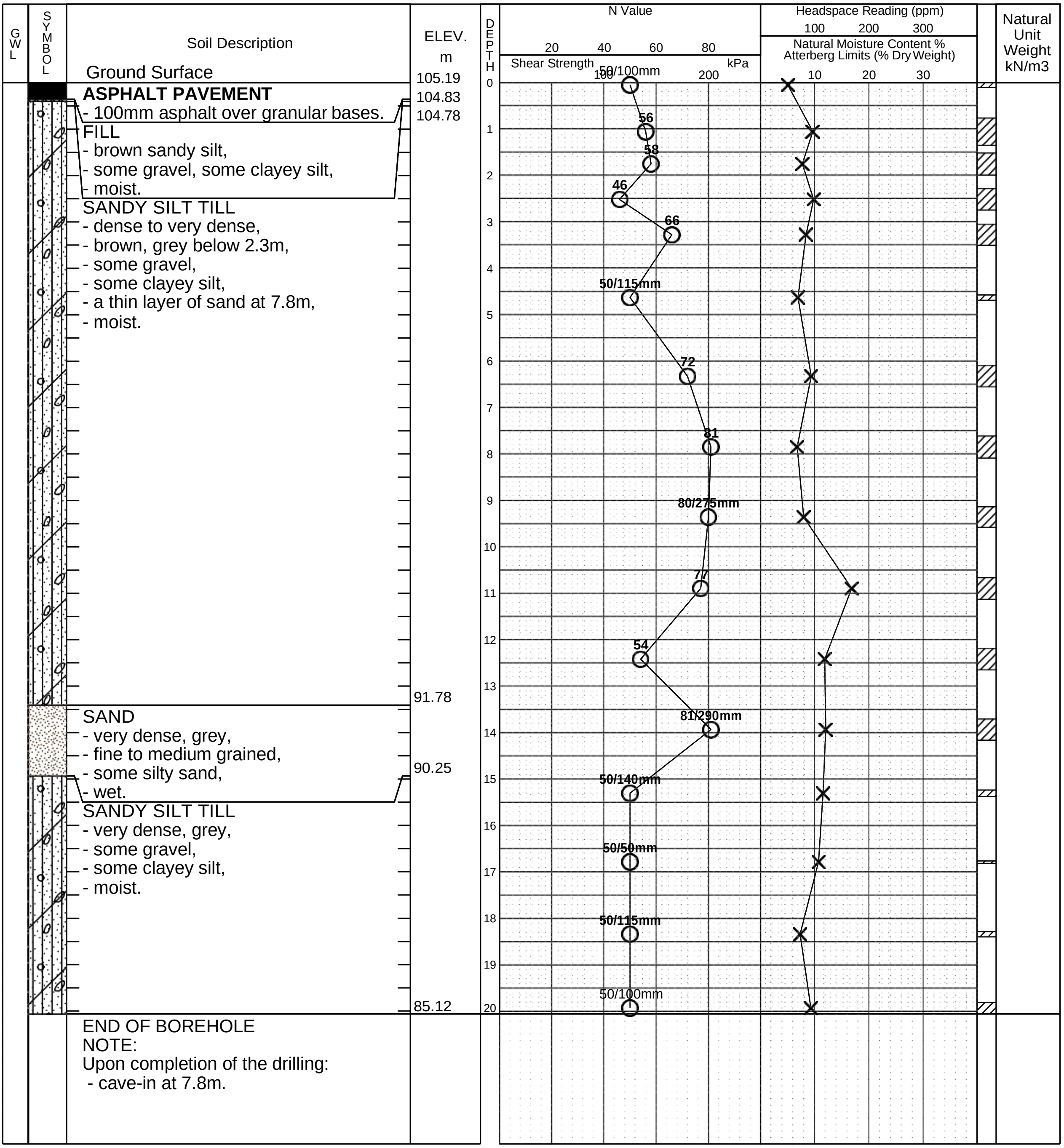
Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/7/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | |
|---|---|
| Auger Sample | ☒ |
| SPT (N) Value | ○ ▨ |
| Dynamic Cone Test | — |
| Shelby Tube | ■ |
| Field Vane Test | ✚ S |
| Headspace Reading (ppm) | • |
| Natural Moisture | × |
| Plastic and Liquid Limit | ├─┤ |
| Unconfined Compression % Strain at Failure | ⊗ |
| Penetrometer | ▲ |



Ground Surface 105.19

**ASPHALT PAVEMENT** 104.83
- 100mm asphalt over granular bases. 104.78

FILL
- brown sandy silt,
- some gravel, some clayey silt,
- moist.

SANDY SILT TILL
- dense to very dense,
- brown, grey below 2.3m,
- some gravel,
- some clayey silt,
- a thin layer of sand at 7.8m,
- moist.

91.78

SAND
- very dense, grey,
- fine to medium grained,
- some silty sand,
- wet.

90.25

SANDY SILT TILL
- very dense, grey,
- some gravel,
- some clayey silt,
- moist.

85.12

END OF BOREHOLE
NOTE:
Upon completion of the drilling:
- cave-in at 7.8m.

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| | | |

# Log of Borehole BH-9

Project No. 4986-19-GC

Dwg No. 10

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

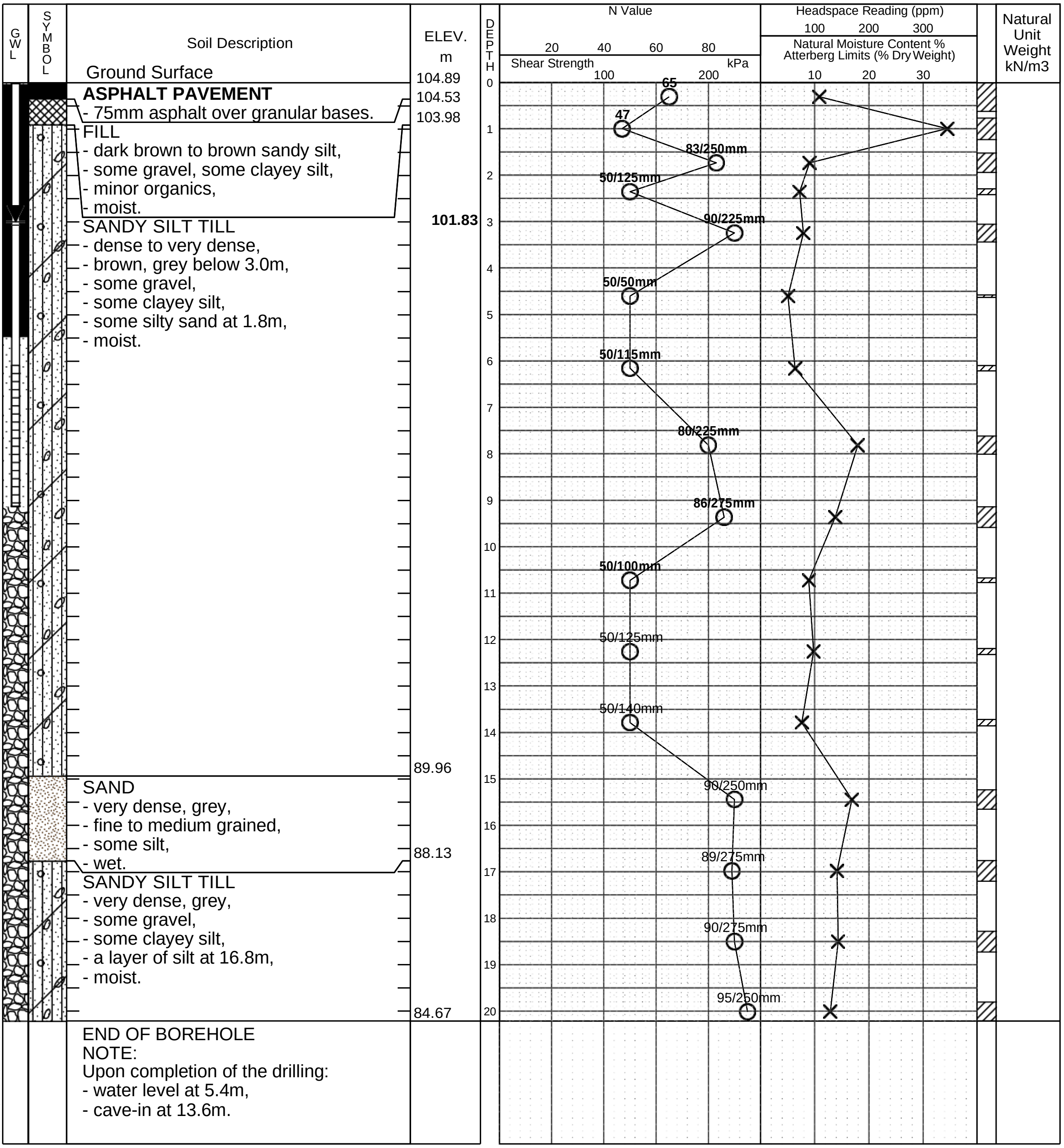
Date Drilled: 2/8/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) ●
Natural Moisture ✕
Plastic and Liquid Limit ├─┤
Unconfined Compression % Strain at Failure ⊗
Penetrometer ▲



| Soil Description | ELEV. m |
|---|---|
| Ground Surface | 104.89 |
| **ASPHALT PAVEMENT**<br>- 75mm asphalt over granular bases. | 104.53 |
| FILL<br>- dark brown to brown sandy silt,<br>- some gravel, some clayey silt,<br>- minor organics,<br>- moist. | 103.98 |
| SANDY SILT TILL<br>- dense to very dense,<br>- brown, grey below 3.0m,<br>- some gravel,<br>- some clayey silt,<br>- some silty sand at 1.8m,<br>- moist. | **101.83** |
| SAND<br>- very dense, grey,<br>- fine to medium grained,<br>- some silt,<br>- wet. | 89.96 |
| SANDY SILT TILL<br>- very dense, grey,<br>- some gravel,<br>- some clayey silt,<br>- a layer of silt at 16.8m,<br>- moist. | 88.13 |
| | 84.67 |

END OF BOREHOLE
NOTE:
Upon completion of the drilling:
- water level at 5.4m,
- cave-in at 13.6m.

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 7, 2019 | 2.98m | |
| March 11, 2019 | 3.05m | |
| March 26, 2019 | 3.06m | |

Project No. 4986-19-GC

# Log of Borehole BH-10

Dwg No. 11

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

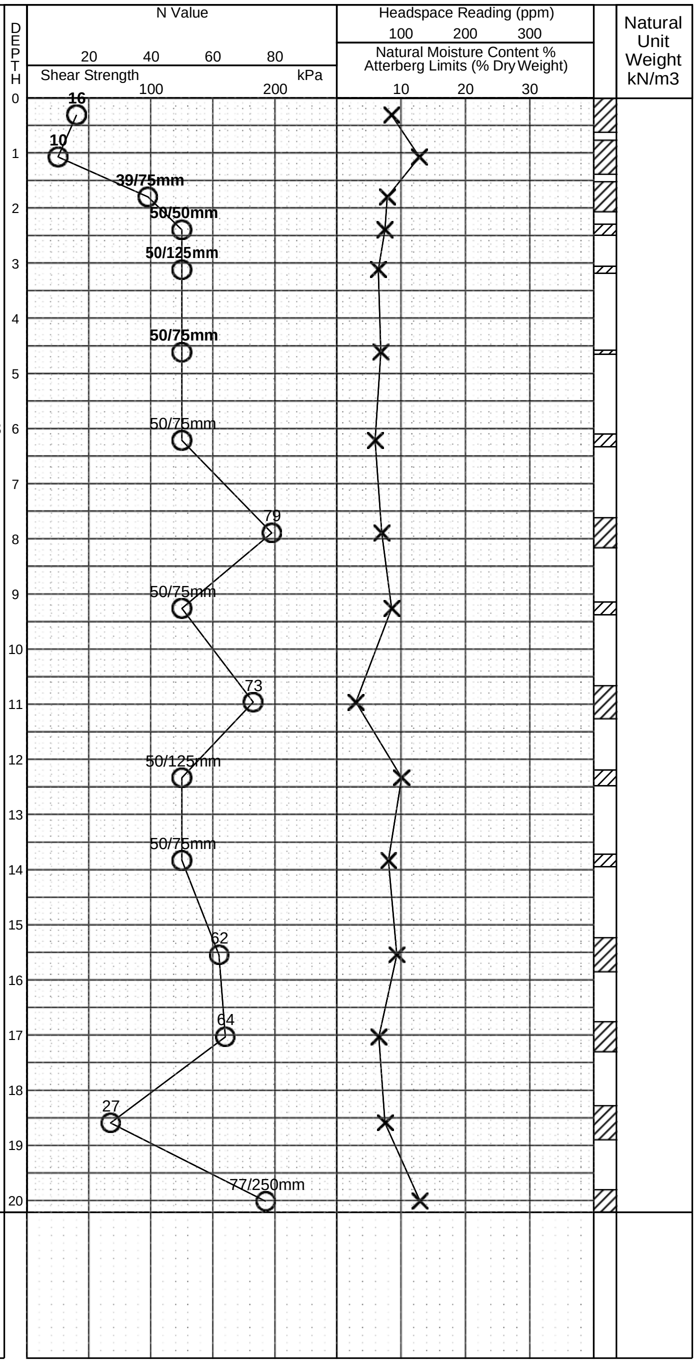
Date Drilled: 3/19/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ☒ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | × |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├─┤ |
| Shelby Tube | ■ | Unconfined Compression % Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |

| GWL | ELEV. m | Soil Description |
|---|---|---|
| | 104.78 | Ground Surface |
| | 104.32 | **ASPHALT PAVEMENT**<br>- 175mm asphalt over granular bases. |
| | 103.10 | FILL<br>- brown sandy silt,<br>- some gravel, some clayey silt,<br>- pockets of organics,<br>- moist to very moist. |
| ▼ (98.68) | **98.68** | SANDY SILT TILL<br>- dense to very dense,<br>- brown, grey below 3.0m,<br>- some gravel, some to trace clayey silt,<br>- some silty sand below 3.0m,<br>- moist to very moist. |
| | 97.46 | SAND AND GRAVEL<br>- very dense, compact at 13.3m,<br>- river sand, river gravel,<br>- medium to coarsed grained sand,<br>- some fine to medium grained sand,<br>- occasional silty sand,<br>- silty sand to sandy silt below 18.3m,<br>- wet. |
| | 84.56 | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 6.1m,<br>- cave-in at 12.2m. |



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| | | |

Project No. 4986-19-GC

# Log of Borehole BH-11

Dwg No. 12

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

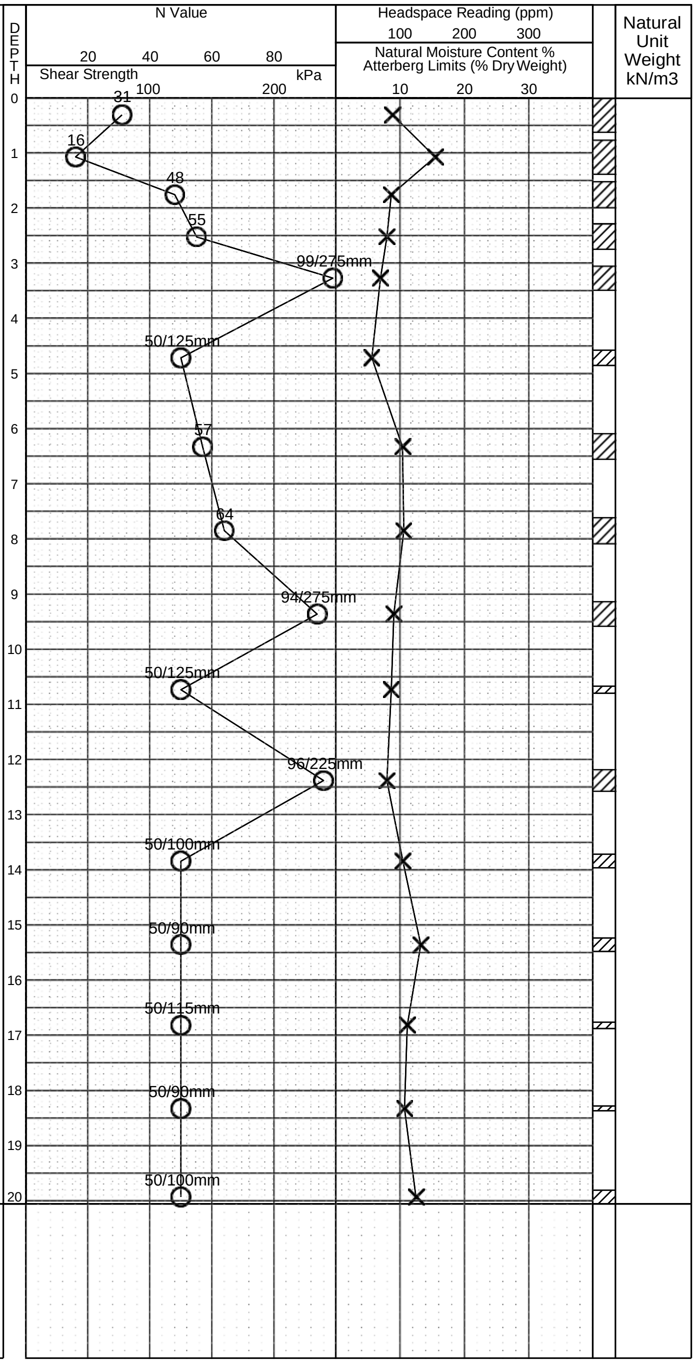
Date Drilled: 2/14/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ☒ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | × |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├─┤ |
| Shelby Tube | ■ | Unconfined Compression<br>% Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |

| GWL | Soil Description | ELEV. m |
|---|---|---|
| | Ground Surface | 104.91 |
| | **ASPHALT PAVEMENT**<br>- 100mm asphalt over granular bases. | **104.48** |
| | FILL<br>- dark brown to brown sandy silt,<br>- some organics,<br>- trace gravel, trace clayey silt,<br>- moist. | 103.84 |
| ▼ | SANDY SILT TILL<br>- compact to very dense,<br>- brown, grey below 2.3m,<br>- some gravel,<br>- some clayey silt,<br>- moist. | 100.81<br>99.12 |
| | SAND<br>- very dense, grey,<br>- medium grained,<br>- some gravel,<br>- very moist to wet. | 94.55 |
| | SANDY SILT TILL<br>- very dense, grey,<br>- some gravel,<br>- some clayey silt,<br>- moist. | 91.50 |
| | SAND<br>- very dense, grey,<br>- fine to coarse grained,<br>- some silt,<br>- some gravel,<br>- river sand with gravel at 16.8m,<br>- very moist to wet. | 86.93 |
| | SANDY SILT TILL<br>- very dense, gery,<br>- some gravel, some clayey silt,<br>- some silty sand at 18.3m,<br>- very wet to moist. | 84.84 |
| | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 4.1m,<br>- cave-in at 7.0m. | |



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| | | |

Project No. 4986-19-GC

# Log of Borehole BH-12

Dwg No. 13

Project: Geotechnical investigation

Sheet No. 1 of 1

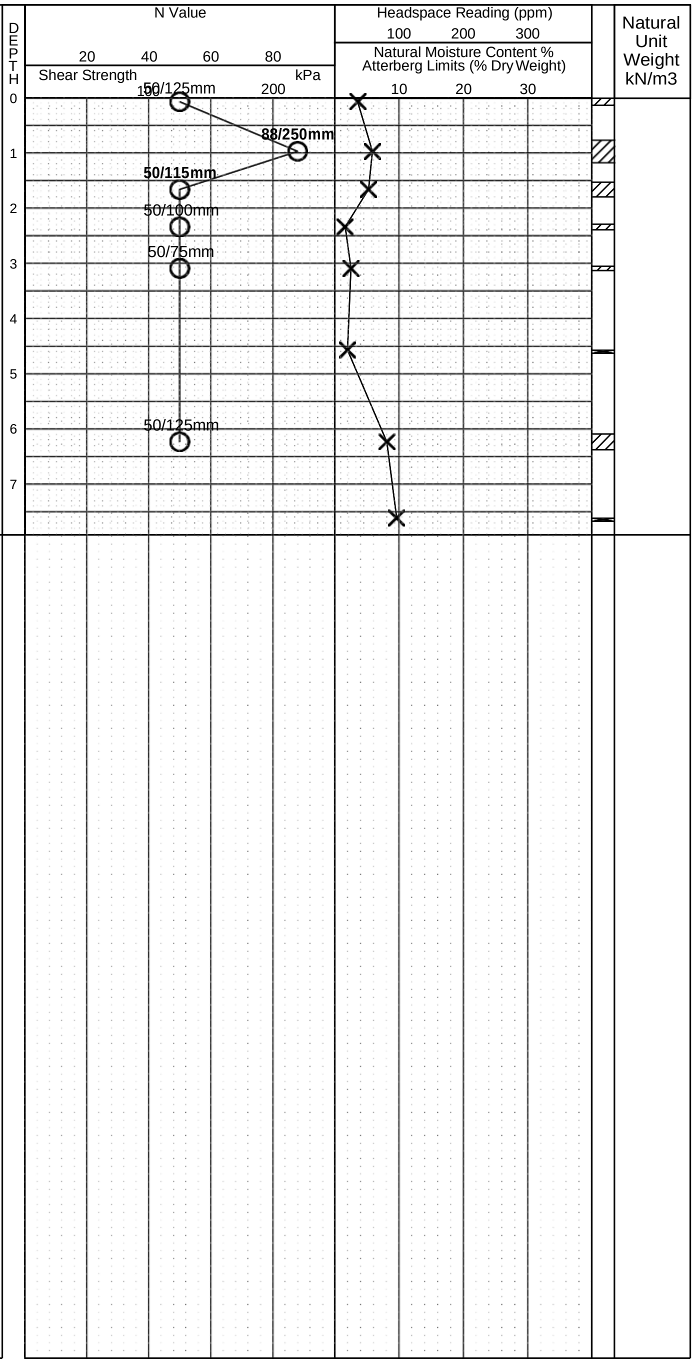
Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/20/19
Drill Type: Truck Mount Drill Rig
Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S
Headspace Reading (ppm) ●
Natural Moisture ×
Plastic and Liquid Limit ├─┤
Unconfined Compression ⊗
% Strain at Failure
Penetrometer ▲

| GWL | Soil Description | ELEV. m |
|---|---|---|
| | Ground Surface | 105.01 |
| | **ASPHALT PAVEMENT** | 104.63 |
| | - 75mm asphalt over granular bases. | 104.40 |
| | FILL<br>- brown sandy silt,<br>- some gravel, some silty sand,<br>- moist. | |
| ▼ | SANDY SILT TILL<br>- very dense,<br>- brown, grey below 6.0m,<br>- layers of silty sand,<br>- some gravel,<br>- moist. | **100.71** |
| | | 99.22 |
| | SAND<br>- very dense, grey,<br>- medium to coarse grained,<br>- some gravel,<br>- wet. | 97.69 |
| | | 97.08 |
| | SANDY SILT TILL<br>(Auger sample)<br>- grey, some gravel,<br>- some silty sand, trace clayey silt,<br>- very moist. | |

END OF BOREHOLE
NOTE:
Upon completion of the drilling:
- water level at 4.3m,
- cave-in at 5.2m.



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| | | |

Project No. 4986-19-GC

# Log of Borehole MW-12

Dwg No. 19

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 3/20/19

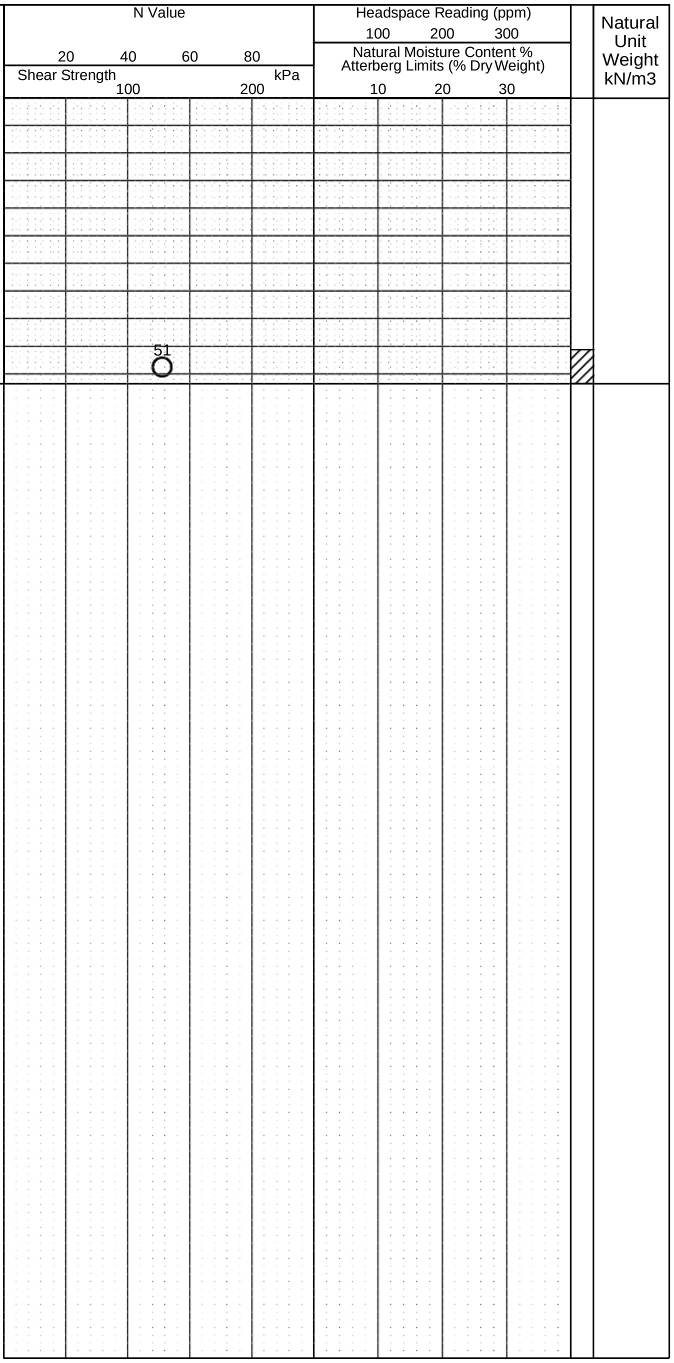
Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) ●
Natural Moisture ×
Plastic and Liquid Limit ├─┤
Unconfined Compression % Strain at Failure ⊗
Penetrometer ▲

| GWL | SYMBOL | Soil Description | ELEV. m | DEPTH |
|---|---|---|---|---|
| | | Ground Surface | 105.01 | 0 |
| | | **NO SAMPLING** | 101.01 | 4 |
| ▼ | | | 100.44 | |
| | | SAND<br>- very dense, grey,<br>- medium to coarse grained,<br>- some gravel,<br>- wet. | 99.83 | 5 |
| | | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- water level at 4.0m. | | |



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 25, 2019 | 4.16m | |
| March 26, 2019 | 4.15m | |

Project No. 4986-19-GC

# Log of Borehole BH-13

Dwg No. 14

Project: Geotechnical investigation

Sheet No. 1 of 1

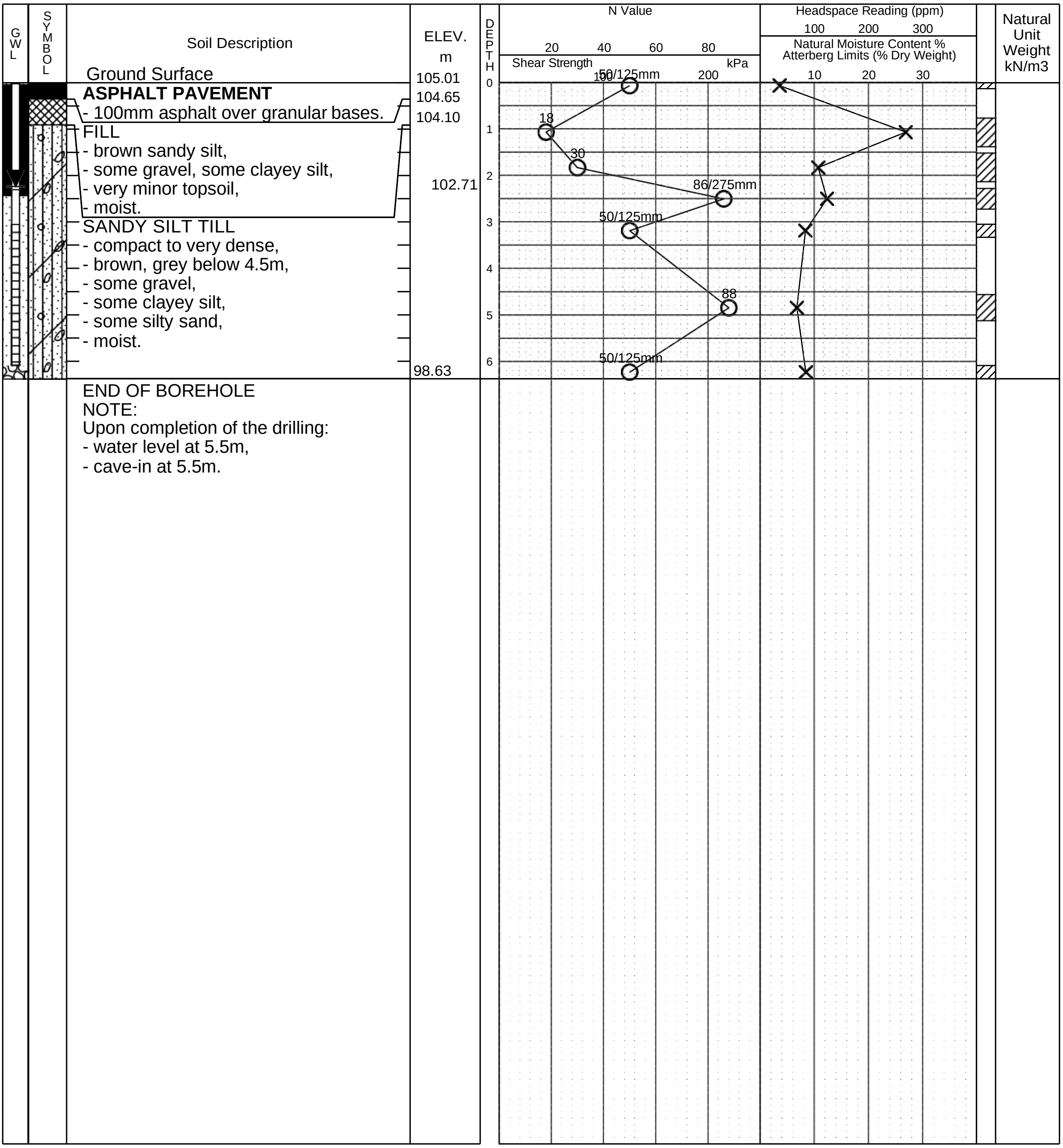
Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/4/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ☒ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | × |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├──┤ |
| Shelby Tube | ■ | Unconfined Compression<br>% Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |



| Soil Description | ELEV. m |
|---|---|
| Ground Surface | 105.01 |
| **ASPHALT PAVEMENT**<br>- 100mm asphalt over granular bases. | 104.65 |
| FILL<br>- brown sandy silt,<br>- some gravel, some clayey silt,<br>- very minor topsoil,<br>- moist. | 104.10 |
| SANDY SILT TILL<br>- compact to very dense,<br>- brown, grey below 4.5m,<br>- some gravel,<br>- some clayey silt,<br>- some silty sand,<br>- moist. | 102.71 |
| | 98.63 |

END OF BOREHOLE
NOTE:
Upon completion of the drilling:
- water level at 5.5m,
- cave-in at 5.5m.

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 7, 2019 | 2.58m | |
| March 11, 2019 | 2.53m | |
| March 26, 2019 | 2.30m | |

Project No. 4986-19-GC

# Log of Borehole BH-14

Dwg No. 15

Project: Geotechnical investigation

Sheet No. 1 of 1

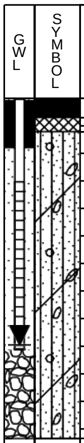
Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/19/19

Drill Type: Truck Mount Drill Rig

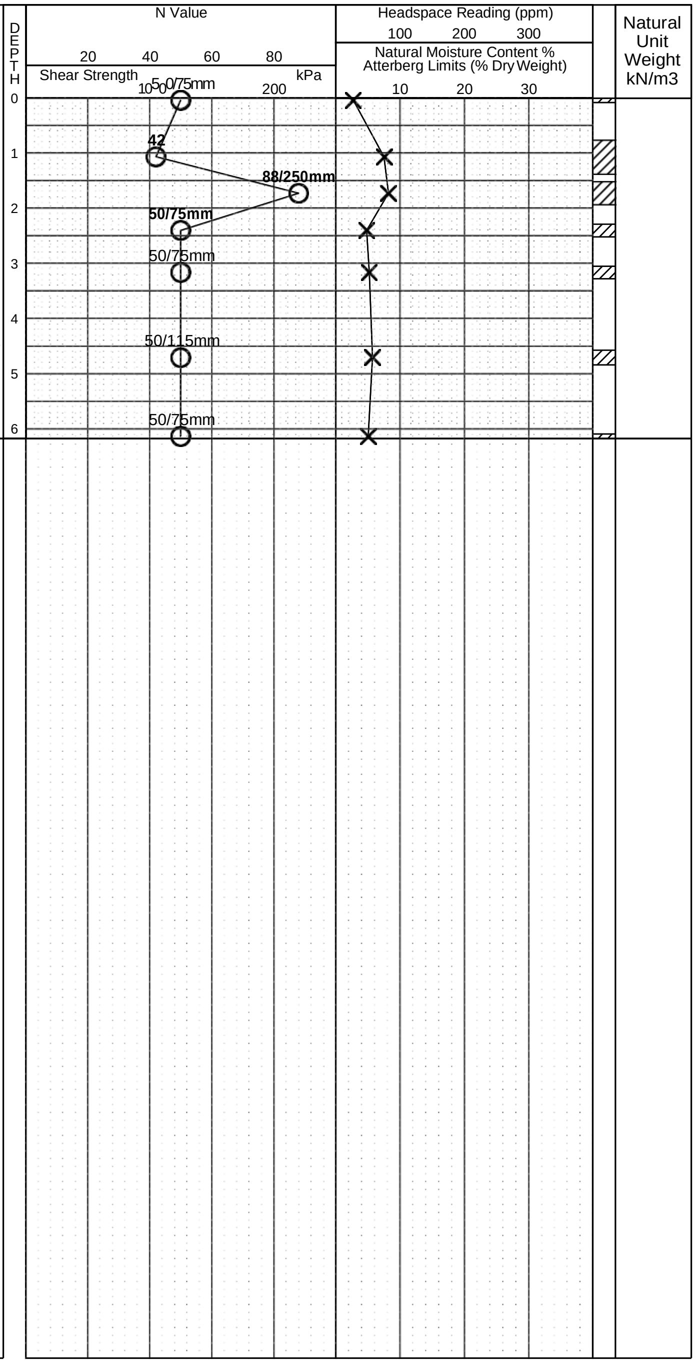
Datum: Geodetic

| | |
|---|---|
| Auger Sample | ☒ |
| SPT (N) Value | ○ ▨ |
| Dynamic Cone Test | — |
| Shelby Tube | ■ |
| Field Vane Test | ✚ S |
| Headspace Reading (ppm) | ● |
| Natural Moisture | × |
| Plastic and Liquid Limit | ├─┤ |
| Unconfined Compression<br>% Strain at Failure | ⊗ |
| Penetrometer | ▲ |



| Soil Description | ELEV. m |
|---|---|
| Ground Surface | 105.32 |
| ASPHALT PAVEMENT<br>- 75mm asphalt over granular bases. | **104.96** |
| FILL<br>- brown sandy silt to clayey silt,<br>- some gravel,<br>- moist. | 104.71 |
| SANDY SILT TILL<br>- dense to very dense,<br>- brown, grey below 2.3m,<br>- some gravel,<br>- some clayey silt,<br>- moist. | **100.78** |
| | 99.15 |

END OF BOREHOLE
NOTE:
Upon completion of the drilling:
- no free water.



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 7, 2019 | 4.31m | |
| March 11, 2019 | 4.59m | |
| March 26, 2019 | 4.54m | |

Project No. 4986-19-GC

# Log of Borehole MW-15

Dwg No. 20

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

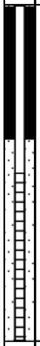
Date Drilled: 3/20/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | |
|---|---|
| Auger Sample | ☒ |
| SPT (N) Value | ○ ▨ |
| Dynamic Cone Test | — |
| Shelby Tube | ■ |
| Field Vane Test | ✚ S |
| Headspace Reading (ppm) | ● |
| Natural Moisture | × |
| Plastic and Liquid Limit | ├─┤ |
| Unconfined Compression<br>% Strain at Failure | ⊗ |
| Penetrometer | ▲ |

| GWL | SYMBOL | Soil Description | ELEV. m | DEPTH | N Value 20 40 60 80<br>Shear Strength kPa 100 200 | Headspace Reading (ppm) 100 200 300<br>Natural Moisture Content %<br>Atterberg Limits (% Dry Weight) 10 20 30 | | Natural Unit Weight kN/m3 |
|---|---|---|---|---|---|---|---|---|
| | | Ground Surface | 105.42 | 0 | | | | |
| | | **NO SAMPLING** | | | | | | |
| | | | | 1 | | | | |
| | | | | 2 | | | | |
| | | | | 3 | | | | |
| | | | | 4 | | | | |
| | | | | 5 | | | | |
| | | | 99.33 | 6 | | | | |
| | | END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- cave-in at 5.8m. | | | | | | |



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 25, 2019 | Dry | |
| March 26, 2019 | Dry | |

Project No. 4986-19-GC

# Log of Borehole BH-15

Dwg No. 16

Project: Geotechnical investigation

Sheet No. 1 of 1

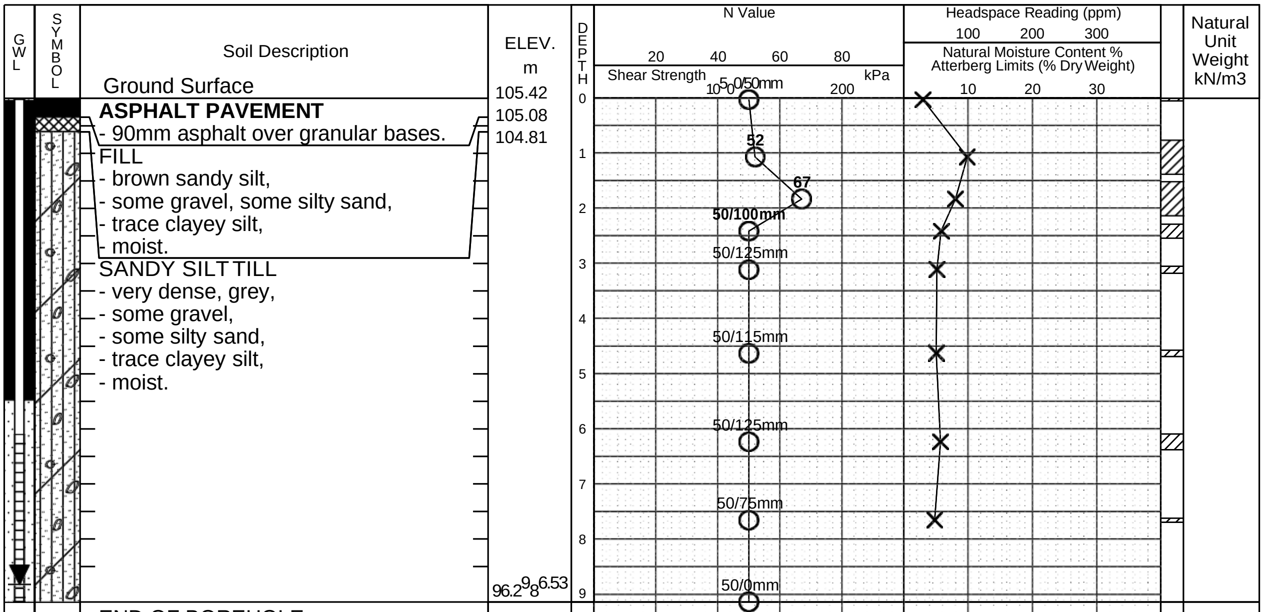
Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/20/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | | | |
|---|---|---|---|
| Auger Sample | ☒ | Headspace Reading (ppm) | ● |
| SPT (N) Value | ○ ▨ | Natural Moisture | × |
| Dynamic Cone Test | — | Plastic and Liquid Limit | ├─┤ |
| Shelby Tube | ■ | Unconfined Compression<br>% Strain at Failure | ⊗ |
| Field Vane Test | ✚ S | Penetrometer | ▲ |



Ground Surface 105.42

**ASPHALT PAVEMENT** 105.08
- 90mm asphalt over granular bases. 104.81

FILL
- brown sandy silt,
- some gravel, some silty sand,
- trace clayey silt,
- moist.

SANDY SILT TILL
- very dense, grey,
- some gravel,
- some silty sand,
- trace clayey silt,
- moist.

96.29 96.53

END OF BOREHOLE
NOTE:
Upon completion of the drilling:
- no free water.

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 7, 2019 | Dry | |
| March 11, 2019 | Dry | |
| March 25, 2019 | 8.48m | |
| March 26, 2019 | 8.89m | |

Project No. 4986-19-GC

# Log of Borehole BH-16

Dwg No. 17

Project: Geotechnical investigation

Sheet No. 1 of 1

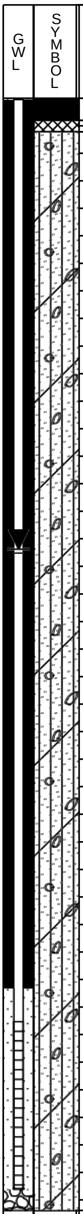
Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 3/21/19

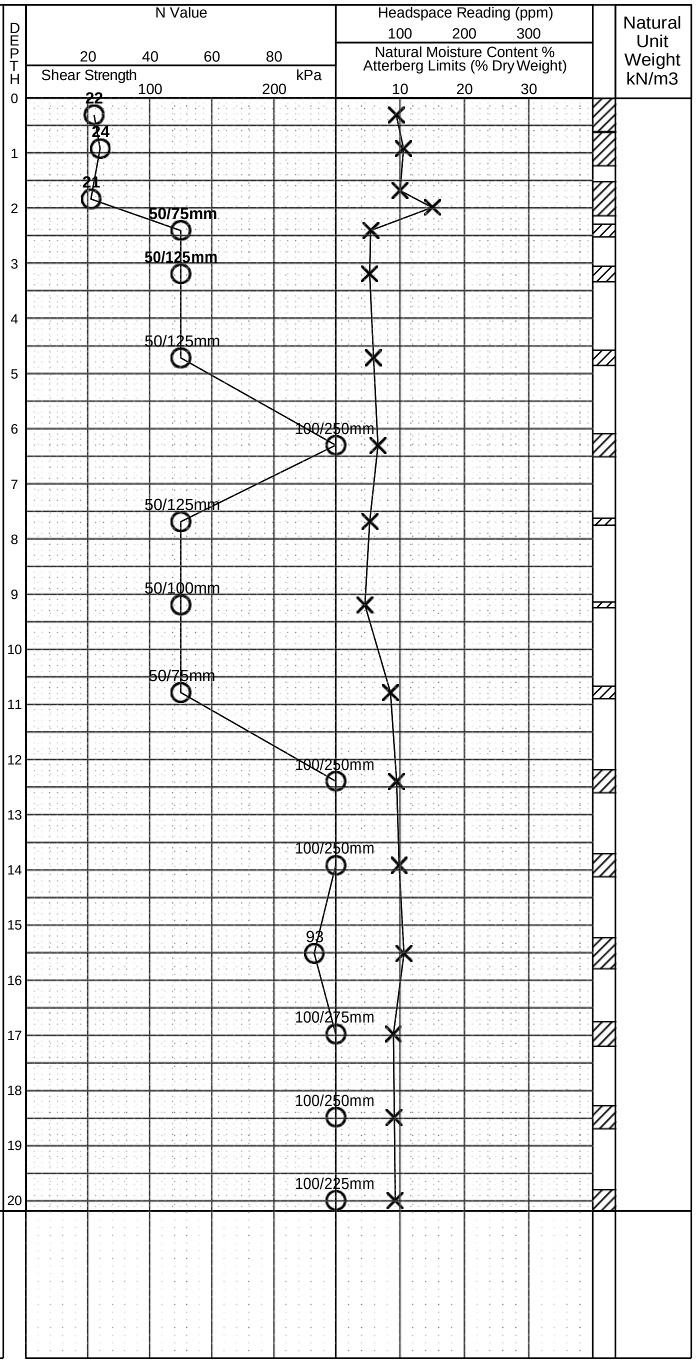
Drill Type: Truck Mount Drill Rig

Datum: Geodetic

| | |
|---|---|
| Auger Sample | ☒ |
| SPT (N) Value | ○ ▨ |
| Dynamic Cone Test | — |
| Shelby Tube | ■ |
| Field Vane Test | ✚ S |
| Headspace Reading (ppm) | ● |
| Natural Moisture | × |
| Plastic and Liquid Limit | ├─┤ |
| Unconfined Compression % Strain at Failure | ⊗ |
| Penetrometer | ▲ |



| Soil Description | ELEV. m |
|---|---|
| Ground Surface | 105.00 |
| **ASPHALT PAVEMENT** | 104.60 |
| - 100mm asphalt over granular bases. | 104.39 |
| FILL<br>- brown silty sand,<br>- some gravel,<br>- moist. | |
| SANDY SILT TILL<br>- compact to very dense,<br>- brown, grey below 1.8m,<br>- some gravel,<br>- some clayey silt,<br>- seam of fine sand,<br>- some silty sand at 6.0m & 7.5m,<br>- some clayey silt layers below 12.2m,<br>- moist, very moist pockets. | |
| | **96.75** |
| | 84.81 |
| END OF BOREHOLE<br>NOTE:<br>Upon completion of the drilling:<br>- no free water. | |



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

## Toronto Inspection Ltd.

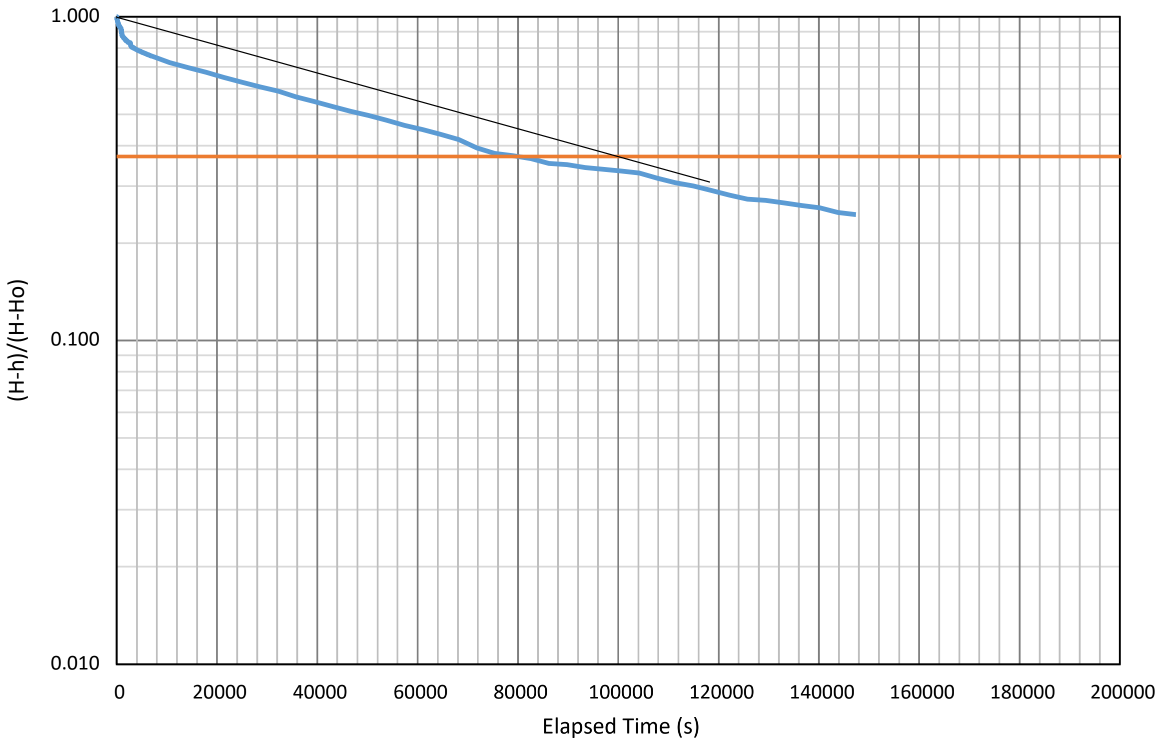
| Time | Water Level (m) | Depth to Cave (m) |
|---|---|---|
| March 25, 2019 | 6.95m | |
| March 26, 2019 | 8.25m | |

# APPENDIX C

Hydraulic Conductivity Analysis

## In-Situ Hydraulic Conductivity Analyses: BH-1

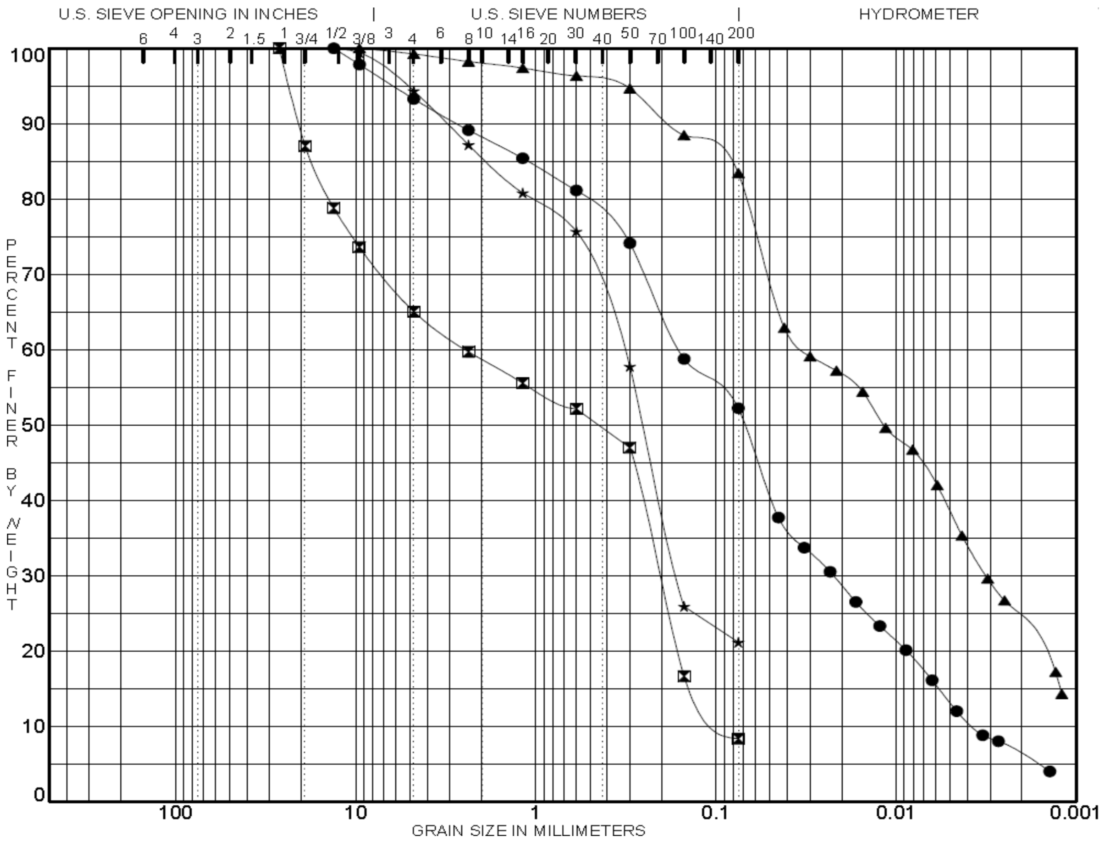
| | |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | BH-1 |
| Test Date: | March 12, 2019 |
| Test Conducted By: | WG |



| | | | |
|---|---|---|---|
| **Well Depth (mbgs):** | 9.2 | **Screened Unit:** | Sandy Silt Till |
| **Initial Water Level (mbgs):** | 7.13 | **Screen Length ($L_e$):** | 3.048 |
| **Available Drawdown (H):** | 2.07 | **Head at Time = 0 ($H_o$):** | 1.70 |
| **Borehole Radius ($R_b$):** | 0.0508 | **Monitoring Well Radius ($R_c$):** | 0.026 |
| **Solution Method:** | Hvorslev (1951) ▼ | **Recovery (%):** | 87% |
| **Early K (m/s)** | NA | **Early To (s):** | NA |
| **Mid K (m/s)** | 5.5E-08 | **Mid To (s):** | 8000 |
| **Late K (m/s)** | NA | **Late To (s):** | NA |

**Hydraulic Conductivity Grainsize Analyses: BH-1** **Appendix C**

| | |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | BH-1 |
| Test Date: | March 27, 2019 |
| Test Conducted By: | TIL |

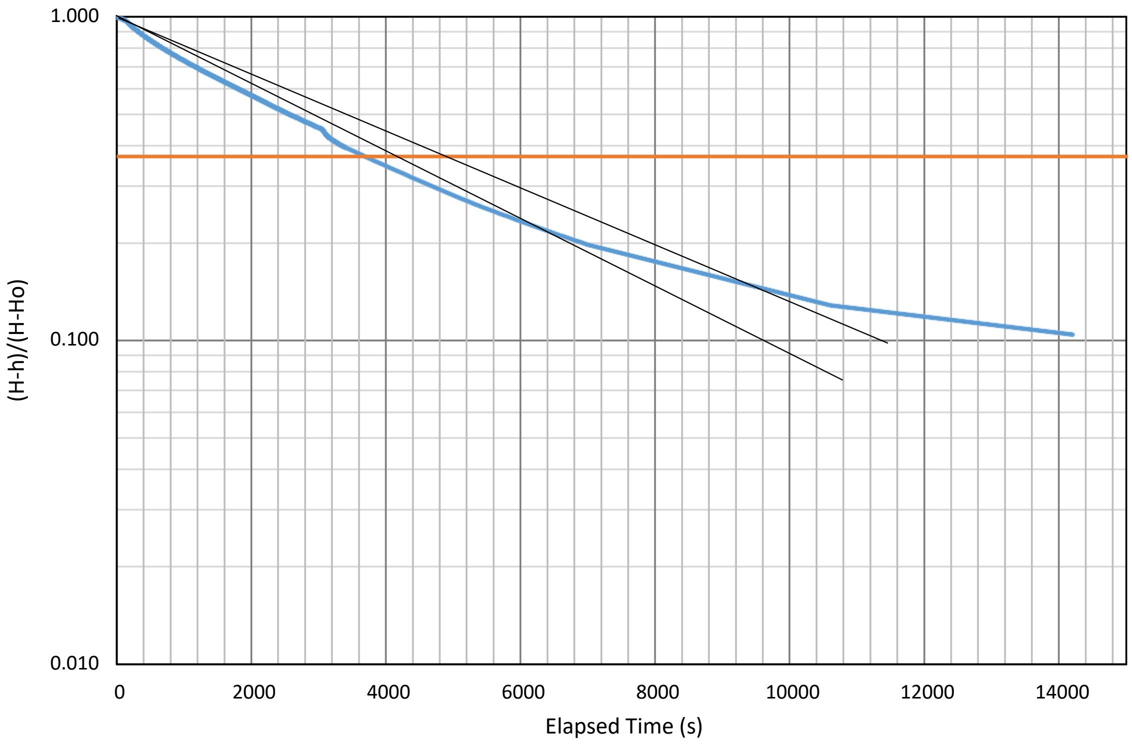


Legend: ● BH-1

| | | | |
|---|---|---|---|
| **Sampled Unit:** | Sandy Silt Till | **Sampled Depth (mbgs):** | 9.1 |
| **% Gravel** | 6.7 | **D100:** | 13.200 |
| **% Sand** | 41.0 | **D60** | 0.1600 |
| **% Silt** | 39.1 | **D30:** | 0.0220 |
| **% Clay** | 13.1 | **D10:** | 0.0037 |
| **K (m/s)** | 1.4E-07 | **Temperature (°C):** | 7 |

**In-Situ Hydraulic Conductivity Analyses: BH-5** **Appendix C**

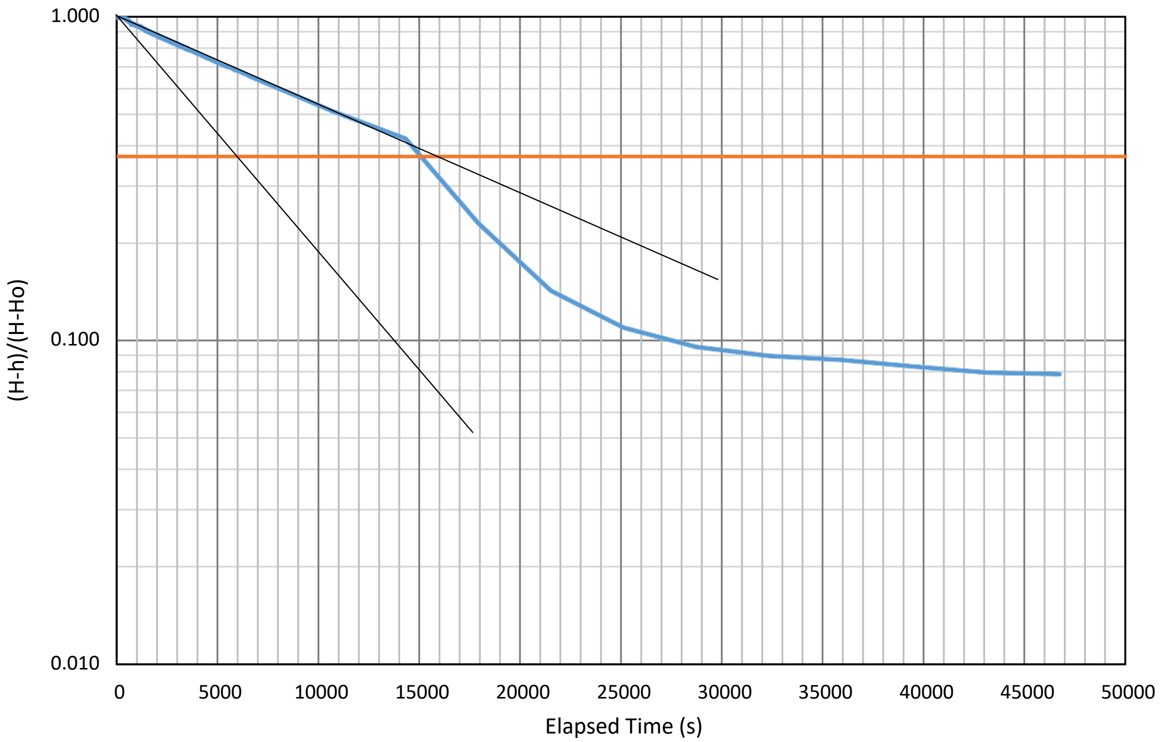
| | |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | BH-5 |
| Test Date: | March 8, 2019 |
| Test Conducted By: | WG |



| | | | |
|---|---|---|---|
| **Well Depth:** | 9.20 | **Screened Unit:** | Sandy Silt Till |
| **Initial Water Level:** | 3.97 | **Screen Length ($L_e$):** | 3.048 |
| **Available Drawdown (H):** | 5.23 | **Head at Time = 0 ($H_o$):** | 5.61 |
| **Borehole Radius ($R_b$):** | 0.0508 | **Monitoring Well Radius ($R_c$):** | 0.026 |
| **Solution Method:** | Hvorslev (1951) ▼ | **Recovery (%):** | 93% |
| **Early K (m/s)** | 1.0E-07 | **Early To (s):** | 4200 |
| **Mid K (m/s)** | 8.7E-08 | **Mid To (s):** | 5000 |
| **Late K (m/s)** | NA | **Late To (s):** | NA |

**In-Situ Hydraulic Conductivity Analyses: MW-6** **Appendix C**

|  |  |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | MW-6 |
| Test Date: | March 8, 2019 |
| Test Conducted By: | WG |

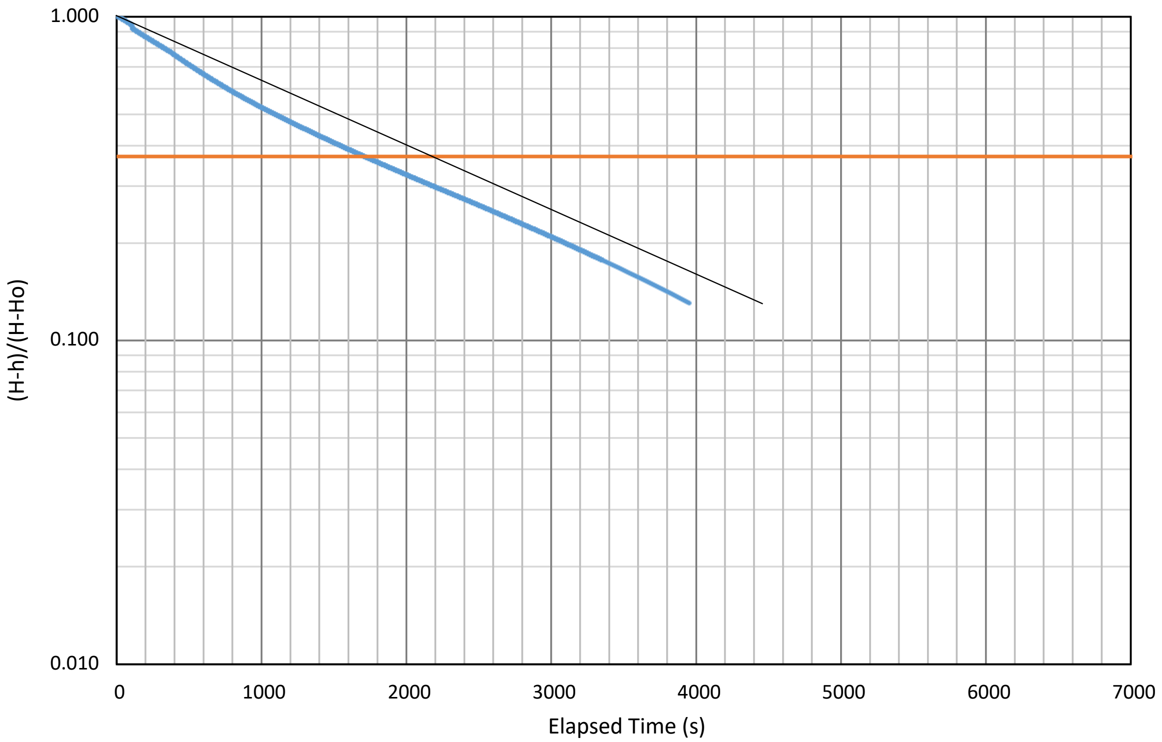


|  |  |  |  |
|---|---|---|---|
| **Well Depth:** | 4.60 | **Screened Unit:** | Sandy Silt Till |
| **Initial Water Level:** | 2.07 | **Screen Length ($L_e$):** | 3.048 |
| **Available Drawdown (H):** | 2.53 | **Head at Time = 0 ($H_o$):** | 1.95 |
| **Borehole Radius ($R_b$):** | 0.0508 | **Monitoring Well Radius ($R_c$):** | 0.026 |
| **Solution Method:** | Hvorslev (1951) ▼ | **Recovery (%):** | 100% |
| **Early K (m/s)** | 2.7E-08 | **Early To (s):** | 16000 |
| **Mid K (m/s)** | 7.3E-08 | **Mid To (s):** | 6000 |
| **Late K (m/s)** | NA | **Late To (s):** | NA |

## In-Situ Hydraulic Conductivity Analyses: BH-7

**Appendix C**

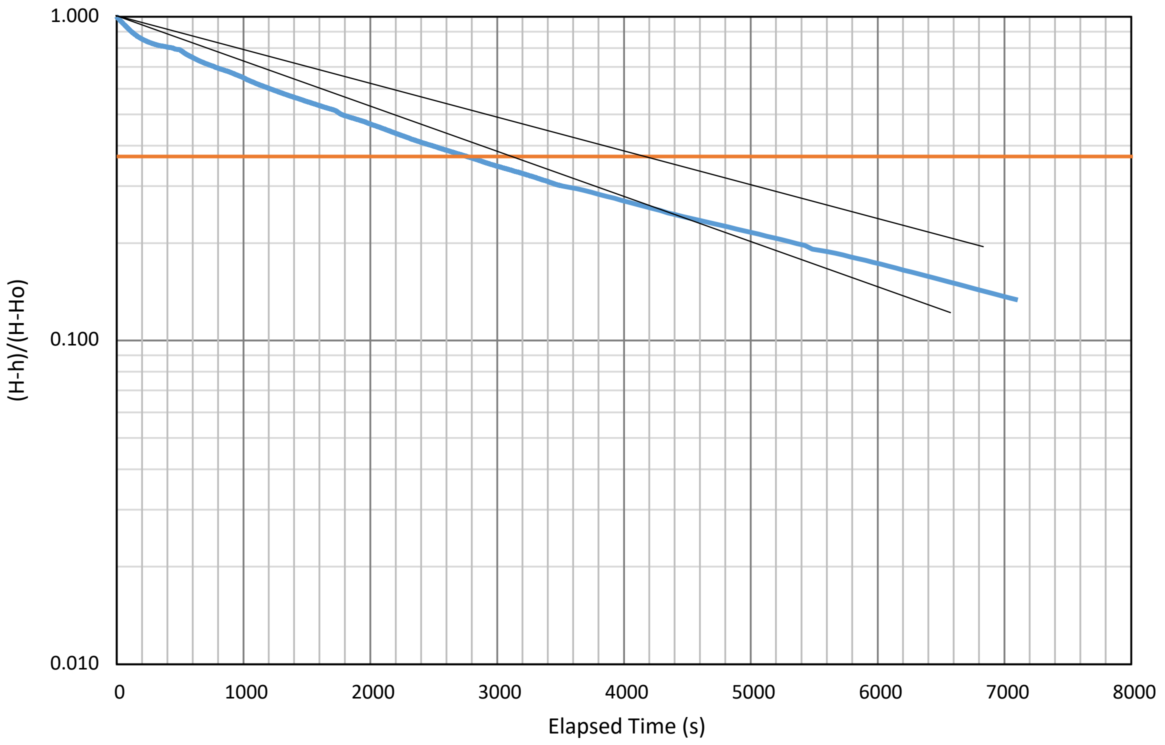
| | |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | BH-7 |
| Test Date: | March 8, 2019 |
| Test Conducted By: | WG |



| | | | |
|---|---|---|---|
| **Well Depth:** | 19.80 | **Screened Unit:** | Sandy Silt Till |
| **Initial Water Level:** | 4.00 | **Screen Length ($L_e$):** | 3.048 |
| **Available Drawdown (H):** | 15.80 | **Head at Time = 0 ($H_o$):** | 15.69 |
| **Borehole Radius ($R_b$):** | 0.0795 | **Monitoring Well Radius ($R_c$):** | 0.026 |
| **Solution Method:** | Hvorslev (1951) ▼ | **Recovery (%):** | 100% |
| **Early K (m/s)** | NA | **Early To (s):** | NA |
| **Mid K (m/s)** | 1.8E-07 | **Mid To (s):** | 2200 |
| **Late K (m/s)** | NA | **Late To (s):** | NA |

**In-Situ Hydraulic Conductivity Analyses:** **BH-9** **Appendix C**

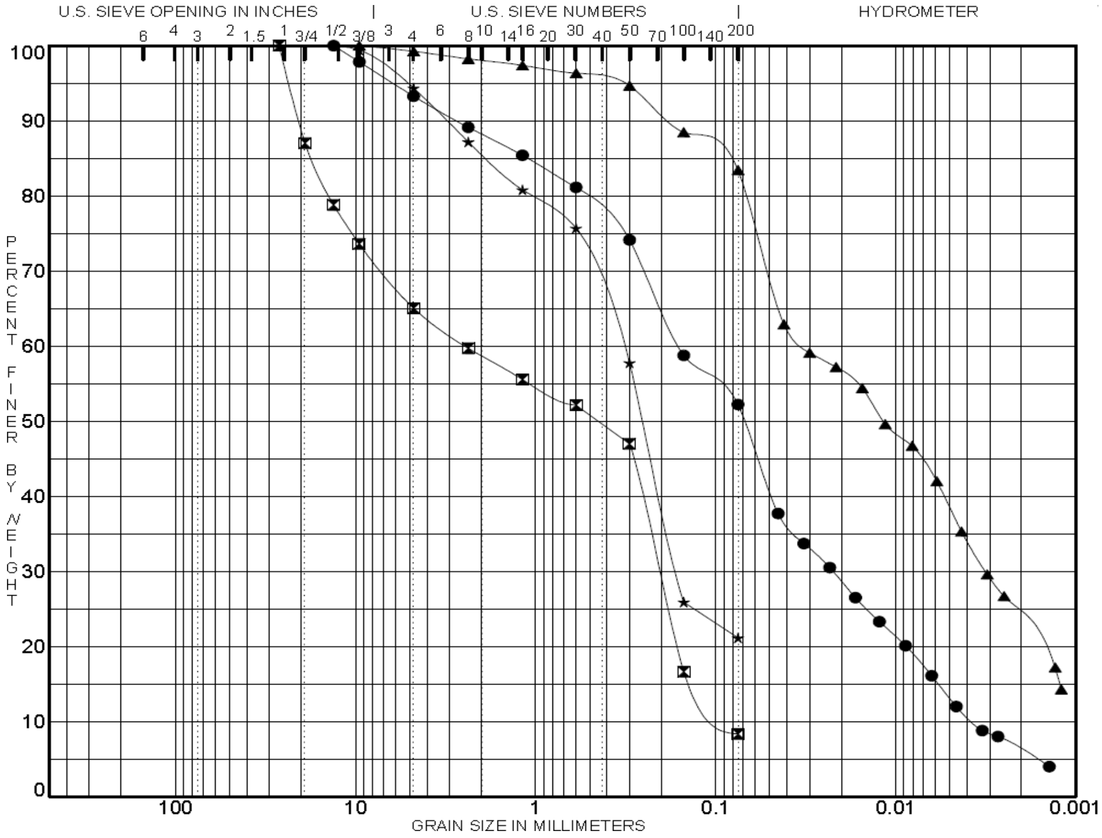
| | |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | BH-9 |
| Test Date: | March 8, 2019 |
| Test Conducted By: | WG |



| | | | |
|---|---|---|---|
| **Well Depth:** | 9.20 | **Screened Unit:** | Sandy Silt Till |
| **Initial Water Level:** | 3.05 | **Screen Length ($L_e$):** | 3.048 |
| **Available Drawdown (H):** | 6.15 | **Head at Time = 0 ($H_o$):** | 4.56 |
| **Borehole Radius ($R_b$):** | 0.0508 | **Monitoring Well Radius ($R_c$):** | 0.026 |
| **Solution Method:** | Hvorslev (1951) ▼ | **Recovery (%):** | 100% |
| **Early K (m/s)** | NA | **Early To (s):** | NA |
| **Mid K (m/s)** | 1.4E-07 | **Mid To (s):** | 3200 |
| **Late K (m/s)** | 1.0E-07 | **Late To (s):** | 4200 |

**In-Situ Hydraulic Conductivity Analyses: BH-10** **Appendix C**

| | |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | BH-10 |
| Test Date: | March 27, 2019 |
| Test Conducted By: | TIL |

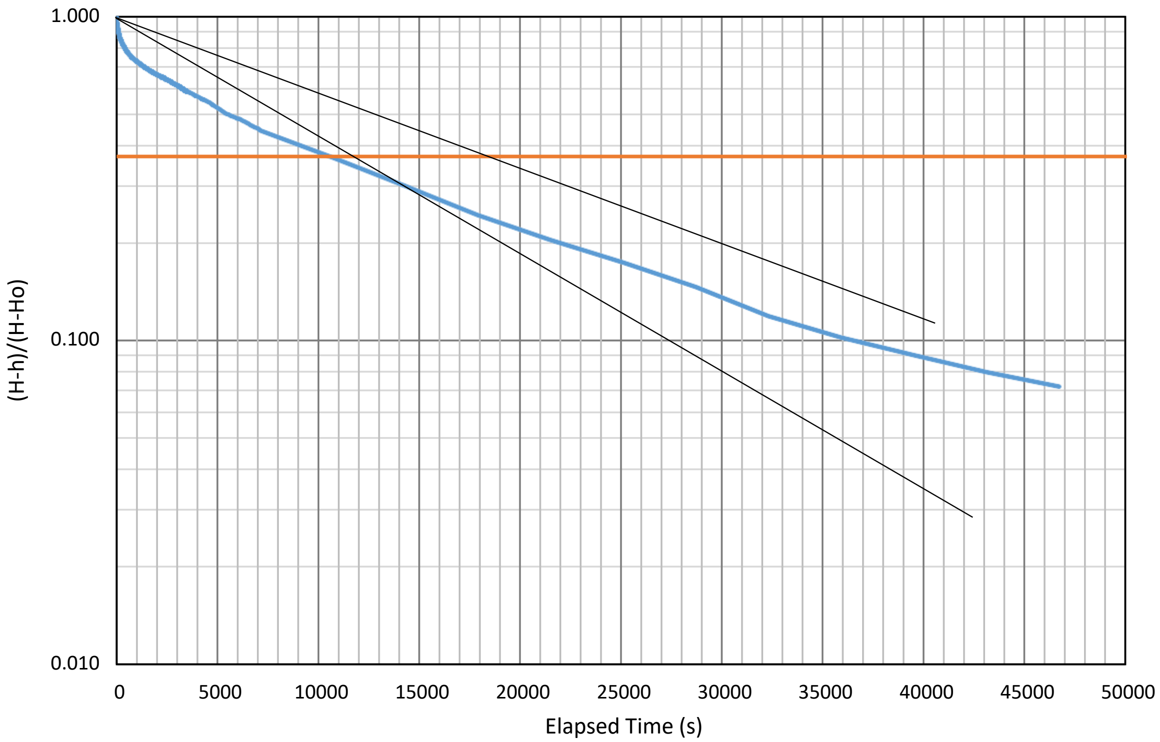


Legend: ☒ BH-10

| | | | |
|---|---|---|---|
| **Sampled Unit:** | Sand and Gravel | **Sampled Depth (mbgs):** | 7.9 |
| **% Gravel** | 35.0 | **D100:** | 26.5000 |
| **% Sand** | 56.7 | **D60** | 2.4500 |
| **% Silt** | 8.4 | **D30:** | 0.2040 |
| **% Clay** | | **D10:** | 0.086 |
| **K (m/s)** | 7.7E-05 | **Temperature (°C):** | 7 |

**In-Situ Hydraulic Conductivity Analyses: BH-13** **Appendix C**

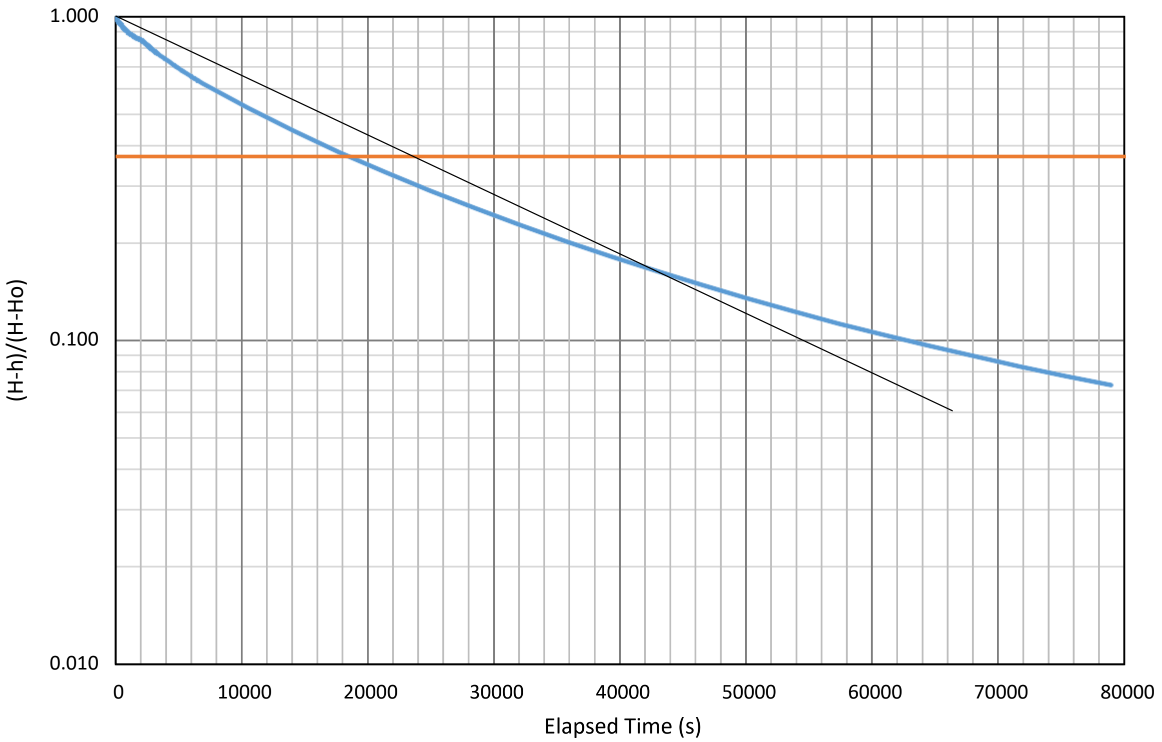
| | |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | BH-13 |
| Test Date: | March 8, 2019 |
| Test Conducted By: | WG |



| | | | |
|---|---|---|---|
| **Well Depth:** | 6.10 | **Screened Unit:** | Sandy Silt Till |
| **Initial Water Level:** | 2.53 | **Screen Length ($L_e$):** | 3.048 |
| **Available Drawdown (H):** | 3.57 | **Head at Time = 0 ($H_o$):** | 3.16 |
| **Borehole Radius ($R_b$):** | 0.0508 | **Monitoring Well Radius ($R_c$):** | 0.026 |
| **Solution Method:** | Hvorslev (1951) ▼ | **Recovery (%):** | 100% |
| **Early K (m/s)** | 3.6E-08 | **Early To (s):** | 12000 |
| **Mid K (m/s)** | 2.3E-08 | **Mid To (s):** | 19000 |
| **Late K (m/s)** | NA | **Late To (s):** | NA |

**In-Situ Hydraulic Conductivity Analyses: BH-16** **Appendix C**

| | |
|---|---|
| Company: | Toronto Inspection Ltd. |
| Client: | Director Industrial Holdings Limited |
| Project: | 4986-19-HD |
| Location: | 603-699 Kingston Rd., Pickering, ON |
| Test Well: | BH-16 |
| Test Date: | April 4, 2019 |
| Test Conducted By: | WG |



| | | | |
|---|---|---|---|
| **Well Depth:** | 19.80 | **Screened Unit:** | Sandy Silt Till |
| **Initial Water Level:** | 5.13 | **Screen Length ($L_e$):** | 3.048 |
| **Available Drawdown (H):** | 14.67 | **Head at Time = 0 ($H_o$):** | 13.70 |
| **Borehole Radius ($R_b$):** | 0.0762 | **Monitoring Well Radius ($R_c$):** | 0.026 |
| **Solution Method:** | Hvorslev (1951) ▼ | **Recovery (%):** | 93% |
| **Early K (m/s)** | NA | **Early To (s):** | NA |
| **Mid K (m/s)** | 1.6E-08 | **Mid To (s):** | 24000 |
| **Late K (m/s)** | NA | **Late To (s):** | NA |

# APPENDIX D

Laboratory Certificate of Analysis

# FINAL REPORT

## CA14255-MAR19 R1

## 4986

**Prepared for**

**Toronto Inspection Ltd.**

# FINAL REPORT

## First Page

### CLIENT DETAILS

| | |
|---|---|
| Client | Toronto Inspection Ltd. |
| Address | 110 Konrad Crescent, Unit 16<br>Markham, ON<br>L3R 9X2, Canada |
| Contact | Tabitha Lee |
| Telephone | 416-996-3214 |
| Facsimile | 905 940 8192 |
| Email | lab@torontoinspection.com; tabitha@torontoinspection.com |
| Project | 4986 |
| Order Number | |
| Samples | Ground Water (2) |

### LABORATORY DETAILS

| | |
|---|---|
| Project Specialist | Brad Moore Hon. B.Sc |
| Laboratory | SGS Canada Inc. |
| Address | 185 Concession St., Lakefield ON, K0L 2H0 |
| Telephone | 705-652-2000 |
| Facsimile | 705-652-6365 |
| Email | |
| SGS Reference | CA14255-MAR19 |
| Received | 03/11/2019 |
| Approved | 03/18/2019 |
| Report Number | CA14255-MAR19 R1 |
| Date Reported | 03/18/2019 |

### COMMENTS

RL - SGS Reporting Limit

Nonylphenol Ethoxylates is the sum of nonylphenol monoethoxylate and nonylphenol diethoxylate.

Total PAH is the sum of anthracene, benzo(a)pyrene, benzo(a)anthracene, benzo(e)pyrene, benzo(b,j)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzo(a,i)pyrene, dibenzo(a,j)acridine, 7H-dibenzo(c,g)carbazole, fluoranthene, indeno(1,2,3-c,d)pyrene, perylene, phenanthrene and pyrene..

Temperature of Sample upon Receipt: 5 degrees C
Cooling Agent Present:Yes
Custody Seal Present:No

Chain of Custody Number:007072

### SIGNATORIES

Brad Moore Hon. B.Sc

## TABLE OF CONTENTS

## PACKAGE: SANSEW - General Chemistry (WATER)

| | |
|---|---|
| **Sample Number** | 8 |
| **Sample Name** | 19MW-7 |
| **Sample Matrix** | Ground Water |
| **Sample Date** | 08/03/2019 |

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW/WATER/- - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

### General Chemistry

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| Biochemical Oxygen Demand (BOD5) | mg/L | 2 | 300 | 15 | < 4↑ |
| Total Suspended Solids | mg/L | 2 | 350 | 15 | 46 |
| Total Kjeldahl Nitrogen | as N mg/L | 0.5 | 100 | 1 | 0.6 |

## PACKAGE: SANSEW - Metals and Inorganics (WATER)

| | |
|---|---|
| **Sample Number** | 8 |
| **Sample Name** | 19MW-7 |
| **Sample Matrix** | Ground Water |
| **Sample Date** | 08/03/2019 |

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW/WATER/- - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

### Metals and Inorganics

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| Sulphate | mg/L | 2 | 1500 | | 15 |
| Cyanide (total) | mg/L | 0.01 | 2 | 0.02 | < 0.01 |
| Fluoride | mg/L | 0.06 | 10 | | 0.39 |
| Aluminum (total) | mg/L | 0.001 | 50 | | 0.335 |
| Antimony (total) | mg/L | 0.0009 | 5 | | < 0.0009 |
| Arsenic (total) | mg/L | 0.0002 | 1 | 0.02 | 0.0021 |
| Cadmium (total) | mg/L | 0.000003 | 0.7 | 0.008 | 0.000010 |
| Chromium (total) | mg/L | 0.00008 | 2 | 0.08 | 0.00209 |
| Cobalt (total) | mg/L | 0.000004 | 5 | | 0.000312 |
| Copper (total) | mg/L | 0.0002 | 3 | 0.05 | 0.0061 |
| Lead (total) | mg/L | 0.00001 | 1 | 0.12 | 0.00056 |

**PACKAGE: SANSEW - Metals and Inorganics (WATER)**

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW/WATER/--Durham Table 2 - Storm Sewer Discharge - BL_43_2004

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **Metals and Inorganics (continued)** | | | | | |
| Manganese (total) | mg/L | 0.00001 | 5 | 0.15 | 0.0391 |
| Molybdenum (total) | mg/L | 0.00004 | 5 | | 0.0261 |
| Nickel (total) | mg/L | 0.0001 | 2 | 0.08 | 0.0009 |
| Phosphorus (total) | mg/L | 0.003 | 10 | 0.4 | 0.055 |
| Selenium (total) | mg/L | 0.00004 | 1 | 0.02 | 0.00005 |
| Silver (total) | mg/L | 0.00005 | 5 | 0.12 | < 0.00005 |
| Tin (total) | mg/L | 0.00006 | 5 | | 0.00056 |
| Titanium (total) | mg/L | 0.00005 | 5 | | 0.0121 |
| Zinc (total) | mg/L | 0.002 | 2 | 0.04 | 0.003 |

## PACKAGE: SANSEW - Microbiology (WATER)

**Sample Number** 9

**Sample Name** 19MW-7 Bacti

**Sample Matrix** Ground Water

**Sample Date** 12/03/2019

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2=SANSEW/WATER/--Durham Table 2-Storm Sewer Discharge-BL_43_2004

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **Microbiology** | | | | | |
| E. Coli | cfu/100mL | - | | 200 | < 2↑ |

## PACKAGE: SANSEW - Nonylphenol and Ethoxylates (WATER)

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2=SANSEW/WATER/--Durham Table 2-Storm Sewer Discharge-BL_43_2004

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **Nonylphenol and Ethoxylates** | | | | | |
| Nonylphenol | mg/L | 0.001 | 0.02 | | < 0.001 |
| Nonylphenol Ethoxylates | mg/L | 0.01 | 0.2 | | < 0.01 |
| Nonylphenol diethoxylate | mg/L | 0.01 | | | < 0.01 |
| Nonylphenol monoethoxylate | mg/L | 0.01 | | | < 0.01 |

## PACKAGE: SANSEW - Oil and Grease (WATER)

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2=SANSEW/WATER/--Durham Table 2-Storm Sewer Discharge-BL_43_2004

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **Oil and Grease** | | | | | |
| Oil & Grease (total) | mg/L | 2 | | | < 2 |
| Oil & Grease (animal/vegetable) | mg/L | 4 | 150 | | < 4 |
| Oil & Grease (mineral/synthetic) | mg/L | 4 | 15 | | < 4 |

## PACKAGE: SANSEW - Other (ORP) (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2=SANSEW/WATER/--Durham Table 2-Storm Sewer Discharge-BL_43_2004

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **Other (ORP)** | | | | | |
| pH | no unit | 0.05 | 10.5 | 9 | 8.15 |
| Mercury (total) | mg/L | 0.00001 | 0.01 | 0.004 | < 0.00001 |

## PACKAGE: SANSEW - PCBs (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2=SANSEW/WATER/--Durham Table 2-Storm Sewer Discharge-BL_43_2004

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **PCBs** | | | | | |
| Polychlorinated Biphenyls (PCBs) - Total | mg/L | 0.0001 | 0.001 | 0.0004 | < 0.0001 |

## PACKAGE: SANSEW - Phenols (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2=SANSEW/WATER/--Durham Table 2-Storm Sewer Discharge-BL_43_2004

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **Phenols** | | | | | |
| 4AAP-Phenolics | mg/L | 0.002 | 1 | 0.008 | < 0.002 |

## PACKAGE: SANSEW - SVOCs (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2=SANSEW/WATER/--Durham Table 2-Storm Sewer Discharge-BL_43_2004

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|

## PACKAGE: SANSEW - SVOCs (WATER)

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW/WATER/- - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **SVOCs** | | | | | |
| di-n-Butyl Phthalate | mg/L | 0.002 | 0.08 | 0.015 | < 0.002 |
| Bis(2-ethylhexyl)phthalate | mg/L | 0.002 | 0.012 | 0.0088 | < 0.002 |

## PACKAGE: SANSEW - VOCs (WATER)

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW/WATER/- - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| **VOCs** | | | | | |
| Chloroform | mg/L | 0.0005 | 0.04 | 0.002 | < 0.0005 |
| 1,2-Dichlorobenzene | mg/L | 0.0005 | 0.05 | 0.0056 | < 0.0005 |
| 1,4-Dichlorobenzene | mg/L | 0.0005 | 0.08 | 0.0068 | < 0.0005 |
| cis-1,2-Dichloroethene | mg/L | 0.0005 | 4 | 0.0056 | < 0.0005 |
| trans-1,3-Dichloropropene | mg/L | 0.0005 | 0.14 | 0.0056 | < 0.0005 |
| Methylene Chloride | mg/L | 0.0005 | 2 | 0.0052 | < 0.0005 |
| 1,1,2,2-Tetrachloroethane | mg/L | 0.0005 | 1.4 | 0.017 | < 0.0005 |
| Tetrachloroethylene (perchloroethylene) | mg/L | 0.0005 | 1 | 0.0044 | < 0.0005 |
| Trichloroethylene | mg/L | 0.0005 | 0.4 | 0.008 | < 0.0005 |
| Methyl ethyl ketone | mg/L | 0.02 | 8 | | 0.18 |
| Styrene | mg/L | 0.0005 | 0.2 | | < 0.0005 |

## PACKAGE: SANSEW - VOCs - BTEX (WATER)

**Sample Number** 8

**Sample Name** 19MW-7

**Sample Matrix** Ground Water

**Sample Date** 08/03/2019

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

### VOCs - BTEX

| Parameter | Units | RL | L1 | L2 | Result |
|---|---|---|---|---|---|
| Benzene | mg/L | 0.0005 | 0.01 | 0.002 | < 0.0005 |
| Ethylbenzene | mg/L | 0.0005 | 0.16 | 0.002 | < 0.0005 |
| Toluene | mg/L | 0.0005 | 0.27 | 0.002 | < 0.0005 |
| Xylene (total) | mg/L | 0.0005 | 1.4 | 0.0044 | < 0.0005 |
| m-p-xylene | mg/L | 0.0005 | | | < 0.0005 |
| o-xylene | mg/L | 0.0005 | | | < 0.0005 |

## EXCEEDANCE SUMMARY

| Parameter | Method | Units | Result | SANSEW / WATER / -- Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004 L1 | SANSEW / WATER / -- Durham Table 2 - Storm Sewer Discharge - BL_43_2004 L2 |
|---|---|---|---|---|---|
| **19MW-7** | | | | | |
| Total Suspended Solids | SM 2540D | mg/L | 46 | | 15 |

## QC SUMMARY

### Anions by discrete analyzer

### Method: US EPA 375.4 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-026

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| **Sulphate** | **DIO0206-MAR19** | **mg/L** | **2** | **<2** | **9** | **20** | **103** | **80** | **120** | **96** | **75** | **125** |

### Biochemical Oxygen Demand

### Method: SM 5210 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-007

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| **Biochemical Oxygen Demand (BOD5)** | **BOD0020-MAR19** | **mg/L** | **2** | **< 2** | **2** | **30** | **89** | **70** | **130** | **NV** | **70** | **130** |

### Cyanide by SFA

### Method: SM 4500 | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-005

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| **Cyanide (total)** | **SKA0081-MAR19** | **mg/L** | **0.01** | **<0.01** | **ND** | **10** | **93** | **90** | **110** | **90** | **75** | **125** |

## QC SUMMARY

### Fluoride by Specific Ion Electrode

### Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-014

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Fluoride | EWL0175-MAR19 | mg/L | 0.06 | <0.06 | NV | 10 | 102 | 90 | 110 | 100 | 75 | 125 |

### Mercury by CVAAS

### Method: EPA 7471A/SM 3112B | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-004

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Mercury(total) | EHG0009-MAR19 | mg/L | 0.00001 | <0.00001 | 4 | 20 | 103 | 80 | 120 | 90 | 70 | 130 |

## QC SUMMARY

### Metals in aqueous samples - ICP-MS

### Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Silver (total) | EMS0055-MAR19 | mg/L | 0.00005 | <0.00005 | ND | 20 | 95 | 90 | 110 | 79 | 70 | 130 |
| Aluminum (total) | EMS0055-MAR19 | mg/L | 0.001 | <0.001 | ND | 20 | 107 | 90 | 110 | NV | 70 | 130 |
| Arsenic (total) | EMS0055-MAR19 | mg/L | 0.0002 | <0.0002 | 2 | 20 | 97 | 90 | 110 | NV | 70 | 130 |
| Cadmium (total) | EMS0055-MAR19 | mg/L | 0.000003 | <0.000003 | ND | 20 | 96 | 90 | 110 | 78 | 70 | 130 |
| Cobalt (total) | EMS0055-MAR19 | mg/L | 0.000004 | <0.000004 | ND | 20 | 99 | 90 | 110 | NV | 70 | 130 |
| Chromium (total) | EMS0055-MAR19 | mg/L | 0.00008 | <0.00008 | 1 | 20 | 100 | 90 | 110 | 105 | 70 | 130 |
| Copper (total) | EMS0055-MAR19 | mg/L | 0.0002 | <0.0002 | 4 | 20 | 99 | 90 | 110 | NV | 70 | 130 |
| Manganese (total) | EMS0055-MAR19 | mg/L | 0.00001 | <0.00001 | ND | 20 | 103 | 90 | 110 | NV | 70 | 130 |
| Molybdenum (total) | EMS0055-MAR19 | mg/L | 0.00004 | <0.00004 | 0 | 20 | 99 | 90 | 110 | 98 | 70 | 130 |
| Nickel (total) | EMS0055-MAR19 | mg/L | 0.0001 | <0.0001 | 2 | 20 | 99 | 90 | 110 | NV | 70 | 130 |
| Lead (total) | EMS0055-MAR19 | mg/L | 0.00001 | <0.00001 | ND | 20 | 94 | 90 | 110 | 102 | 70 | 130 |
| Antimony (total) | EMS0055-MAR19 | mg/L | 0.0009 | <0.0009 | ND | 20 | 101 | 90 | 110 | 107 | 70 | 130 |
| Selenium (total) | EMS0055-MAR19 | mg/L | 0.00004 | <0.00004 | ND | 20 | 98 | 90 | 110 | 106 | 70 | 130 |
| Tin (total) | EMS0055-MAR19 | mg/L | 0.00006 | < 0.0006 | ND | 20 | 94 | 90 | 110 | NV | 70 | 130 |
| Titanium (total) | EMS0055-MAR19 | mg/L | 0.00005 | <0.00005 | ND | 20 | 96 | 90 | 110 | NV | 70 | 130 |
| Zinc (total) | EMS0055-MAR19 | mg/L | 0.002 | <0.002 | ND | 20 | 100 | 90 | 110 | NV | 70 | 130 |

## QC SUMMARY

### Metals in aqueous samples - ICP-OES

### Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-003

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Phosphorus(total) | EMS0055-MAR19 | mg/L | 0.003 | <0.003 | ND | 20 | 95 | 90 | 110 | NV | 70 | 130 |

### Microbiology

### Method: SM 9222D | Internal ref.: ME-CA-[ENV]MIC-LAK-AN-006

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| E. Coli | BAC9170-MAR19 | cfu/100mL | - | ACCEPTED | ACCEPTED | | | | | | | |

## QC SUMMARY

### Nonylphenol and Ethoxylates

### Method: ASTM D7065-06 | Internal ref.: ME-CA-[ENV]GC-LAK-AN-015

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| **Nonylphenol diethoxylate** | GCM0186-MAR19 | mg/L | 0.01 | < 0.01 | | | 77 | 55 | 120 | | | |
| **Nonylphenol Ethoxylates** | GCM0186-MAR19 | mg/L | 0.01 | < 0.01 | | | | | | | | |
| **Nonylphenol monoethoxylate** | GCM0186-MAR19 | mg/L | 0.01 | < 0.01 | | | 86 | 55 | 120 | | | |
| **Nonylphenol** | GCM0186-MAR19 | mg/L | 0.001 | < 0.001 | | | 83 | 55 | 120 | | | |

### Oil & Grease

### Method: MOE E3401 | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| **Oil & Grease (total)** | GCM0185-MAR19 | mg/L | 2 | <2 | | | 107 | 75 | 125 | | | |

## QC SUMMARY

### Oil & Grease-AV/MS

### Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Oil & Grease (animal/vegetable) | GCM0185-MAR19 | mg/L | 4 | < 4 | | | NA | 70 | 130 | | | |
| Oil & Grease (mineral/synthetic) | GCM0185-MAR19 | mg/L | 4 | < 4 | | | NA | 70 | 130 | | | |

### pH

### Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| pH | EWL0177-MAR19 | no unit | 0.05 | NA | 0 | | 101 | | | NA | | |

### Phenols by SFA

### Method: SM 5530B-D | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-006

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| 4AAP-Phenolics | SKA0078-MAR19 | mg/L | 0.002 | <0.002 | ND | 10 | 104 | 90 | 110 | 102 | 75 | 125 |

## QC SUMMARY

### Polychlorinated Biphenyls

### Method: MOE E3400/EPA 8082A | Internal ref.: ME-CA-[ENV]GC-LAK-AN-001

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Polychlorinated Biphenyls (PCBs) - Total | GCM0155-MAR19 | mg/L | 0.0001 | <0.0001 | ND | 30 | 107 | 60 | 140 | 94 | 60 | 140 |

### Semi-Volatile Organics

### Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Bis(2-ethylhexyl)phthalate | GCM0145-MAR19 | mg/L | 0.002 | < 0.002 | NSS | 30 | 106 | 50 | 140 | NSS | 50 | 140 |
| di-n-Butyl Phthalate | GCM0145-MAR19 | mg/L | 0.002 | < 0.002 | NSS | 30 | 103 | 50 | 140 | NSS | 50 | 140 |

## QC SUMMARY

### Suspended Solids

### Method: SM 2540D | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-004

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Total Suspended Solids | EWL0172-MAR19 | mg/L | 2 | < 2 | 0 | 10 | NV | 90 | 110 | NA | | |

### Total Nitrogen

### Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| Total Kjeldahl Nitrogen | SKA0085-MAR19 | as N mg/L | 0.5 | <0.5 | 9 | 10 | 99 | 90 | 110 | 98 | 75 | 125 |

## QC SUMMARY

### Volatile Organics

### Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENV]GC-LAK-AN-004

| Parameter | QC batch Reference | Units | RL | Method Blank | Duplicate | | LCS/Spike Blank | | | Matrix Spike / Ref. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | RPD | AC (%) | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | | Low | High | | Low | High |
| 1,1,2,2-Tetrachloroethane | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 99 | 60 | 130 | 98 | 50 | 140 |
| 1,2-Dichlorobenzene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 98 | 60 | 130 | 98 | 50 | 140 |
| 1,4-Dichlorobenzene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 97 | 60 | 130 | 97 | 50 | 140 |
| Benzene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 97 | 60 | 130 | 101 | 50 | 140 |
| Chloroform | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 98 | 60 | 130 | 99 | 50 | 140 |
| cis-1,2-Dichloroethene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 96 | 60 | 130 | 100 | 50 | 140 |
| Ethylbenzene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 100 | 60 | 130 | 100 | 50 | 140 |
| m-p-xylene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 101 | 60 | 130 | 102 | 50 | 140 |
| Methyl ethyl ketone | GCM0146-MAR19 | mg/L | 0.02 | <0.02 | ND | 30 | 101 | 50 | 140 | 99 | 50 | 140 |
| Methylene Chloride | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 96 | 60 | 130 | 98 | 50 | 140 |
| o-xylene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 100 | 60 | 130 | 100 | 50 | 140 |
| Styrene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 101 | 60 | 130 | 101 | 50 | 140 |
| Tetrachloroethylene (perchloroethylene) | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 95 | 60 | 130 | 96 | 50 | 140 |
| Toluene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 98 | 60 | 130 | 98 | 50 | 140 |
| trans-1,3-Dichloropropene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 99 | 60 | 130 | 95 | 50 | 140 |
| Trichloroethylene | GCM0146-MAR19 | mg/L | 0.0005 | <0.0005 | ND | 30 | 96 | 60 | 130 | 96 | 50 | 140 |

## QC SUMMARY

**Method Blank:** a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

**Duplicate:** Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

**LCS/Spike Blank:** Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

**Matrix Spike:** A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

**Reference Material:** a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

**RL:** Reporting limit

**RPD:** Relative percent difference

**AC:** Acceptance criteria

**Multielement Scan Qualifier:** as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

**Duplicate Qualifier:** for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

**Matrix Spike Qualifier:** for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

## LEGEND

### FOOTNOTES

NSS Insufficient sample for analysis.

RL Reporting Limit.

↑ Reporting limit raised.

↓ Reporting limit lowered.

NA The sample was not analysed for this analyte

ND Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This report must not be reproduced, except in full. This report supersedes all previous versions.

-- End of Analytical Report --

**SGS** Environment, Health & Safety

# Request for Laboratory Services and CHAIN OF CUSTODY

- Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 006101

Page 1 of 1

## Laboratory Information Section - Lab use only

Received By: Scott Ross

Received Date (mm/dd/yyyy): 03/12/19 (mm\dd\yy)

Received Time: 15 : 11 hrs

Received By (signature): S.R.

Custody Seal Present: ☐ no

Custody Seal Intact: ☐ no

Cooling Agent Present: ☑

Temperature Upon Receipt (°C) 4°C 4°C 4°C 3,3

LAB LIMS #: CA14255-Mar19

## REPORT INFORMATION

Company: Toronto Inspection Ltd.

Contact: Tabitha Loe

Address: 110 Konrad Cres, Unit 16.
Markham, Ontario, L3R 9X2

Phone: (905)940-8509

Email: (905)940-8192

Email: Lab@torontoinspection.com
Tabitha@torontoinspection.com

## INVOICE INFORMATION

☑ (same as Report Information)

Company:

Contact: Sharon Poon

Address:

Phone:

Email: Sharon@torontoinspection.com

## PROJECT INFORMATION

Quotation #:

P.O. #:

Project #: 4986

Site Location/ID:

## TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

Rush Confirmation ID:

NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

## REGULATIONS

**Regulation 153/04:**

☐ Table 1 ☐ R/P/I

☐ Table 2 ☐ I/C/C

☐ Table 3 ☐ A/O

☐ Table ____

Soil Texture: ☐ Coarse ☐ Medium ☐ Fine

**Other Regulations:**

☐ Reg 347/558 (3 Day min TAT)

☐ PWQO ☐ MMER

☐ CCME ☐ Other:

☐ MISA

**Sewer By-Law:**

☑ Sanitary

☑ Storm

Municipality: Durham

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

## ANALYSIS REQUESTED

| | SAMPLE IDENTIFICATION | DATE SAMPLED | TIME SAMPLED | # OF BOTTLES | MATRIX | Field Filtered (Y/N) | Metals & Inorganics | PAH☐ ABN ☐ SVOC(all)☐ | PCB Total ☐ Aroclor ☐ | PHC F1-F4 ☐ VOC☐<br>BTEX ☐ BTEX/F1☐ F2-F4☐ | VOC☐ BTEX☐ THM☐ | Pesticides OC ☐ OP ☐ | TCLP M&I ☐ VOC ☐ PCB☐<br>B(a)P ☐ ABN ☐ Ignit.☐ | Water Pkg Gen. ☐ Ext. ☐ | Sewer Use: Sani & Storm (EC) Durham bylaw | | | | | | COMMENTS: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 19MW-7 | March 12, 2019 | 11:30 | 1 | GW | N | | | | | | | | | ✓ | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | | |

Observations/Comments/Special Instructions

Sampled By (NAME): Will Guo | Signature: | Date: 03/12/19 (mm/dd/yy) | Pink Copy - Client

Relinquished by (NAME): Will Guo | Signature: | Date: 03/12/19 (mm/dd/yy) | Yellow & White Copy - SGS

Revision #: 1.1

Date of Issue: 04 April, 2018

# RE: Toronto Inspection-Markham

Wells, Katrina (Lakefield)

Tue 3/12/2019 7:18 PM

Inbox

To:Ross, Scott (Mississauga) <Scott.Ross@sgs.com>; Moore, Brad (Lakefield) <brad.moore@sgs.com>; Vaithilingam, Stephanie (Mississauga) <Stephanie.Vaithilingam@sgs.com>; LR.Envlogin1 (Lakefield) <LR.Envlogin1@sgs.com>; Anderson, Hawley (Lakefield) <Hawley.Anderson@sgs.com>;

Cc:Vukovic, Ivana (Mississauga) <Ivana.Vukovic@sgs.com>;

This ecoli Sample is an addition For CA14255-MAR19. It was sent by purolator on Friday for Saturday receipt but di not make it to the lab until Monday.

Please add to this report, as a new sample line with new date and time please.

Thank you,
**Katrina Wells**
**Environment, Health and Safety**
Project Specialist Assistant
**SGS – Lakefield**
185 Concession St.
Lakefield, ON K0L 2H0
Phone: 705-652-2191
Fax: 705-652-6365
E-mail : katrina.wells@sgs.com

---

**From:** Ross, Scott (Mississauga)
**Sent:** Tuesday, March 12, 2019 3:16 PM
**To:** Wells, Katrina (Lakefield) <Katrina.Wells@sgs.com>; Moore, Brad (Lakefield) <brad.moore@sgs.com>; Vaithilingam, Stephanie (Mississauga) <Stephanie.Vaithilingam@sgs.com>; LR.Envlogin1 (Lakefield) <LR.Envlogin1@sgs.com>; Anderson, Hawley (Lakefield) <Hawley.Anderson@sgs.com>

# APPENDIX E

## Dewatering Analysis

## Dewatering Calculations at: 603-643, 645 and 699 Kingston Road, Pickering, ON - Podium 1

Equivalent Well Radius (Equivalent Perimeter Approximation of Rectangular Excavation):

$$r_s = \frac{a+b}{\pi}$$

Where:

$r_s$ = Equivalent well radius (m)
$a$ = Length of excavation (m)
$b$ = Width of excavation (m)

| Parameter | Value | Units |
|---|---|---|
| $r_s$ | 66 | m |
| a | 170 | m |
| b | 35 | m |

Radius of Influence Formula (Bear, 1979):

$$R_{01} = 2.45\sqrt{\frac{HK}{S_y}t}$$

Where:

$R_{01}$ = Radius of Influence (m), beyond which there is negligible drawdown
$H$ = Distance from initial static water level to bottom of saturated aquifer (m)
$K$ = Hydraulic conductivity (m/s)
$S_y$ = Specific yield of the aquifer formation [-]
$t$ = Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

| Parameter | Value | Units | |
|---|---|---|---|
| $R_{01}$ | 6 | m | |
| H | 12 | m | |
| K | 6.0E-08 | m/s | |
| $S_y$ | 0.20 | [-] | (Johnson, 1967) |
| t | 1,209,600 | s | |

Dewatering Rate Formula for a Rectangular Excavation in Unconfined Aquifer (Powers et al., 2007):

$$Q = \frac{\pi K(H^2-h^2)}{\ln(R_{02}/r_s)} + 2\left[\frac{xK(H^2-h^2)}{2L}\right]$$

Where:

$Q$ = Anticipated pumping rate ($m^3$/day)

$K$ = Hydraulic Conductivity (m/day)
$H$ = Distance from initial static water level to bottom of the saturated aquifer (m)
$h$ = Depth of water in the well while pumping (m)
$R_{02}$ = Radius of Influence (m) from excavation, beyond which there is negligible drawdown. Equivalent to $R_{01}$ plus $r_s$.
$r_s$ = Equivalent well radius (m)
$x$ = Trench Length (m)
$L$ = Distance from a line source to the trench, equivalent to $R_{02}$ (m)

| Parameter | Value | Units |
|---|---|---|
| Q | 14.386 | $m^3$/day |
| | 0.167 | L/s |
| K | 5.2E-03 | m/day |
| H | 12 | m |
| h | 9 | m |
| $R_{01} + r_s$ | 72 | m |
| $r_s$ | 66 | m |
| x | 170 | m |
| L | 72 | m |

| Incident Precipitation | | |
|---|---|---|
| Design Event = | 10 | mm in 24-hours |
| Area = | 5,950 | $m^2$ |
| Volume = | 59.500 | $m^3$/day |
| | 59,500 | L/day |

* 10 mm/24-hr = 80th Percentile Accumulation

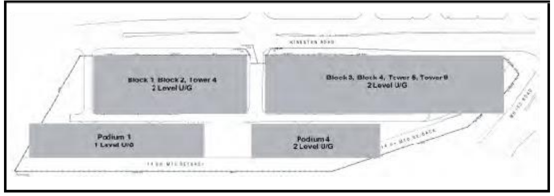
**Summary**

| Summary | Short-Term Pumping Rate Q | | | Long-Term Pumping Rate Q |
|---|---|---|---|---|
| | $m^3$/day | L/day | L/s | L/day |
| Groundwater | 28.771 | 28,771 | 0.33 | 9,590 |
| Precipitation | 59.500 | 59,500 | 0.69 | - |
| Total | 88.271 | 88,271 | 1.02 | 9,590 |

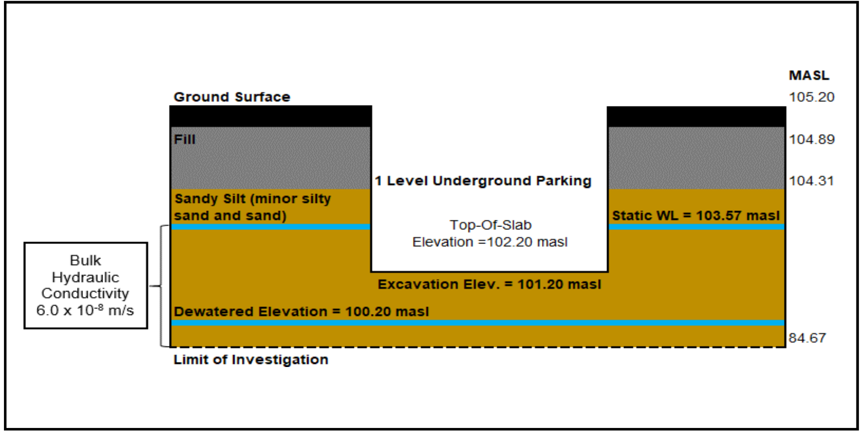
**Notes:**

**1.** Considering a groundwater factor of safety of: **2**
2. Long-term pumping rate approximately 1/3rd short-term rate.

**Dewatering Layout**



**Simplified Dewatering Schematic (not to scale)**



## Dewatering Calculations at: 603-643, 645 and 699 Kingston Road, Pickering, ON - Podium 4

Equivalent Well Radius (Equivalent Perimeter Approximation of Rectangular Excavation):

$$r_s = \frac{a+b}{\pi}$$

Where:

$r_s$ = Equivalent well radius (m)
$a$ = Length of excavation (m)
$b$ = Width of excavation (m)

| Parameter | Value | Units |
|---|---|---|
| $r_s$ | 51 | m |
| a | 123 | m |
| b | 35 | m |

Radius of Influence Formula (Bear, 1979):

$$R_{01} = 2.45\sqrt{\frac{HK}{S_y}t}$$

Where:

$R_{01}$ = Radius of Influence (m), beyond which there is negligible drawdown
$H$ = Distance from initial static water level to bottom of saturated aquifer (m)
$K$ = Hydraulic conductivity (m/s)
$S_y$ = Specific yield of the aquifer formation [-]
$t$ = Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

| Parameter | Value | Units | |
|---|---|---|---|
| $R_{01}$ | 45 | m | |
| H | 14 | m | |
| K | 5.0E-06 | m/s | |
| $S_y$ | 0.25 | [-] | (Johnson, 1967) |
| t | 1,209,600 | s | |

Dewatering Rate Formula for a Rectangular Excavation in Unconfined Aquifer (Powers et al., 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_{02}/r_s)} + 2\left[\frac{xK(H^2 - h^2)}{2L}\right]$$

Where:

$Q$ = Anticipated pumping rate ($m^3$/day)

$K$ = Hydraulic Conductivity (m/day)
$H$ = Distance from initial static water level to bottom of the saturated aquifer (m)
$h$ = Depth of water in the well while pumping (m)
$R_{02}$ = Radius of Influence (m) from excavation, beyond which there is negligible drawdown. Equivalent to $R_{01}$ plus $r_s$.
$r_s$ = Equivalent well radius (m)
$x$ = Trench Length (m)
$L$ = Distance from a line source to the trench, equivalent to $R_{02}$ (m)

| Parameter | Value | Units |
|---|---|---|
| Q | 284.649 | $m^3$/day |
| | 3.295 | L/s |
| K | 4.3E-01 | m/day |
| H | 14 | m |
| h | 9 | m |
| $R_{01} + r_s$ | 96 | m |
| $r_s$ | 51 | m |
| x | 123 | m |
| L | 96 | m |

| Incident Precipitation | | |
|---|---|---|
| Design Event = | 10 | mm in 24-hours |
| Area = | 4,305 | $m^2$ |
| Volume = | 43.050 | $m^3$/day |
| | 43,050 | L/day |

* 10 mm/24-hr = 80th Percentile Accumulation

**Summary**

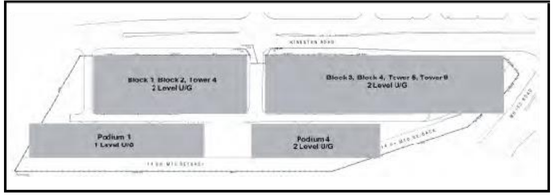
| Summary | Short-Term Pumping Rate Q | | | Long-Term Pumping Rate Q |
|---|---|---|---|---|
| | $m^3$/day | L/day | L/s | L/day |
| Groundwater | 569.298 | 569,298 | 6.59 | 189,766 |
| Precipitation | 43.050 | 43,050 | 0.50 | - |
| Total | 612.348 | 612,348 | 7.09 | 189,766 |

**Notes:**

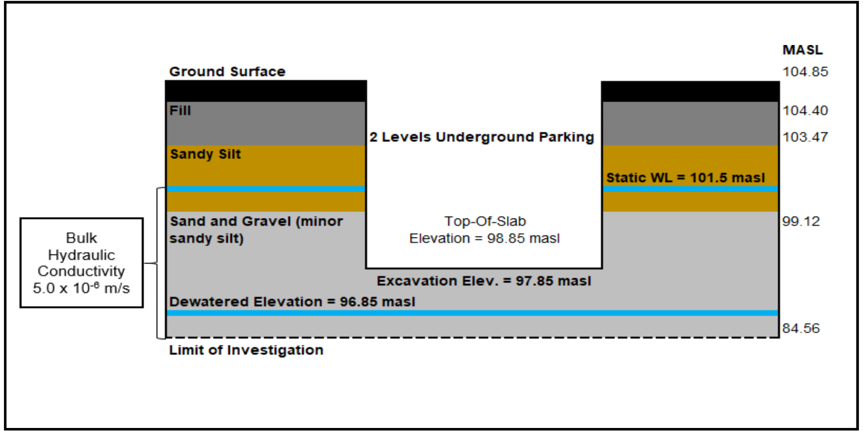
**1.** Considering a groundwater factor of safety of: **2**

2. Long-term pumping rate approximately 1/3rd short-term rate.

**Dewatering Layout**



**Simplified Dewatering Schematic (not to scale)**



## Dewatering Calculations at: 603-643, 645 and 699 Kingston Road, Pickering, ON - Block 1, Block 2, Tower 4

Equivalent Well Radius (Equivalent Perimeter Approximation of Rectangular Excavation):

$$r_s = \frac{a+b}{\pi}$$

Where:

$r_s$ = Equivalent well radius (m)
$a$ = Length of excavation (m)
$b$ = Width of excavation (m)

| Parameter | Value | Units |
|---|---|---|
| **$r_s$** | 67 | **m** |
| **a** | 150 | **m** |
| **b** | 60 | **m** |

Radius of Influence Formula (Bear, 1979):

$$\mathrm{R}_{01} = 2.45\sqrt{\frac{HK}{S_y}\mathrm{t}}$$

Where:

$R_{01}$ = Radius of Influence (m), beyond which there is negligible drawdown
$H$ = Distance from initial static water level to bottom of saturated aquifer (m)
$K$ = Hydraulic conductivity (m/s)
$S_y$ = Specific yield of the aquifer formation [-]
$t$ = Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

| Parameter | Value | Units | |
|---|---|---|---|
| **$R_{01}$** | 5 | **m** | |
| **H** | 9 | **m** | |
| **K** | 6.0E-08 | **m/s** | |
| **$S_y$** | 0.20 | **[-]** | (Johnson, 1967) |
| **t** | 1,209,600 | **s** | |

Dewatering Rate Formula for an Excavation in Unconfined Aquifer (Powers et al., 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_{02}/r_s)}$$

Where:

$Q$ = Anticipated pumping rate ($m^3$/day)

$K$ = Hydraulic Conductivity (m/day)
$H$ = Distance from initial static water level to bottom of the saturated aquifer (m)
$h$ = Depth of water in the well while pumping (m)
$R_{02}$ = Radius of Influence (m) from excavation, beyond which there is negligible drawdown. Equivalent to $R_{01}$ plus $r_s$.
$r_s$ = Equivalent well radius (m)

| Parameter | Value | Units |
|---|---|---|
| **Q** | 13.704 | **$m^3$/day** |
| | 0.159 | **L/s** |
| **K** | 5.2E-03 | **m/day** |
| **H** | 9 | **m** |
| **h** | 4 | **m** |
| **$R_{01} + r_s$** | 72 | **m** |
| **$r_s$** | 67 | **m** |

| **Incident Precipitation** | | |
|---|---|---|
| Design Event = | 10 | mm in 24-hours |
| Area = | 9,000 | $m^2$ |
| Volume = | 90.000 | $m^3$/day |
| | 90,000 | L/day |

* 10 mm/24-hr = 80th Percentile Accumulation

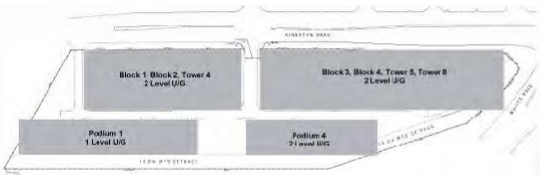
**Summary**

| **Summary** | **Short-Term Pumping Rate Q** | | | **Long-Term Pumping Rate Q** |
|---|---|---|---|---|
| | **$m^3$/day** | **L/day** | **L/s** | **L/day** |
| Groundwater | 27.408 | 27,408 | 0.32 | 9,136 |
| Precipitation | 90.000 | 90,000 | 1.04 | - |
| Total | 117.408 | 117,408 | 1.36 | 9,136 |

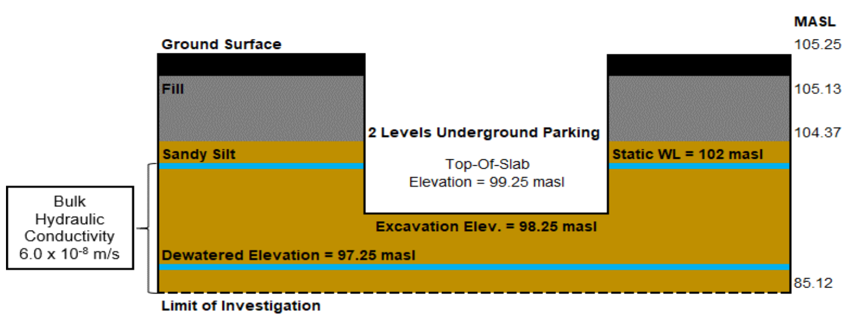
**Notes:**

**1.** Considering a groundwater factor of safety of: **2**
2. Long-term pumping rate approximately 1/3rd short-term rate.

**Dewatering Layout**



**Simplified Dewatering Schematic**



## Dewatering Calculations at: 603-643, 645 and 699 Kingston Road, Pickering, ON - Block 3, Block 4, Tower 5, and Tower 8

Equivalent Well Radius (Equivalent Perimeter Approximation of Rectangular Excavation):

$$r_s = \frac{a+b}{\pi}$$

Where:

$r_s$ = Equivalent well radius (m)
$a$ = Length of excavation (m)
$b$ = Width of excavation (m)

| Parameter | Value | Units |
|---|---|---|
| $r_s$ | 93 | m |
| a | 230 | m |
| b | 61 | m |

Radius of Influence Formula (Bear, 1979):

$$R_{01} = 2.45\sqrt{\frac{HK}{S_y}t}$$

Where:

$R_{01}$ = Radius of Influence (m), beyond which there is negligible drawdown
$H$ = Distance from initial static water level to bottom of saturated aquifer (m)
$K$ = Hydraulic conductivity (m/s)
$S_y$ = Specific yield of the aquifer formation [-]
$t$ = Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

| Parameter | Value | Units |
|---|---|---|
| $R_{01}$ | 5 | m |
| H | 9 | m |
| K | 6.0E-08 | m/s |
| $S_y$ | 0.20 | [-] |
| t | 1,209,600 | s |

(Johnson, 1967)

Dewatering Rate Formula for a Rectangular Excavation in Unconfined Aquifer (Powers et al., 2007):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_{02}/r_s)} + 2\left[\frac{xK(H^2 - h^2)}{2L}\right]$$

Where:

$Q$ = Anticipated pumping rate ($m^3$/day)

$K$ = Hydraulic Conductivity (m/day)
$H$ = Distance from initial static water level to bottom of the saturated aquifer (m)
$h$ = Depth of water in the well while pumping (m)
$R_{02}$ = Radius of Influence (m) from excavation, beyond which there is negligible drawdown. Equivalent to $R_{01}$ plus $r_s$.
$r_s$ = Equivalent well radius (m)
$x$ = Trench Length (m)
$L$ = Distance from a line source to the trench, equivalent to $R_{02}$ (m)

| Parameter | Value | Units |
|---|---|---|
| Q | 21.708 | $m^3$/day |
| | 0.251 | L/s |
| K | 5.2E-03 | m/day |
| H | 9 | m |
| h | 4 | m |
| $R_{01} + r_s$ | 98 | m |
| $r_s$ | 93 | m |
| x | 230 | m |
| L | 98 | m |

| Incident Precipitation | | |
|---|---|---|
| Design Event = | 10 | mm in 24-hours |
| Area = | 14,030 | $m^2$ |
| Volume = | 140.300 | $m^3$/day |
| | 140,300 | L/day |

* 10 mm/24-hr = 80th Percentile Accumulation

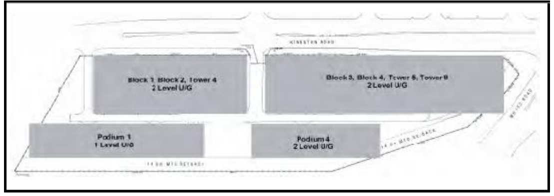
### Summary

| Summary | Short-Term Pumping Rate Q | | | Long-Term Pumping Rate Q |
|---|---|---|---|---|
| | $m^3$/day | L/day | L/s | L/day |
| Groundwater | 43.416 | 43,416 | 0.50 | 14,472 |
| Precipitation | 140.300 | 140,300 | 1.62 | - |
| Total | 183.716 | 183,716 | 2.13 | 14,472 |

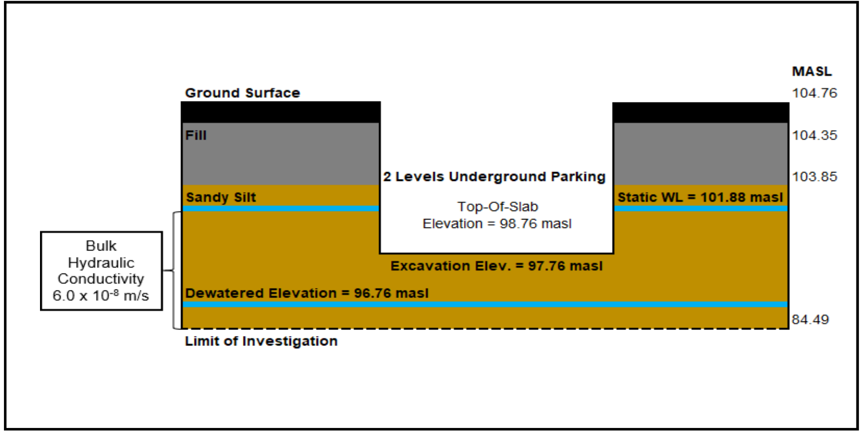
**Notes:**

**1.** Considering a groundwater factor of safety of: **2**
2. Long-term pumping rate approximately 1/3rd short-term rate.

### Dewatering Layout



Simplified Dewatering Schematic (not to scale)



# APPENDIX F

## MECP Water Well Records

# Water Well Records

May 28, 2019

3:06:26 PM

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|
| PICKERING TOWN | 17 650678<br>4852481 W | 2011-04 7241 | 2 | | | MT | 0008 5 | 7162828<br>(Z132057)<br>A111513 | BRWN FILL 0004 GREY SILT TILL WBRG 0008 GREY SILT DNSE 0013 |
| PICKERING TOWN | 17 651536<br>4852845 W | 2012-05 7241 | 2.04 | | | MT | 0010 10 | 7183708<br>(Z150892)<br>A131170 | BRWN LOAM-----LOOS 0001 BRWN SILT CLAY DNSE 0010 GREY SILT CLAY DNSE 0020 |
| PICKERING TOWN | 17 650674<br>4852462 W | 2011-07 7241 | | | | MT | | 7168012<br>(Z136726)<br>A111514 A | |
| PICKERING TOWN | 17 650665<br>4852459 W | 2011-07 7241 | | | | MT | | 7168011<br>(Z136725)<br>A111513 A | |
| PICKERING TOWN | 17 650664<br>4852473 W | 2011-07 7241 | | | | MT | | 7168010<br>(Z136724)<br>A111512 A | |
| PICKERING TOWN | 17 650945<br>4852828 W | 2011-07 7241 | 2 | | | | 0005 10 | 7166731<br>(Z134953)<br>A120954 | BLCK 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND LOOS 0012 GREY SILT SAND LOOS 0015 |
| PICKERING TOWN | 17 650935<br>4852797 W | 2011-07 7241 | 2 | | | MT | 0010 10 | 7166730<br>(Z134954)<br>A120953 | BLCK 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND LOOS 0012 GREY SILT SAND LOOS 0020 |
| PICKERING TOWN | 17 650955<br>4852775 W | 2011-07 7241 | 2 | | | MT | 0008 10 | 7166729<br>(Z134952)<br>A120952 | BLCK 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND LOOS 0010 GREY SILT SAND LOOS 0018 |
| PICKERING TOWN | 17 651656<br>4852833 W | 2012-05 7241 | 2.04 | | | MT | 0010 10 | 7183709<br>(Z150891)<br>A131171 | BRWN LOAM-----LOOS 0001 BRWN SILT SAND DNSE 0010 GREY SILT SAND DNSE 0020 |
| PICKERING TOWN | 17 650685<br>4852485 W | 2011-04 7241 | 2 | | | MT | 0008 5 | 7162829<br>(Z132056)<br>A111514 | BRWN FILL 0004 GREY SILT TILL WBRG 0008 GREY SILT DNSE 0013 |
| PICKERING TOWN | 17 650986<br>4852936 W | 2007-04 7215 | 0.79 | | | | | 7044062<br>(Z70361)<br>A041768 | |
| PICKERING TOWN | 17 650683<br>4852494 W | 2011-04 7241 | 2 | | | MT | 0008 5 | 7162827<br>(Z132058)<br>A111512 | BRWN FILL 0004 GREY SILT TILL WBRG 0008 GREY SILT DNSE 0013 |
| PICKERING TOWN | 17 651565<br>4853343 W | 2009-05 6607 | 2.00 | | | MO | | 7125150<br>(M05150)<br>A082740 | BRWN SILT SAND PCKD 0002 BRWN SILT TILL HARD 0007 GREY SILT TILL HARD 0013 |

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|
| PICKERING TOWN | 17 651543<br>4853487 W | 2009-03 7241 | 1.5 | | | MT | 0008 10 | 7122456<br>(Z93173)<br>A081890 | BRWN 0001 BRWN SILT CLAY DNSE 0014 GREY SILT CLAY DNSE 0018 |
| PICKERING TOWN | 17 650971<br>4852926 W | 2007-04 7215 | 0.79 | | | | | 7044063<br>(Z70360)<br>A055063 | |
| PICKERING TOWN | 17 651443<br>4853606 W | 2017-01 7383 | 2 | | | MO | 0010 10 | 7288920<br>(Z257467)<br>A211867 | SNDY TILL 0020 |
| PICKERING TOWN | 17 651869<br>4852506 W | 2007-02 6607 | 2.00 | | | NU | 0005 15 | 7041862<br>(Z64678)<br>A049110 | BRWN SAND GRVL 0020 |
| PICKERING TOWN | 17 650854<br>4852808 W | 2006-07 6032 | 1.97 | | | NU | 0005 10 | 1918446<br>(Z05119)<br>A005430 | BRWN SAND GRVL 0006 GREY CLAY SLTY GRVL 0010 GREY TILL 0015 |
| PICKERING TOWN | 17 650967<br>4852770 W | 2011-07 7241 | 2 | | | MT | 0010 10 | 7166728<br>(Z136822)<br>A120951 | BLCK 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND LOOS 0012 GREY SILT SAND LOOS 0020 |
| PICKERING TOWN | 17 651544<br>4852840 W | 2015-11 7241 | 2 | | | MT | 0005 10 | 7253328<br>(Z219332)<br>A180381 | BRWN FILL GRVL LOOS 0005 BRWN SILT SAND DNSE 0010 GREY SILT SAND DNSE 0015 |
| PICKERING TOWN | 17 651854<br>4853712 W | 2016-11 7230 | | | | | | 7283297<br>(C36623)<br>A217100 P | |
| PICKERING TOWN | 17 652010<br>4853977 W | 2015-11 7247 | 2 | | | MT | 0030 10 | 7265423<br>(Z226651)<br>A179566 | BRWN SAND CLAY LOOS 0007 BRWN SILT CLAY DNSE 0013 GREY SAND CLAY DNSE 0026 GREY CLAY FSND HARD 0042 |
| PICKERING TOWN | 17 652384<br>4854148 W | 2016-04 7147 | | | | | | 7263265<br>(C32467)<br>A198593 P | |
| PICKERING TOWN | 17 651509<br>4853534 W | 2016-01 6032 | 1.79 | | | MO | 0015 10 | 7262371<br>(Z183676)<br>A194335 | BRWN FILL LOOS 0003 BRWN SILT SAND 0025 |
| PICKERING TOWN | 17 652383<br>4852829 W | 2016-03 4102 | | | | | | 7260538<br>(Z213890) A | |
| PICKERING TOWN | 17 651531<br>4853635 W | 2012-10 7241 | 2 | | | MO | 0010 10 | 7190980<br>(Z160697)<br>A109671 | BRWN FILL 0005 BRWN TILL SILT HARD 0010 GREY TILL HARD 0020 |
| PICKERING TOWN | 17 651438<br>4853616 W | 2017-01 7383 | 2 | | | MO | 0010 10 | 7288919<br>(Z257468)<br>A211866 | SNDY TILL 0020 |

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|
| PICKERING TOWN | 17 651494 4853615 W | 2014-09 7241 | 2.04 | | | MT | 0015 10 | 7228398 (Z195962) A164767 | BRWN FILL GRVL LOOS 0005 BRWN TILL SAND DNSE 0010 BRWN SAND SILT DNSE 0015 GREY SAND SAND DNSE 0020 GREY SAND TILL DNSE 0025 |
| PICKERING TOWN | 17 651478 4853604 W | 2014-09 7241 | 2.04 | | | MT | 0015 10 | 7228397 (Z195695) A164762 | BRWN FILL GRVL LOOS 0005 BRWN TILL SAND DNSE 0010 BRWN SAND SILT DNSE 0015 GREY SAND SAND DNSE 0020 GREY SAND TILL DNSE 0025 |
| PICKERING TOWN | 17 650854 4852808 W | 2006-11 6032 | | | | NU | | 7041285 (Z46585) A005430 A | 0015 |
| PICKERING TOWN | 17 651493 4853732 W | 2012-10 7241 | 2 | | | MO | 0010 10 | 7190982 (Z160699) A123787 | BRWN FILL 0005 BRWN TILL SILT HARD 0010 GREY TILL HARD 0020 |
| PICKERING TOWN | 17 651590 4853660 W | 2012-10 7241 | 2 | | | MO | 0010 10 | 7190981 (Z160698) A109687 | BRWN FILL 0001 BRWN TILL SILT HARD 0006 GREY TILL HARD 0020 |
| PICKERING TOWN | 17 651547 4852865 W | 2015-11 7241 | 2 | | | MT | 0005 10 | 7253330 (Z219334) A156245 | BRWN FILL GRVL LOOS 0005 BRWN SAND SILT DNSE 0010 GREY SILT SAND DNSE 0015 |
| PICKERING TOWN 02 440 | 17 651361 4853532 W | 2006-10 1413 | 5.5 | | 10///: | | | 1918489 (Z53348) A | |
| PICKERING TOWN 028 | 17 651846 4853697 W | 2005-08 6946 | 5 | | | | | 1917749 (Z10103) A | |
| PICKERING TOWN CON 01 027 | 17 652055 4854073 W | 1970-06 0001 | 48 | FR 0042 | 6///: | NU | | 4605199 () | OBDN 0044 |
| PICKERING TOWN CON 01 028 | 17 651488 4854071 W | 1964-11 5420 | 5 | | | | | 4601228 () A | PRDG 0047 GRVL CLAY STNS 0085 BRWN SHLE 0171 |
| PICKERING TOWN CON 01 028 | 17 651465 4854175 W | 1964-11 5420 | 5 | | | | | 4601229 () A | CLAY STNS 0027 MSND CLAY 0030 GRVL CLAY STNS 0055 GRVL CLAY 0060 BLUE CLAY MSND 0083 BRWN SHLE 0087 |
| PICKERING TOWN CON 01 028 | 17 651446 4854047 W | 1964-11 5420 | 5 | | | | | 4601226 () A | GRVL CLAY STNS 0069 |
| PICKERING TOWN CON 01 028 | 17 651572 4853540 W | 1994-11 5459 | | | | CO | | 1912210 (141557) A | GREY CLAY SAND STNS 0017 GREY SAND GRVL SILT 0037 GREY LMSN |
| PICKERING TOWN CON 01 028 | 17 651574 4853540 W | 1994-11 5459 | 6 | FR 0022 | 20/23/30/1:0 | CO | 0029 2 | 1912209 (141554) | GREY CLAY SAND STNS 0017 GREY SAND GRVL SILT 0022 BLCK CSND 0037 GREY LMSN 0037 |
| PICKERING TOWN CON 01 028 | 17 651573 4853540 W | 1994-11 5459 | 6 | FR 0022 | 12/16/30/1:0 | CO | 0025 3 | 1912207 (141552) | GREY CLAY SAND STNS 0017 GREY SAND GRVL SILT 0022 BLCK SAND LOOS 0037 GREY LMSN 0037 |
| PICKERING TOWN CON 01 028 | 17 651571 4853540 W | 1994-11 5459 | 6 | FR 0021 | 12/15/30/1:0 | CO | 0026 12 | 1912208 (141555) | GREY CLAY SAND 0018 GREY SAND STNS SILT 0021 BLCK SAND LOOS 0038 GREY LMSN |
| PICKERING TOWN CON 01 029 | 17 651075 4853923 W | 1974-11 2218 | 30 | FR 0010 | 9/20/6/1:0 | DO | | 4606113 () | BLCK LOAM 0001 BLUE CLAY 0010 GRVL 0012 BLUE CLAY 0023 |

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|
| PICKERING TOWN CON 01 030 | 17 650582 4853818 W | 1958-09 2516 | 5 | FR 0079 | 22/37/5/1:0 | DO | 0077 2 | 4601234 () | CLAY 0079 |
| PICKERING TOWN CON 01 030 | 17 650513 4854047 W | 1964-02 5420 | 34 | FR 0018 | 10///: | DO | | 4601232 () | LOAM 0001 BRWN CLAY STNS 0012 BLUE CLAY STNS 0029 |
| PICKERING TOWN CON 01 031 | 17 650426 4854159 W | 1995-05 5459 | | | | NU | | 1912418 (141601) A | |
| PICKERING TOWN CON 01 031 | 17 650516 4853801 W | 2009-12 1663 | 36 | | 8///: | NU | | 7140475 (Z94137) A | BRWN 0005 0006 BRWN 0014 0016 |
| PICKERING TOWN RANGE 01 027 | 17 651778 4853826 W | 2005-12 4102 | | | | | | 1918302 (Z36198) A | |
| PICKERING TOWN RANGE 03 027 | 17 652169 4853901 W | 2006-09 6032 | 0.20 | | | NU | 0030 10 | 1918449 (Z46512) A005442 | BRWN SAND SILT CLAY 0044 |
| PICKERING TOWN RANGE 03 027 | 17 652376 4852785 W | 1963-11 2610 | 30 | FR 0034 | 29//0/24:0 | DO | | 4601896 () | BRWN CLAY 0017 GREY CLAY 0034 CSND 0037 |
| PICKERING TOWN RANGE 03 028 | 17 651731 4853724 W | 1963-05 5412 | 30 | FR 0057 | 48///: | DO | | 4601907 () | BRWN CLAY 0008 BLUE CLAY STNS 0024 BLUE CLAY 0057 SHLE 0058 |
| PICKERING TOWN RANGE 03 028 | 17 652094 4852775 W | 1954-01 3421 | 4 | FR 0093 | 63///: | | | 4601906 () A | BRWN CLAY BLDR 0023 BLDR STNS 0060 BLUE CLAY 0093 BLCK SHLE 0123 |
| PICKERING TOWN RANGE 03 028 | 17 651718 4853927 W | 1955-11 3512 | 6 | FR 0063 | 30/51/1/: | DO | | 4601905 () | BLUE CLAY STNS 0062 BLCK SLTE 0100 |
| PICKERING TOWN RANGE 03 028 | 17 651747 4853940 W | 1958-10 2516 | 5 | FR 0080 | 46/80/1/1:0 | DO | | 4601904 () | LOAM 0005 GREY CLAY 0070 BRWN SLTE 0080 |
| PICKERING TOWN RANGE 03 029 | 17 651541 4852865 W | 2015-11 7241 | 0.79 | | | MT | 0033 33 | 7253329 (Z219331) A181297 | BRWN FILL GRVL LOOS 0007 BRWN SILT SAND DNSE 0033 GREY SILT SAND DNSE 0066 |
| PICKERING TOWN RANGE 03 029 | 17 651495 4853563 W | 1969-09 5420 | 34 | FR 0018 | 14/14/10/2:0 | DO | | 4604328 () | LOAM 0001 BRWN CLAY STNS 0012 BLUE CLAY STNS 0018 GREY GRVL CSND 0027 |
| PICKERING TOWN RANGE 03 030 | 17 650765 4853368 W | 1962-07 2636 | 4 | FR 0227 | 34/185/10/48:0 | DO | 0227 4 | 4601874 () | YLLW CLAY STNS 0019 BLUE CLAY STNS 0227 GRVL 0231 |
| PICKERING TOWN RANGE 03 030 | 17 650885 4853159 W | 1952-02 4823 | 4 | | | | | 4601908 () A | RED MSND CLAY STNS 0018 GREY CLAY GRVL 0055 HPAN 0078 GRVL SILT 0079 BLCK SHLE 0097 |
| PICKERING TOWN RANGE 03 030 | 17 651174 4852255 W | 1955-04 4222 | 6 | FR 0035 FR 0048 | 20///: | NU | | 4601909 () A | FILL 0001 LOAM 0002 BRWN CLAY MSND 0009 GREY CLAY SILT STNS 0035 MSND GRVL 0038 GREY SILT MSND 0077 |
| PICKERING TOWN RANGE 03 030 | 17 651172 4852305 W | 1957-04 2610 | 30 | FR 0042 | 35///: | DO | | 4601910 () | BRWN CLAY 0010 GREY CLAY 0035 QSND 0042 |
| PICKERING TOWN RANGE 03 030 | 17 650815 4853513 W | 1971-11 2214 | | | | | | 4605056 () A | LOAM 0001 BRWN CLAY STNS 0012 BLUE CLAY STNS 0030 |
| PICKERING TOWN RANGE 03 031 | 17 650603 4853494 W | 1966-02 5420 | 30 | FR 0007 | 5///: | DO | | 4601913 () | LOAM 0001 YLLW CLAY 0005 CLAY GRVL 0010 BLUE CLAY 0017 |

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|
| PICKERING TOWN RANGE 03 031 | 17 650771 4852580 L | 2001-11 2214 | | | | | | 1915420 (240016) A | |
| PICKERING TOWN RANGE 03 031 | 17 650831 4852894 W | 1966-08 5412 | 30 | FR 0020 | 17//6/: | DO | | 4601912 () | LOAM 0001 BRWN CLAY 0010 GREY CLAY 0020 GRVL 0025 |
| PICKERING TOWN RANGE 03 031 | 17 650591 4853144 W | 1966-11 2610 | 30 | FR 0010 | 10//1/: | DO | | 4601914 () | MSND 0022 |
| PICKERING TOWN RANGE 03 031 | 17 650624 4852568 W | 1964-06 2613 | 7 | | | | | 4601915 () A | GREY CLAY 0133 GREY SHLE 0138 LMSN 0218 |
| PICKERING TOWN RANGE 03 031 | 17 650915 4852783 W | 1967-09 2306 | 6 | FR 0102 | 90/95/3/2:30 | DO | | 4601916 () | PRDG 0040 CLAY 0100 GRVL 0102 |
| PICKERING TOWN RANGE 03 031 | 17 650891 4852820 W | 2015-07 7147 | | | | | | 7245784 (C28817) P | |
| PICKERING TOWN RANGE 03 031 | 17 650699 4852903 W | 2014-07 4102 | | | | | | 7227606 (Z154883) A | |
| PICKERING TOWN RANGE 03 031 | 17 650683 4852905 W | 2014-07 4102 | | | | | | 7227605 (Z154882) A | |
| PICKERING TOWN RANGE 03 031 | 17 650691 4852889 W | 2014-07 4102 | | | | | | 7227604 (Z154881) A | |
| PICKERING TOWN RANGE 03 031 | 17 650683 4853245 W | 1958-11 2516 | 5 | | | | | 4601911 () A | PRDG 0025 GREY LMSN 0050 |

Notes:
UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completedand Well Contractor Licence Number
CASING DIA: .Casing diameter in inches
WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL ( AUDIT # ) Well Tag . A: Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

## 1. Core Material and Descriptive terms

| Code | Description | Code | Description | Code | Description | Code | Description | Code | Description |
|---|---|---|---|---|---|---|---|---|---|
| BLDR | BOULDERS | FCRD | FRACTURED | IRFM | IRON FORMATION | PORS | POROUS | SOFT | SOFT |
| BSLT | BASALT | FGRD | FINE-GRAINED | LIMY | LIMY | PRDG | PREVIOUSLY DUG | SPST | SOAPSTONE |
| CGRD | COARSE-GRAINED | FGVL | FINE GRAVEL | LMSN | LIMESTONE | PRDR | PREV. DRILLED | STKY | STICKY |
| CGVL | COARSE GRAVEL | FILL | FILL | LOAM | TOPSOIL | QRTZ | QUARTZITE | STNS | STONES |
| CHRT | CHERT | FLDS | FELDSPAR | LOOS | LOOSE | QSND | QUICKSAND | STNY | STONEY |
| CLAY | CLAY | FLNT | FLINT | LTCL | LIGHT-COLOURED | QTZ | QUARTZ | THIK | THICK |
| CLN | CLEAN | FOSS | FOSILIFEROUS | LYRD | LAYERED | ROCK | ROCK | THIN | THIN |
| CLYY | CLAYEY | FSND | FINE SAND | MARL | MARL | SAND | SAND | TILL | TILL |
| CMTD | CEMENTED | GNIS | GNEISS | MGRD | MEDIUM-GRAINED | SHLE | SHALE | UNKN | UNKNOWN TYPE |
| CONG | CONGLOMERATE | GRNT | GRANITE | MGVL | MEDIUM GRAVEL | SHLY | SHALY | VERY | VERY |
| CRYS | CRYSTALLINE | GRSN | GREENSTONE | MRBL | MARBLE | SHRP | SHARP | WBRG | WATER-BEARING |
| CSND | COARSE SAND | GRVL | GRAVEL | MSND | MEDIUM SAND | SHST | SCHIST | WDFR | WOOD FRAGMENTS |
| DKCL | DARK-COLOURED | GRWK | GREYWACKE | MUCK | MUCK | SILT | SILT | WTHD | WEATHERED |
| DLMT | DOLOMITE | GVLY | GRAVELLY | OBDN | OVERBURDEN | SLTE | SLATE | | |
| DNSE | DENSE | GYPS | GYPSUM | PCKD | PACKED | SLTY | SILTY | | |
| DRTY | DIRTY | HARD | HARD | PEAT | PEAT | SNDS | SANDSTONE | | |
| DRY | DRY | HPAN | HARDPAN | PGVL | PEA GRAVEL | SNDY | SANDYOAPSTONE | | |

## 2. Core Color

| Code | Description |
|---|---|
| WHIT | WHITE |
| GREY | GREY |
| BLUE | BLUE |
| GREN | GREEN |
| YLLW | YELLOW |
| BRWN | BROWN |
| RED | RED |
| BLCK | BLACK |
| BLGY | BLUE-GREY |

## 3. Well Use

| Code | Description | Code | Description |
|---|---|---|---|
| DO | Domestic | OT | Other |
| ST | Livestock | TH | Test Hole |
| IR | Irrigation | DE | Dewatering |
| IN | Industrial | MO | Monitoring |
| CO | Commercial | MT | Monitoring TestHole |
| MN | Municipal | | |
| PS | Public | | |
| AC | Cooling And A/C | | |
| NU | Not Used | | |

## 4. Water Detail

| Code | Description | Code | Description |
|---|---|---|---|
| FR | Fresh | GS | Gas |
| SA | Salty | IR | Iron |
| SU | Sulphur | | |
| MN | Mineral | | |
| UK | Unknown | | |