



# GEMTEC

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**Hydrogeological Investigation  
Proposed Commercial Development  
4497 O'Keefe Court  
Ottawa, Ontario**

GEMTEC Project: 102669.001

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Submitted to:

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Proposed Commercial Development  
4497 O'Keefe Court  
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September 4, 2024  
GEMTEC Project: 102669.001



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## 1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) has been retained by The Properties Group Management Ltd. (Client), to carry out geotechnical, environmental, and hydrogeological investigations for a proposed commercial development to be located at 4497 O’Keefe Court, Ottawa, Ontario, herein referred to as ‘the site’. This report provides the hydrogeological investigation and should be read in conjunction with the geotechnical and environmental investigation reports (issued under separate cover).

The purpose of the hydrogeological investigation is to characterize the general subsurface and groundwater conditions at the site by means of a limited number of boreholes and monitoring wells and based on the information obtained, provide water levels, hydraulic conductivity of on-site soils, estimate infiltration rates, estimate short-term (i.e., construction dewatering) and long-term dewatering needs and assess the potential impacts of the water takings on existing resources. The location of the Site is displayed in the Figure 1, the GEMTEC Site Plan, which is displayed following the text of the report.

This report is subject to the Conditions and Limitations of This Report which follow the text of the report, and which are considered an integral part of the report.

## 2.0 PROJECT DESCRIPTION AND SETTING

### 2.1 Project Description

It is understood that plans are being prepared for a commercial development to be located at 4497 O’Keefe Court in Ottawa, Ontario. The new development consists of three light industrial warehouses with surficial parking, driveways, and landscaped areas. The development will be serviced with municipal water services and private septic services (on-site treatment plant). A stormwater management pond is proposed to be constructed at the southern end of the site.

The existing site is a parcel of land rectangular in shape and is currently undeveloped and vacant.

The preliminary site development plan provided is displayed in Appendix A.

### 2.2 Topography and Drainage

Topography mapping shows that the site is relatively flat with slightly higher elevation towards the northwestern portion of the site. The site elevation ranges from approximately 105 to 110 m from east to west (Figure 2, *Topography and Natural Heritage*). As shown in Figure 2, there are no natural features located within the site boundaries nor within 500 m of the site boundaries, however, there is an unevaluated wetland located north of the site.

Jock river (tributary of the Rideau River) is the closest surface water feature to the site, located about 2.6 km to the south. Groundwater flow often reflects topographic features and typically flows

toward nearby lakes, rivers and wetland areas. Localized groundwater flow may also be influenced by local topographical features, subsurface service trenches and other factors. Overall groundwater flow may also be influenced by the regional geology, topography, and recharge/discharge areas on and off the subject site.

### **2.3 Surficial Geology and Physiography**

Published surficial geology mapping (Ontario Geological Survey, 2010) indicates that the site is underlain by thin deposits of glacial till (Figure 3, *Surficial Geology*). Paleozoic bedrock geology mapping (Armstrong and Dodge, 2007) indicates that the overburden is underlain by limestone, dolostone, shale, and sandstone of the March, Oxford and Bobcaygeon Formations.

The site is located across two physiographic regions: the Ottawa Valley Clay Plain and Smith Falls Limestone Plain, characterized by a continuous tract of shallow soil over limestone (Chapman and Putnam, 1984).

### **2.4 MECP Water Well Records**

A review of the Ministry of the Environment, Conservation, and Parks (MECP) water well records (WWR) (MECP, 2021) indicated that there are 41 WWR reported within approximately 500 m of the site (Figure 1, *Site Plan*), including two (2) public supply wells, 20 domestic supply wells, one (1) commercial supply well, one (1) irrigation well, two (2) stock wells, one (1) cooling and A/C wells, two (2) monitoring wells, three (3) wells not in use and nine (9) wells with unknown use.

According to the WWR, the depth to bedrock within 500 m of the site (where recorded) ranged between 0 and 17.7 m below ground surface (bgs). The overburden is recorded to consist primarily of boulder, gravel, sand, and clay. Static groundwater level within the wells ranged from 2.4 to 30 m below ground surface (bgs). Shale and limestone bedrock was commonly reported in the WWR. A summary of information from the WWR is presented in Appendix B.

### **2.5 Source Water Protection**

The MECP Source Protection Information Atlas (MECP, 2023) was reviewed to assess the presence of source water protection areas including: Wellhead Protection Areas (WHPA) associated with municipal groundwater supplies, Intake Protection Zones (IPZ) associated with municipal surface water supplies, Significant Groundwater Recharge Areas (SGRA), and Highly Vulnerable Aquifers (HVA).

The nearest IPZ-3, WHPA, and SGRA are located about 1.3 km north, 9 km southwest, and 400 m south of the site respectively. The site is located within the mapped Highly Vulnerable Aquifer, which is likely associated with the high permeability surficial sand and gravel deposits in the area.

### 3.0 PREVIOUS STUDIES COMPLETED

The following previous reports for the site were provided to GEMTEC for review:

- *Paterson Group Inc. Terrain Analysis and Hydrogeological Study, Proposed Commercial Development Part 14, Lot 21, Concession 4 (R.F.) Ottawa (Nepean), Ontario, October, 2006. (2006 Terrain Analysis and Hydrogeological Study)*
- *Addendum No. 1 to Terrain Analysis and Hydrogeological Study Report, Proposed Gateway Industrial Centre, 4497 O'Keefe Court, Ottawa, Ontario, prepared by Paterson Group Inc. dated September 2008;*
- *Hydrogeological Overview, 4497 O'Keefe Court, Ottawa, Ontario, (letter) prepared by Paterson Group Inc. dated October 2015;*
- *Additional correspondence relating to commentary on reporting submissions, prepared by Paterson Group Inc.*

Paterson (2015) summarises the previous investigations carried out at the site. Key points relating to the hydrogeological investigations are as follows:

- Historically, the site was used as part of an aggregate extraction operation until early to mid 1980's.
- Records for 75 test pits and 4 boreholes (79 test holes in total) are provided in the report. More specifically:
  - TP1-08 to TP18-08 inclusive (18 No.) and TP21-08 to TP52-08 inclusive (32 No.).
  - TP1-07 to TP8-07, inclusive (8 No.)
  - BH1-06 to BH4-06, inclusive (4 No.)
  - TP1-06 to TP6-06, inclusive (6 No.)
  - TP/MW1 to TP/MW11, inclusive (11 No.)
- The subsurface conditions encountered in the test pits were generally consistent with the geological mapping for the area; however, uncontrolled fill material was encountered from ground surface, with variable thickness, which is likely associated with the historical aggregate extraction operation.
- The test pits are not evenly distributed across the site. A higher concentration of test pits was carried out in the central western portion of the Site, possibly around some underground feature / anomaly at this location. This feature is described as a previously infilled trench, or which may be a stormwater drain, which originates to the west of the Site and may be transmitting water into / across the Site. The culverts associated with this drain may have been sealed off in 2015, however this has not been confirmed. The ground investigation points may also have been laid out around a previously proposed building(s) layout.
- Significant groundwater may be encountered in the region of the underground drainage feature, for instance, in the vicinity of TP7-07 and TP7-08.

- Two bedrock aquifers were present at the site; the upper aquifer at depths of approximately 8 to 11 m below ground surface (bgs) and the lower aquifer at a depth of approximately 100 m below bgs. The lower aquifer, which was deemed a suitable bedrock aquifer for water supply at the development, is no longer proposed (as the facilities will be serviced by municipal water supplies).

The records of the ground investigation points from Paterson (2015) are provided in Appendix C with the associated Test Hole Location plan. It has not been verified if the locations of all the ground investigation points are shown on the Test Hole Location Plan provided in the report, or if the positions shown are accurate. It is noted that some test pit positions appear to have changed from previous reporting versions provided.

### **3.1 Geotechnical Investigation**

A geotechnical investigation was conducted by GEMTEC in conjunction with the hydrogeological investigation. The report findings were submitted in the report titled: *“Supplemental Geotechnical Investigation, Proposed Light Industrial Warehouse Development, 4497 O’Keefe Court, Ottawa Ontario”*, dated September 8, 2023. The results of the investigation is summarized below.

The fieldwork for the supplemental geotechnical investigation was carried out on June 23, 2023. Fourteen test pits numbered 23-01 to 23-12 inclusive, including 23-07A and 23-08A were advanced at the locations shown on the Site Plan, Figure 1.

The test pits were excavated predominantly in the eastern and northern portions of the site where less existing information was available, and where the berms of existing fill material are located. The positions were agreed with input from The Properties Group Management Ltd., and their representatives.

The test pits were advanced using a track-mounted hydraulic excavator (30 ton) supplied and operated by Dave Wright Excavating of Ottawa Ontario. The test pits were excavated to depths ranging from about 3.0 to 5.3 metres below the existing ground surface using a toothed bucket. The subsurface conditions in the test pits were determined based on visual and tactile examination of soils exposed on the sides and bottom of the excavations.

The fieldwork was observed by a member of our engineering staff who directed the excavation operations, observed the conditions in the test pits, and logged the samples and test holes. Following the fieldwork, the soil samples were returned to our laboratory for examination by a geotechnical engineer. Selected samples of the soil were tested for moisture content, Atterberg limits and grain size distribution testing.

The test pit locations were positioned at the site by GEMTEC relative to existing site features. The locations and ground surface elevations at the test pit locations were surveyed by GEMTEC using a high precision GPS survey instrument.

Descriptions of the subsurface conditions logged in the test pits are provided on the Record of Test Hole Sheets in Appendix D. The approximate locations of the test holes are shown on the Site Plan, Figure 1.

### **3.2 Phase Two Environmental Site Assessment**

As indicated above, GEMTEC carried out a concurrent environmental investigation. The Phase Two ESA investigated the areas of potential environmental concern (APECs) identified in the 2023 Phase One ESA titled: *“Phase One Environmental Site Assessment, 4497 O’Keefe Court, Ottawa, Ontario”*, dated July 2023.

Between December 15 and 16, 2023, 4 boreholes (BH23-01 to BH23-01A and BH23-01B) were advanced at the Site to depths of about 3.05 to 7.62 m bgs. All the boreholes advanced as part of the Phase Two ESA were completed with nominal 50 mm diameter monitoring wells. Borehole/monitoring well locations are provided in Figure 5, Appendix A. Boreholes were advanced using a track mounted B3YX drill rig by Strata Drilling (Strata) using hollow stem augers. Sampling of overburden soils was carried out at regular depth intervals using conventional 50 millimetre (mm) outer diameter split spoon sampling equipment. The soil samples were obtained at regular depth intervals and logged in the field, noting subsurface conditions. The environmental borehole logs are provided in Appendix D.

Groundwater monitoring wells were installed by Strata using threaded 51 mm diameter, schedule 40, polyvinyl chloride (PVC) well screens and riser pipe, which were brought to the Site in sealed plastic bags. The annular space was filled with silica filter sand to at least 0.3 m above the well screen. The monitoring well was sealed with bentonite from the top of the sand pack and completed with a monument protective well casing. The riser pipes were sealed with a J-plug.

Groundwater samples were collected from MW23-01 to MW23-03, and MW23-101 on December 21, 2023 and were submitted to AGAT for analysis of one or more of the following parameters: metals and inorganics, other regulated parameters (ORP) including electrical conductivity (EC), cyanide (CN), hexavalent chromium (Cr-IV), mercury (Hg) and pH, petroleum hydrocarbon (PHC) fractions F1 to F4, benzene, toluene, ethylbenzene, and xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), and volatile organic compounds (VOC). The results of the sampling program are available in the Phase Two ESA report (GEMTEC, 2024).

Based on the results of the groundwater samples submitted as part of the Phase Two ESA, no exceedances of the applicable site conditions standards Table 1: Full Depth Background Site Condition Standards were identified.

## **4.0 SUBSURFACE CONDITIONS**

### **4.1 General**

The soil conditions logged in the test pits from the supplemental geotechnical investigation are given on the Record of Test Pits Sheet in Appendix D. Subsurface conditions encountered during environmental drilling are displayed on the Record of Borehole Sheet in Appendix D. Grain Size analysis was completed on selected soil samples, in which the results are displayed in Appendix E. Generally, the subsurface conditions encountered during the environmental borehole drilling agree with the geotechnical test pitting program completed by GEMTEC. The test pit logs indicate the subsurface conditions at the specific test locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. Subsurface conditions at locations other than the test hole locations may vary from the conditions encountered in the test holes. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and GEMTEC does not guarantee descriptions as exact but infers accuracy to the extent that is common in current geotechnical practice.

The following presents an overview of the subsurface conditions encountered in the boreholes and test pits advanced as part of the current investigation.

### **4.2 Topsoil**

Topsoil was encountered at the ground surface at all of the test pit locations excluding test pit 23-03.

### **4.3 Fill Material (Uncontrolled)**

Fill material was encountered in all of test pits advanced at the site by GEMTEC and similarly was encountered in many of the test pits advanced by Paterson (2015). In the absence of any records of placement of the fill materials at the Site and based on the conditions encountered in the test pits the fill material is considered predominantly to be 'uncontrolled' fill.

The fill material is comprised of both coarse-grained (i.e. sands, gravels) and fine-grained (i.e. silts and clays) soil types. The depth to the base of the fill material is variable. Fill material was present to bedrock at some locations, and in others, the fill material overlies native soils.

### **4.4 Former Topsoil Layer**

A layer of (former or buried) topsoil was encountered below the fill material in numerous test pits from the GEMTEC supplemental investigation and the Paterson (2015) investigations.



Where it could be measured, the former topsoil layer ranges in thickness from about 100 to 150 millimetres.

A moisture content test was carried out on a sample of the former topsoil layer which returned a value of about 57 percent. The (relatively high) value may be due to the presence of organic material within the layer, and the saturated condition of the layer at this location.

**4.5 Silty Clay, Native**

Native deposits of silty clay were encountered in a relatively small number of test pits below the fill material and former topsoil layers. This unit was encountered in the test pits advanced by GEMTEC as part of the supplemental investigation and in the test pits documented in Paterson (2015).

The silty clay unit does not appear to be present as a continuous layer throughout the site, but rather is inferred to be present in isolated locations.

One particle size distribution test was performed on a sample of the silty clay. The results of the testing summarized in Table 4.1 below.

**Table 4.1 – Summary of Grain Size Distribution Test (Silty Sand)**

Test Pit ID	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
23-03	4	2.1 – 3.0	2	34	64 (combined)	

**4.6 Glacial Till, Native**

Native deposits of glacial till were encountered in several of the test pits advanced by GEMTEC and Paterson (2015), below either the fill material and former topsoil, the silty clay or in a few instances below topsoil.

Glacial till is a heterogeneous mixture of all grain sizes; however, at this site the glacial till can generally be described as brown sand with varying amounts of silt and gravel. Cobbles and boulders are frequently encountered in the glacial till.

Similar to the silty clay deposits, the glacial till unit does not appear to be present as a continuous layer throughout the site, but rather is present in isolated locations, albeit at increased frequency.

Two grain size distribution tests were carried out on a sample of the glacial till. The results are summarized in Table 4.2.

**Table 4.2 – Summary of Grain Size Distribution Test (Glacial Till)**

Borehole Number	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
21-02	4	2.3 – 2.9	19	43	30	8

#### 4.7 Silty Sand

A layer of silty sand was identified in a low number of test pits documented in Paterson (2015). Similar layers were not identified in the GEMTEC supplemental investigation. It is possible that this layer is part of the glacial till unit, given that it is noted to contain gravel, cobbles and occasionally boulders.

Standard penetration tests (SPT) carried out in the silty sand layers from Paterson (2015) indicate dense or very dense state in general. These values are also typically more representative of glacial till.

#### 4.8 Refusal

Auger refusal was encountered in all test pits except for TP23-9 and TP23-11 and environmental boreholes at depths of about 3.0 and 5.3 metres below the existing ground surface, respectively. The auger refusal likely represents the bedrock surface.

A summary of the refusal depths and elevations are provided in Table 4.3.

**Table 4.3 – Summary of Auger Refusal Depth and Elevation**

Borehole/Test Pit Number	Ground Surface Elevation (metres)	Depth to Refusal (metres)	Refusal Elevation (metres)
23-01	103.8	3.1	100.7
23-02	105.3	4.7	100.6
23-03	101.6	3.4	101.6
23-04	106.3	4.8	101.5
23-05	105.2	3.1	102.1
23-06	105.2	3.0	102.2
23-07	107.3	5.1	102.2
23-07A	107.8	5.3	102.5

Borehole/Test Pit Number	Ground Surface Elevation (metres)	Depth to Refusal (metres)	Refusal Elevation (metres)
23-08	109.0	4.9	104.2
23-08A	108.6	4.5	104.1
23-09	111.7	> 4.1 / <107.6	N/A (in berm)
23-10	110.3	5.1	105.2
23-11	111.2	> 3.7 / <107.5	N/A (in berm)
23-12	110.9	4.1	106.8
MW23-01	109.32	4.27	105.05
MW23-02	105.46	4.57	105.46
MW23-03A/B	105.17	3.05	102.12

#### 4.9 Groundwater Levels

Well screens were sealed in the overburden at monitoring wells MW23-01 to MW23-03S and MW23-03D for measurement of the groundwater levels. The groundwater levels in the monitoring wells were measured after install of the wells on December 19, 2023, and again on February 1, 2024. Water levels measured on December 19, 2023 may not be representative of stabilized groundwater conditions. The groundwater level depth and elevations are summarized in Table 4.4.

**Table 4.4 – Summary of Groundwater Levels**

Borehole Number	Screened Material	Groundwater Depth (metres)	Groundwater Elevation (metres)	Date
23-1	Silty Sand and Sandy Silt	4.81	104.51	December 19, 2023
		4.85	104.47	February 1, 2024
23-2	Silty Sand and Sandy Silt	5.49	99.97	December 19, 2023
		1.29	104.17	February 1, 2024

Borehole Number	Screened Material	Groundwater Depth (metres)	Groundwater Elevation (metres)	Date
23-3S	Silty Sand	1.87	103.30	December 19, 2023
		1.97	103.20	February 1, 2024
23-3D	Bedrock	1.33	103.92	December 19, 2023
		2.04	103.21	February 1, 2024

The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation.

Based on the stabilized water levels measurements within the monitoring wells on the site, groundwater elevations decrease from north to south, and therefore, groundwater flow direction is expected to be generally southward.

An upward gradient is apparent at monitoring well 23-3, in which the stabilized hydraulic head (water level) in the deep bedrock port is at a higher elevation than the shallow overburden port. Confined groundwater conditions are therefore expected within the bedrock unit, and upward movement of groundwater from the bedrock unit into the overburden may be encountered on the site.

Electronic water level recorders were installed in monitoring wells 23-3S, 23-3D, 23-02, and 23-03 on February 1, 2024, to record long term water level measurements. The water level information will be downloaded, corrected for barometric pressure and plotted. The results of the long-term water level monitoring program will be provided under a sperate cover.

#### 4.10 Hydraulic Response Test Results

The results of the hydraulic testing carried out in the well screens are provided in Appendix E. The hydraulic conductivity values estimated from the falling and rising head tests are presented in Table 4.5.

**Table 4.5 – Summary Hydraulic Conductivity Estimates**

Borehole	Geological Material Monitored	Calculated Hydraulic Conductivity, k (m/s) <sup>1,2</sup>	
		Falling Head Test by Introducing a Slug	Rising Head Test by Removing a Slug
23-1	Gravel and Sand; Silty Sand; Sandy Silt	-	$2 \times 10^{-4}$
23-2	Silty Sand; Sandy Silt	$2 \times 10^{-8}$	-
23-3S	Silty Sand	$1 \times 10^{-7}$	-
23-3D	Bedrock	$3 \times 10^{-4}$	$3 \times 10^{-4}$

Notes:

1. The hydraulic conductivities were calculated using the Bouwer-Rice (1976) analysis.
2. Displacement volume of slug used in analysis for all boreholes.

The estimated hydraulic conductivity of the silty sand unit at the three boreholes ranged from  $2 \times 10^{-8}$  to  $2 \times 10^{-4}$ . These hydraulic conductivity values are within the literature range for silty sand of  $10^{-8}$  to  $5 \times 10^{-4}$  m/s (Freeze and Cherry, 1979).

The estimated hydraulic conductivity of the limestone bedrock at BH23-3 was greater than the literature range for limestone of  $10^{-9}$  m/s to  $10^{-6}$  m/s (Freeze and Cherry, 1979). The estimated hydraulic conductivity of the limestone bedrock encountered is inferred to be higher than literature values due to weathering near the surface of the bedrock.

## 5.0 PRELIMINARY INFILTRATION ASSESSMENT

### 5.1 Preliminary Infiltration Rate Estimates

Preliminary infiltration rates were estimated for the various soil types encountered above the water table. Selected samples encountered across the site during the test pit investigation were characterized based on the USDA Soils Textural Triangle (Figure D.13.1. MDE, 2009). The corresponding minimum infiltration rates, based on Table D.13.1 hydrologic soil properties classified by soil texture (MDE, 2009) ranged from 2.3 mm/hour to 61.0 mm/hour. The infiltration rates estimated based on soil texture classification are summarized in Table G1 in Appendix G. The minimum infiltration rates are based on soil texture only and does not consider site specific factors that may affect the infiltration rate, such as soil heterogeneity, compaction, groundwater level, etc.

Preliminary locations for proposed LIDs were provided to GEMTEC (Appendix A), which are located in relatively close proximity to test pits 23-06 and 23-11. The estimated infiltration rates at test pit 23-06 was 4.3 mm/h, and at 23-11, 25.8 and 61.0 mm/h depths of 0.60-1.0 and 2.5-3.1 meters below ground surface respectively. It is noted that the majority of test pit locations indicated variable composition and thickness of fill material, for which estimates of infiltration are not provided. It is recommended that in-situ testing (e.g., Guelph Permeameter) be completed at any proposed LID locations to confirm infiltration rates.

## **5.2 Infiltration Potential Assessment**

In planning for proposed LID features, the following should be considered:

- The potential for conditions to change at the site as a result of site development (i.e. if fill material in a test area is to be excavated and replaced);
- The position of the groundwater level (or levels) in the soil and bedrock units at the test location, and the potential for seasonal variation to occur;
- The effects of the existing buried drainage channel or potential site flooding by other means.

Storm Water Management (SWM) Design Guidelines (MOE, 2003) for LID features require that a minimum separation distance of 1.0 metre be present between the bottom of the LID features and bedrock surface. This may be achievable, depending on final grading and the type of LID features proposed. Deep LID features may not be suitable (e.g., buried infiltration chambers).

A minimum separation distance of 1.0 metre is also required between the bottom of the LID features and the seasonally high groundwater level (which likely occurs during the spring). The seasonally high-water level should be confirmed by groundwater level measurements at the proposed LID locations. The presence of a high groundwater level at this site may prevent the successful application of LID features. Consideration should also be given to the potential effects of the buried drainage feature and any potential hydraulic connectivity between it and the LID features.

## **6.0 GROUNDWATER PUMPING AND MANAGEMENT**

The groundwater levels in the monitoring wells installed in the overburden were variable, with water levels measured on February 1, 2024, ranging from 1.29 to 4.85 meters below the existing ground surface (elevations ranging from about 103.20 to 104.17 meters, geodetic).

Excavation depths and dimensions for the proposed construction are unknown, but it is expected that the uncontrolled fill material on the site may have to be excavated for geotechnical considerations of the proposed structures. The depth to the base of the fill material is variable,

with fill being located to bedrock at some locations, and in others, the fill material overlies native soils.

Additional consideration must be given to the potential presence of a previously infilled trench, which may be transmitting water into/across the site. If encountered, significant groundwater inflow into construction excavations may occur.

Groundwater management is the responsibility of the contractor. The approach to dewatering the excavations should be designed and installed by a dewatering specialist. A groundwater management plan be submitted for review and approval as part of the contract. Any groundwater disposal should be carried out in accordance with provincial and local regulations.

The groundwater levels identified in this report may not represent the seasonal high groundwater level, nor future conditions, as the groundwater level will fluctuate seasonally and during periods of notable precipitation, as well as possibly due to construction activities in the area of the project. Also, perched (shallow) groundwater may be present within the fill material including in granular surrounds to existing underground services, pavement materials, etc.

## **6.1 Groundwater Pumping Volume Estimate**

The amount of water entering the excavations for the construction at this site will depend on the size of the trench and pit excavations, as well as the water table level at the time of construction. The type of dewatering permit that is required is dependant on the estimated groundwater inflow volumes during construction.

An Environmental Activity and Sector Registry (EASR) is required for groundwater taking between 50,000 to 400,000 litres per day, and a Category 3 Permit to Take Water (PTTW) is required for water takings greater than 400,000 litres per day. Supporting documentation prepared by a Qualified Professional is required to support an EASR or PTTW application.

Based on the potential of shallow groundwater tables, the high hydraulic conductivity soils ( $10^{-4}$  m/s) and the underlying bedrock aquifer ( $10^{-4}$  m/s), and the potential of encountering an infilled trench that may be transmitting water into/across the site, significant groundwater infiltration over 400,000 litres per day could be encountered.

Therefore, a Category 3 Permit to Take Water (PTTW) is recommended. To support a Category 3 PTTW application, additional hydrogeological assessment will be required to estimate dewatering rates (based on a review of preliminary design drawings and project requirements for fill removal) and associated impacts to natural features, well users, etc.

The proposed PTTW will be completed to support the dewatering requirements for the construction activities only. If permanent groundwater pumping is required to lower groundwater levels (e.g.,

maintain groundwater levels below footing levels, if required), additional investigations may be required.

## **6.2 Groundwater Management Options**

To assess groundwater management options, groundwater samples were collected from the monitoring well MW23-01 to MW23-03S and MW23-03D, in laboratory supplied bottles using a low-flow peristaltic pump with disposable tubing. Static groundwater levels were measured in all wells prior to sampling on February 2, 2024, using a Heron Instruments oil/water interface meter. Free petroleum product was not detected in the monitoring well. Samples were collected following a period of stabilization, which was monitored using a multi-parameter probe. The samples were submitted to a CALA-accredited laboratory for following parameters to supplement the Phase Two ESA (GEMTEC, 2023): total suspended solids and total metals.

Groundwater analytical results were compared to the City of Ottawa Sewer Use By-Law, more specifically to the Sanitary and Combined Sewer (Table 1) and Storm Sewer use (Table 2) limits.

Water quality analytical results from the Phase Two ESA and the supplemental sampling program are presented in Appendix H along with their respective Laboratory certificates of analysis.

For the purpose of assessing pumped groundwater discharge options, a summary of parameters in groundwater with concentrations exceeding the Table 1 and Table 2 Discharge Limits is summarized below.

### **MW23-01**

- Manganese (0.115 mg/L vs. the Table 2 Limit of 0.05 mg/L);
- Total Suspended Solids (402 mg/L vs. the Table 1 Limit of 350 mg/L)

### **MW23-02**

- Manganese (0.925 mg/L vs. the Table 2 Limit of 0.05 mg/L);
- Total Suspended Solids (18 mg/L vs. the Table 2 Limit of 15 mg/L).

### **MW23-03S**

- Manganese (1.74 mg/L vs. the Table 2 Limit of 0.05 mg/L);
- Total Suspended Solids (12,400 mg/L vs. the Table 1 Limit of 350 mg/L).

### **MW23-03D**

- Manganese (0.166 mg/L vs. the Table 2 Limit of 0.05 mg/L);
- Total Suspended Solids (123 mg/L vs. the Table 2 Limit of 15 mg/L).



The concentration of the sampled parameters in the groundwater samples met the Table 1 and Table 2 Limits, with the exceptions of manganese and total suspended solids (TSS). No detectable concentrations of volatile organic compounds (VOCs), or petroleum hydrocarbons (PHCs) were reported in the samples. Elevated TSS is not uncommon and is associated with sampling from newly constructed monitoring wells. Filtration at the time of discharge using appropriate sediment and erosion control measures is expected to reduce TSS levels to acceptable limits for discharge to storm sewers (i.e., Table 2 limits).

The elevated manganese concentration of may also be related to the presence of suspended sediment in the sample and / or naturally occurring, as is common in the Ottawa area. A variance for naturally occurring manages can be requested from the local sewer use office, or treatment of manganese prior to discharge may be required.

Removal of suspended solids with filter bags and appropriate sediment control will be necessary before discharging groundwater to local sewers. Based on the results of the water quality sampling, the groundwater can be discharged to a combined/sanitary sewer or a storm sewer following the implementation of sedimentation control measures to reduce TSS and manganese to acceptable levels and where manganese is dissolved and exceeds the acceptable limits, a variance or on-site treatment may be required. Discharge to municipal sewer systems require approval from the City of Ottawa Sewer Use Office in the form of a City of Ottawa sewer use agreement.

## **7.0 ADDITIONAL SITE INVESTIGATIONS**

### **7.1 Long-Term Water Levels**

Long-term groundwater level monitoring is recommended to determine seasonally high-water levels in support of the proposed Low Impact Development features. Electronic dataloggers are currently installed in the four on-site monitoring wells, to be downloaded at quarterly intervals and monitored over a 1-year period. Comments will be provided on seasonally high-water levels, trends, flow directions, response to significant precipitation events, and any long-term changes. The results of the long-term water level monitoring will be provided under separate cover.

### **7.2 Infiltration Testing**

It is recommended that In-situ infiltration testing be completed at the specific locations of proposed LID features using a Guelph Permeameter to gather representative infiltration rates of the soils underlying the features. The long-term water level monitoring data should be reviewed as part of to determine seasonally high water levels to ensure minimum separation distance of 1.0 metre is present between the bottom of the LID features and the water table.

### 7.3 Permit To Take Water (PTTW)

Significant groundwater infiltration over 400,000 litres per day could be encountered during subsurface construction, associated with removal of the site fill material for construction of the proposed structure footings. Therefore, it is recommended that a category 3 Permit To Take Water application, submitted to the MECP is recommended prior to construction. To note, the MECP has a 90-day review period for PTTW applications.

## 8.0 REFERENCES

Supplemental Geotechnical Investigation, Proposed Light Industrial Warehouse Development, 4497 O'Keefe Court, Ottawa Ontario, prepared by GEMTEC (Project No. 102669.001).

Phase One Environmental Site Assessment, 4497 O'Keefe Court, Ottawa, Ontario, prepared by GEMTEC (Project No. 102669.001).

Ontario Geological Survey. 2010. Surficial geology of Southern Ontario. Ontario Geological Survey, Miscellaneous Release-Data 128-Revision 1.

Ontario Geological Survey. 2011. 1:250 000 scale bedrock geology of Ontario. Ontario Geological Survey, Miscellaneous Release-Data 126-Revision 1.

Singer, S.N., Cheng, C.K., and Scafe, M.G. 2003. The Geology of Southern Ontario, Second Edition, April 2003.

Ontario Ministry of Municipal Affairs and Housing (OMMAH), 1997. Supplementary Guidelines to Ontario Building Code 1997, SG-6 Percolation Times and Soil Descriptions, Toronto, Ontario.

Maryland Department of the Environment (MDE), 2009. Method for Designing Infiltration Structures, Appendix D.13., Figure D.13.1, Revised May 2009. 2000 Maryland Stormwater Design Manual. Prepared by Center for Watershed Protection (CWP). Baltimore, MD).

## 9.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.



Brent Redmond, M.A.Sc, P.Geo  
Hydrogeologist



Andrius Paznekas, M.Sc., P.Geo.  
Hydrogeologist



BR/DC/AP

## CONDITIONS AND LIMITATIONS OF THIS REPORT

1. **Standard of Care:** GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.
2. **Copyright:** The contents of this report are subject to copyright owned by GEMTEC, save to the extent that copyright has been legally assigned by us to another party or is used by GEMTEC under license. To the extent that GEMTEC owns the copyright in this report, it may not be copied without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to the Client in confidence and must not be disclosed or copied to third parties without the prior written agreement of GEMTEC. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests.
3. **Complete Report:** This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC cannot be responsible for use of portions of the report without reference to the entire report.
4. **Basis of Report:** This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.
5. **Time Dependence:** If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.
6. **Use of This Report:** The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process.

Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.
7. **No Legal Representations:** GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.
8. **Decrease in Property Value:** GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **Reliance on Provided Information:** The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions,

misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

10. **Investigation Limitations:** Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of the subsurface descriptions.

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

In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fill materials or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.
12. **Follow-Up and Construction Services:** All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.  
During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of GEMTEC's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in GEMTEC's report. Adequate field review, observation and testing during construction are necessary for GEMTEC to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, GEMTEC's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.
13. **Changed Conditions:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.
14. **Drainage:** Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



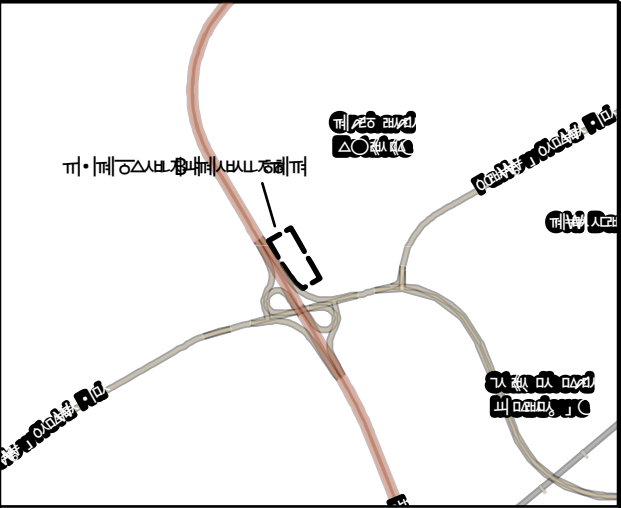
## **APPENDIX A**

### Site Development Plan









- 연구대상지역**
- 북쪽방향**
- 도로**
- 연구대상지역**
- 연구대상지역**
- 연구대상지역**



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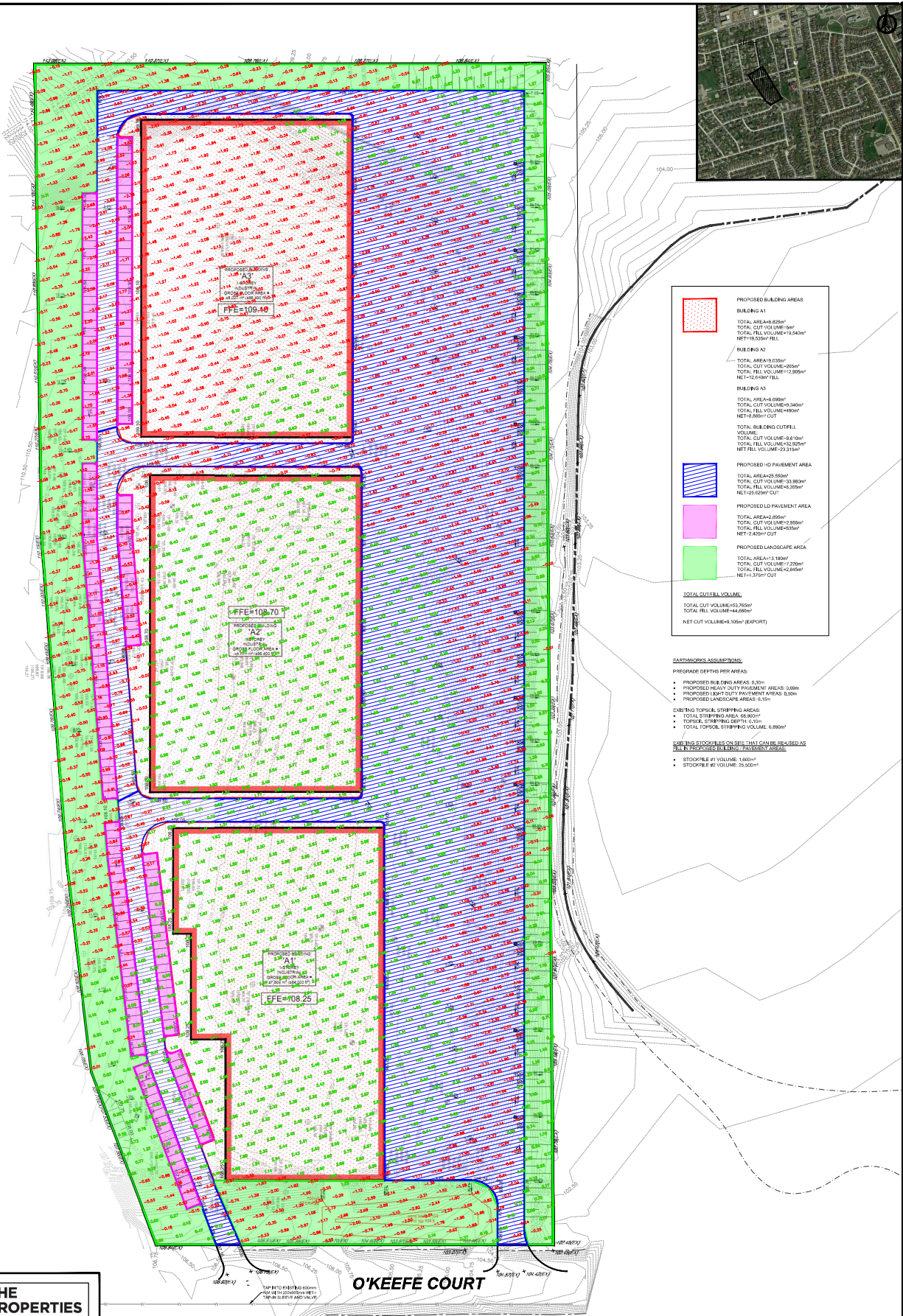
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THE KINGS HIGHWAY 416



<b>PROPOSED BUILDING AREAS</b>	
<b>BUILDING A1</b>	
TOTAL AREA=8.05m <sup>2</sup>	
TOTAL CUT VOLUME=19.54m <sup>3</sup>	
TOTAL FILL VOLUME=19.54m <sup>3</sup>	
NET=0.00m <sup>3</sup> FILL	
<b>BUILDING A2</b>	
TOTAL AREA=9.03m <sup>2</sup>	
TOTAL CUT VOLUME=20.00m <sup>3</sup>	
TOTAL FILL VOLUME=12.00m <sup>3</sup>	
NET=8.00m <sup>3</sup> FILL	
<b>BUILDING A3</b>	
TOTAL AREA=8.05m <sup>2</sup>	
TOTAL CUT VOLUME=9.34m <sup>3</sup>	
TOTAL FILL VOLUME=8.00m <sup>3</sup>	
NET=1.34m <sup>3</sup> CUT	
<b>TOTAL BUILDING CUT/FILL VOLUME</b>	
TOTAL CUT VOLUME=48.88m <sup>3</sup>	
TOTAL FILL VOLUME=39.54m <sup>3</sup>	
NET FILL VOL=9.34m <sup>3</sup>	
<b>PROPOSED 1D PAVEMENT AREA</b>	
TOTAL AREA=2.55m <sup>2</sup>	
TOTAL CUT VOLUME=33.30m <sup>3</sup>	
TOTAL FILL VOLUME=8.35m <sup>3</sup>	
NET=25.00m <sup>3</sup> CUT	
<b>PROPOSED 1D PAVEMENT AREA</b>	
TOTAL AREA=2.05m <sup>2</sup>	
TOTAL CUT VOLUME=2.85m <sup>3</sup>	
TOTAL FILL VOLUME=4.00m <sup>3</sup>	
NET=1.15m <sup>3</sup> FILL	
<b>PROPOSED LANDSCAPE AREA</b>	
TOTAL AREA=1.18m <sup>2</sup>	
TOTAL CUT VOLUME=7.20m <sup>3</sup>	
TOTAL FILL VOLUME=2.85m <sup>3</sup>	
NET=4.35m <sup>3</sup> CUT	
<b>TOTAL CUT/FILL VOLUME</b>	
TOTAL CUT VOLUME=83.79m <sup>3</sup>	
TOTAL FILL VOLUME=46.69m <sup>3</sup>	
NET CUT VOLUME=37.10m <sup>3</sup> (EXPORT)	

- EARTHWORK ASSUMPTIONS:**
- PROPOSED BUILDING AREAS: 0.30m
  - PROPOSED HEAVY DUTY PAVEMENT AREAS: 0.09m
  - PROPOSED LIGHT DUTY PAVEMENT AREAS: 0.09m
  - PROPOSED LANDSCAPE AREAS: 0.15m
- ESTIMATING TOPSOIL STRIPPING AREAS:**
- TOTAL STRIPPING AREA: 16.80m<sup>2</sup>
  - TOPSOIL STRIPPING DEPTH: 0.10m
  - TOTAL TOPSOIL STRIPPING VOLUME: 1.68m<sup>3</sup>
- ESTIMATING STOCKPILES ON SITE THAT CAN BE RE-CYCLED AS FILL IN PROPOSED BUILDING/PAVEMENT AREAS:**
- STOCKPILE #1 VOLUME: 1.60m<sup>3</sup>
  - STOCKPILE #2 VOLUME: 25.00m<sup>3</sup>



**THE PROPERTIES GROUP**



KWA SITE DEVELOPMENT  
CONSULTING INC.  
2100 Appleton Drive  
Burlington, ON L7R 1A8

REVISION BLOCK	
#	DATE DESCRIPTION
1	04/21/2023 ISSUED FOR COORDINATION

CONCEPTUAL GRADING PLAN

THE PROPERTIES GROUP  
O'KEEFE COURT (NEPEAN)


NEPEAN, ONTARIO

PROJECT No. 21884

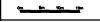
DRAWN BY: BC2

CHECKED BY: CDB

NORTH ARROW



GRAPHIC SCALE



CGP



## **APPENDIX B**

### Water Well Record Study

## MECP Online Well Database Summary (500-m Radius)

(1 of 5)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7102912	NEPEAN TOWNSHIP 05 025	2008-02-15	NU	60.9	4.3	6.1	-	-	BRWN CLAY SAND HARD 0014 BLDR GREY LMSN LYRD 0200
7218442	NEPEAN TOWNSHIP RF 04 021	2014-01-15	-	-	-	-	-	-	-
1520817	NEPEAN TOWNSHIP	1986-03-21	DO	93.0	4.3	6.7	7.3	FR 0195 FR 0297	BRWN SAND CLAY BLDR 0004 BRWN SAND GRVL PCKD 0014 GREY LMSN LYRD MGRD 0305
1534314	NEPEAN TOWNSHIP RF 04 020	2003-09-23	NU	-	-	-	-	-	-
1534317	NEPEAN TOWNSHIP RF 04 020	2003-11-05	NU	-	-	-	-	-	-
1527488	NEPEAN TOWNSHIP RF 04 020	1993-09-24	PS AC	91.4	7.6	8.8	2.4	UK 0075 UK 0145 UK 0275	GREY CLAY BLDR PCKD 0025 GREY LMSN HARD 0145 SNDS HARD 0300
1527489	NEPEAN TOWNSHIP RF 04 020	1993-09-24	PS AC	88.4	7.0	8.2	2.7	UK 0075 UK 0145 UK 0275	GREY CLAY BLDR PCKD 0023 GREY LMSN HARD 0145 SNDS HARD 0290
1527903	NEPEAN TOWNSHIP RF 04 020	1994-09-24	AC	119.8	5.2	7.6	-	UK 0175	GREY CLAY BLDR PCKD 0017 GREY LMSN SHLE DRY 0120 SNDS LMSN FCRD 0393
			AC = Cooling and A/C IR = Irrigation OT = Other	CO = Commercial MN = Municipal PS = Public	DE = Dewatering MO = Monitoring ST = Livestock	DO = Domestic MT = Monitoring and Test Hole TH = Test Hole	IN = Industrial NU = Not Used		

# MECP Online Well Database Summary (500-m Radius)

(2 of 5)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
1528157	NEPEAN TOWNSHIP RF 04 020	1994-08-25	CO AC	90.5	5.5	10.1	2.7	UK 0050 UK 0275	BRWN OBDN STNS 0018 GREY LMSN FCRD 0027 GREY LMSN MGRD 0085 GREY SNDS LMSN 0140 GREY LMSN VERY HARD 0160 GREY SNDS LMSN LYRD 0275 WHIT SNDS MGRD 0297
7162187	NEPEAN TOWNSHIP RF 04 021	2011-03-21	DO	134.1	15.5	17.7	14.8	UT 0433	SAND GRVL BLDR 0051 GREY LMSN 0433 GREY LMSN 0440
1535794	NEPEAN TOWNSHIP 04 020	2005-08-03	DO	103.6	3.0	6.7	3.5	0330 0332	GRVL 0010 GREY LMSN 0340
1535406	NEPEAN TOWNSHIP	2005-03-05		6.0		1.3	-	-	BRWN SILT SNDY GREY SILT CLYY BLDR 0020
7200691	NEPEAN TOWNSHIP RF 04 021	2013-02-11	DO	42.7	17.7	25.0	10.4	UT 0132	SAND GRVL BLDR 0058 GREY LMSN QTZ 0132 GREY LMSN QTZ 0140
7152273	NEPEAN TOWNSHIP RF 04 021	2010-07-27	DO	137.2	2.4	6.1	15.3	UT 0218	SAND GRVL 0008 GREY LMSN 0185 GREY LMSN 0220 GREY LMSN 0450
7244907	NEPEAN TOWNSHIP RF 04 021	2015-06-05	-	-	-	-	-	-	-
7219580	NEPEAN TOWNSHIP RF 04 022	2013-07-17	DO	170.7	0.9	16.8	2.6	UT 0259 UT 0358	GRVL CLAY 0003 GREY LMSN 0230 GREY LMSN QTZ 0240 GREY LMSN 0265 GREY LMSN SNDS 0270 GREY

OT = Other

PS = Public

ST = Livestock

TH = Test Hole



# MECP Online Well Database Summary (500-m Radius)

(3 of 5)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
									LMSN 0520 GREY LMSN SNDS 0536 WHIT SNDS 0560
1534739	NEPEAN TOWNSHIP RF 04 022	2004-05-25	DO	23.0	2.0	7	4.2	75	BRWN GRVL 0007 GREY LMSN 0062 RED SNDS 0075
7438764	-	2022-11-08	-	-	-	-	-	-	-
7298094	NEPEAN TOWNSHIP RF 04 022	2017-06-13	-	9.6	-	-	-	-	
7167913	NEPEAN TOWNSHIP RF 04 021	2011-05-19	DO	189.0	2.4	79.9	15.2	-	SAND GRVL ROCK 0008 GREY LMSN 0148 BLCK SHLE 0285 GREY LMSN 0525 GREY SNDS LMSN 0620
7169716	NEPEAN TOWNSHIP RF 04 021	2011-06-30		225.6	2.4		15.6	-	0620 GREY SNDS 0654 RED GRNT 0710 WHIT GRNT QTZ 0740
7256766	NEPEAN TOWNSHIP RF 04 021	2015-12-23	-	-	-	-	-	-	-
7263451	NEPEAN TOWNSHIP	2015-11-09	-	-	-	-	-	-	-
7253258	NEPEAN TOWNSHIP RF 04 022	2015-11-13	MT	7.0	3.1	3.96			GREY GRVL LOOS 0002 BRWN SAND GRVL LOOS 0010 GREY LMSN LYRD 0023
1535795	NEPEAN TOWNSHIP 04 020	2005-08-04	DO	43.3	5.5	7.3	3.6	36	GRVL 0018 LMSN 0142

OT = Other

PS = Public

SL = Livestock

TR = Test Hole

## MECP Online Well Database Summary (500-m Radius)

(4 of 5)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
1525470	NEPEAN TOWNSHIP 04 021	1991-06-19	DO	56.4	14.0	14.9		UK 0055 UK 0179	BRWN CLAY BLDR 0018 GREY CLAY BLDR SNDY 0046 GREY LMSN SNDS LYRD 0185
1528797	NEPEAN TOWNSHIP 04 021	1995-11-17	MN	52.7	3.7	4.3	8.0	UK 0014 UK 0108 UK 0148	BRWN LOAM SNDY DRY 0012 GREY GRNT WBRG 0013 GREY LMSN MGRD SOFT 0106 GREY LMSN LYRD FCRD 0173
1523369	NEPEAN TOWNSHIP RF 04 021	1989-02-22	DO	45.7	1.8	6.4	30.0	FR 0050 FR 0142	BRWN SAND FILL 0006 WHIT SNDS LYRD HARD 0150
1525234	NEPEAN TOWNSHIP RF 04 021	1990-12-15	DO AC	26.2	-	25.3	4.0	FR 0085	BRWN CLAY 0015 GREY CLAY BLDR 0038 GREY HPAN BLDR 0075 GREY GRVL 0086
1526002	NEPEAN TOWNSHIP RF 04 021	1991-10-17	IR	62.5	3.4	6.7	20.0	UK 0125 UK 0184 UK 0202	BRWN HPAN BLDR PCKD 0011 GREY LMSN MGRD 0167 GREY SNDS HARD 0205
1530347	NEPEAN TOWNSHIP RF 04 021	1998-10-20	ST	91.4	-	91.4	18.0	UK 0233 UK 0268	UNKN 0200 GREY LMSN 0278 GREY LMSN 0300
1530347	NEPEAN TOWNSHIP RF 04 021	1998-10-20	ST	91.4	-	91.4	18.0	UK 0233 UK 0268	UNKN 0200 GREY LMSN 0278 GREY LMSN 0300
7189269	NEPEAN TOWNSHIP RF 04 022	2012-06-27	DO	152.4	0.0	12.2	14.0	UT 0380	SHLE FCRD 0004 GREY LMSN 0360 GREY LMSN 0380 GREY LMSN 0500

AC = Cooling and A/C  
IR = Irrigation  
OT = Other

CO = Commercial  
MN = Municipal  
PS = Public

DE = Dewatering  
MO = Monitoring  
ST = Livestock

DO = Domestic  
MT = Monitoring and Test Hole  
TH = Test Hole

IN = Industrial  
NU = Not Used

## MECP Online Well Database Summary (500-m Radius)

(5 of 5)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7321075	NEPEAN TOWNSHIP RF 04 022	2018-09-18							
1506101	NEPEAN TOWNSHIP RF 04 022	1955-05-14	DO	37.5	0.0	6.40/37.49	20.0	FR 0100	LMSN 0123
7315283	NEPEAN TOWNSHIP RF 04 022	2018-06-19	DO	54.9	1.8	12.19/54.86	8.1	UT 0072 UT 0104 UT 0173	HPAN FILL 0006 GREY LMSN 0180
1522195	NEPEAN TOWNSHIP	1987-11-30	DO	38.1	1.2	6.10/30.48/38.10	3.0	FR 0117	BRWN CLAY PCKD 0004 WHIT SNDS LYRD VERY 0125
1525630	NEPEAN TOWNSHIP 04 022	1991-08-12	DO	41.1	2.7	6.71/41.15	6.0	UK 0129	BRWN CLAY BLDR PCKD 0009 GREY LMSN HARD 0110 GREY SNDS HARD 0135
1527561	NEPEAN TOWNSHIP 04 022	1993-10-07	DO	29.9	4.0	7.9	9.0	UK 0065 UK 0085	BRWN LOAM FCRD LYRD 0013 GREY SNDS HARD 0098
1518834	NEPEAN TOWNSHIP RF 04 022	1983-11-07	DO	30.5	4.3	6.1	10.0	FR 0060 FR 0092	BRWN CLAY SAND GRVL 0014 GREY SNDS HARD 0100

AC = Cooling and A/C  
IR = Irrigation  
OT = Other

CO = Commercial  
MN = Municipal  
PS = Public

DE = Dewatering  
MO = Monitoring  
ST = Livestock

DO = Domestic  
MT = Monitoring and Test Hole  
TH = Test Hole

IN = Industrial  
NU = Not Used

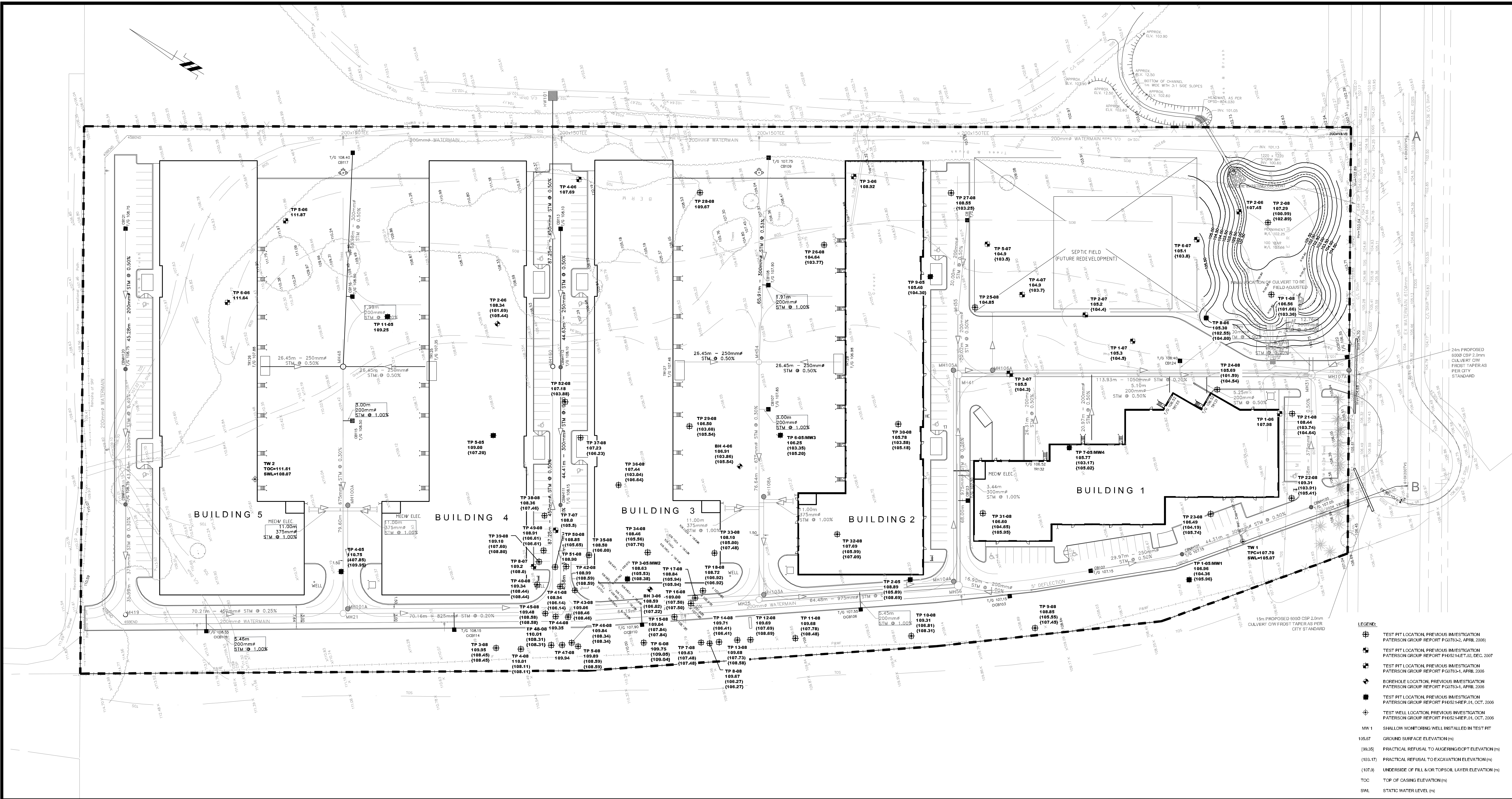




## **APPENDIX C**

Paterson, 2015





patersongroup

consulting engineers

154 Colonnade Road South  
Ottawa, Ontario K2E 7J5  
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NO.	REVISIONS	DATE	INITIAL
2	BASE PLAN UPDATED	30/10/2015	DJG
1	BASE PLAN UPDATED	23/09/2015	DJG

O'KEEFE COURT PROPERTIES LIMITED

GEOTECHNICAL INVESTIGATION

PROP. OFFICE / WAREHOUSE DEVELOPMENT - 449 O'KEEFE COURT

OTTAWA, ONTARIO

TEST HOLE LOCATION PLAN

Scale: 1:500

Drawn by: MPG

Checked by: DJG

Approved by: DJG

Date: 09/2015

Report No.: PG0783

Drawing No.: PG0783-2

Revision No.: 2



# **APPENDIX 1**

**SOIL PROFILE AND TEST DATA SHEETS**

**SYMBOLS AND TERMS**

**GRAIN SIZE DISTRIBUTION SHEETS**

**ANALYTICAL TESTING RESULTS**

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 1-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel

DATE April 11, 2008

FILE NO.

PG0783

HOLE NO.

TP 2-08

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	107.29					
FILL: Brown silty sand, some crushed stone, trace asphalt		G	1			1	106.29					
						2	105.29					
FILL: Grey crushed stone, some clay, sand, trace asphalt		G	2			3	104.29					
FILL: Grey crushed stone						4	103.29					
TOPSOIL						5	102.29					
Grey-brown SILTY CLAY, some sand		G	3			6	101.29					
GLACIAL TILL: Brown silty sand, some gravel, cobbles, boulders, trace clay		G	4									
- grey by 5.7m depth		G	5									
End of Test Pit												
TP terminated on bedrock surface at 6.30m depth												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. PG0783

REMARKS

HOLE NO. **TP 2-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 3-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 4-08**

**DATE** April 11, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	110.01					
<b>FILL:</b> Brown silty sand  <div> <div></div> <div>1.90</div> </div> End of Test Pit  TP terminated on bedrock surface at 1.90m depth						1	109.01					
								20	40	60	80	100



## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 5-08**

**DATE** April 11, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
FILL: Brown silty sand with gravel, some asphalt						0	109.89					
- - - - - 0.40												
FILL: Brown silty sand, some crushed stone												
- - - - - 1.30						1	108.89					
End of Test Pit												
TP terminated on bedrock surface at 1.30m depth												

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 6-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 7-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 8-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel

DATE April 11, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP 9-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	108.85						
FILL: Brown silty sand with crushed stone						1	107.85						
TOPSOIL													
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders						2	106.85						
						3	105.85						
End of Test Pit													
TP terminated on bedrock surface at 3.20m depth													
(GWL @ 1.8m depth based on field observations)													

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. PG0783

REMARKS

HOLE NO. **TP10-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. PG0783

REMARKS

HOLE NO. **TP11-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 11, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>												
FILL: Crushed stone ----- 0.10						0	109.68					
FILL: Brown silty sand with gravel, cobbles, boulders and blast rock ----- 1.20						1	108.68					
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders ----- 1.90												
End of Test Pit												
TP terminated on bedrock surface at 1.90m depth												
(GWL @ 1.7m depth based on field observations)												

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP12-08**

**DATE** April 11, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>						0	109.69					
FILL: Crushed stone ----- 0.15	[Cross-hatch pattern]											
FILL: Brown silty sand with crushed stone ----- 1.00	[Cross-hatch pattern]					1	108.69					
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders ----- 2.00	[Upward triangle pattern]											
End of Test Pit						2	107.69					
TP terminated on bedrock surface at 2.00m depth												
(GWL @ 1.6m depth based on field observations)												

Shear Strength (kPa)  
▲ Undisturbed    △ Remoulded



## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP13-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP14-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP15-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. PG0783

REMARKS

HOLE NO. **TP16-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. **PG0783**

REMARKS

HOLE NO. **TP17-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 11, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>						0	108.84					
<b>FILL:</b> Blast rock						1	107.84					
						2	106.84					
End of Test Pit	2.90											
TP terminated on bedrock surface at 2.90m depth												

Shear Strength (kPa)  
▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. PG0783

REMARKS

HOLE NO. **TP18-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 11, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	108.72					
FILL: Brown silty sand with blast rock												
1.00												
FILL: Blast rock						1	107.72					
1.80												
End of Test Pit												
TP terminated on bedrock surface at 1.80m depth												

20406080100

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic




REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP21-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	108.44						
FILL: Grey-brown silty sand with crushed stone, trace asphalt		G	1			1	107.44						
						2	106.44						
						3	105.44						
	3.50	G	2										
TOPSOIL	3.80												
Brown SILTY CLAY	3.95												
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders		G	3			4	104.44						
End of Test Pit	4.70												
TP terminated on bedrock surface at 4.70m depth													
								20	40	60	80	100	
								Shear Strength (kPa)					
								▲ Undisturbed    △ Remoulded					

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel


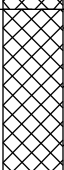



DATE April 14, 2008

FILE NO.

PG0783

HOLE NO.

TP22-08

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	109.31					
FILL: Brown silty sand with crushed stone, gravel, cobbles, trace asphalt		G	1			1	108.31					
						2	107.31					
						3	106.31					
FILL: Crushed stone, trace asphalt		G	2			3	106.31					
		G	3									
TOPSOIL												
Brown SILTY CLAY with sand, trace gravel						4	105.31					
GLACIAL TILL: Brown silty sand, some clay, gravel, cobbles and bouldes		G	4			5	104.31					
End of Test Pit												
TP terminated on bedrock surface at 5.40m depth												

20 40 60 80 100  
Shear Strength (kPa)  
▲ Undisturbed △ Remoulded



## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP23-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP24-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP25-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	104.85					
FILL: Crushed stone	0.40	G	1									
FILL: Blast rock	0.60											
TOPSOIL	0.75											
Brown SILTY CLAY		G	2			1	103.85					
						2	102.85					
	2.50											
GLACIAL TILL: Brown silty sand, some clay, gravel, cobbles and boulders						3	101.85					
- grey by 3.4m depth												
	4.00											
End of Test Pit												
TP terminated on bedrock surface at 4.00m depth												
(GW infiltration at 0.6m depth)												

Shear Strength (kPa)  
 ▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. PG0783

REMARKS

HOLE NO. **TP26-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP27-08**

**DATE** April 14, 2008

[illegible]



## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP28-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP29-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP30-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY <small>%</small>	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>												
<b>FILL:</b> Brown silty sand, trace crushed stone and organics ----- 0.30		G	1			0	105.78					
<b>TOPSOIL</b> ----- 0.60												
<b>GLACIAL TILL:</b> Bluish brown silty sand, some gravel, cobbles and boulders  ----- 2.20		G	2			1	104.78					
End of Test Pit  TP terminated on bedrock surface at 2.20m depth  (GWL infiltration at bottom of test pit)						2	103.78					

20    40    60    80    100

**Shear Strength (kPa)**

▲ Undisturbed     △ Remoulded

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP31-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic





FILE NO. PG0783

REMARKS

HOLE NO. **TP32-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>												
<b>FILL:</b> Organics, some crushed stone						0	107.70					
<b>TOPSOIL</b>												
<b>GLACIAL TILL:</b> Brown silty clay, some sand, gravel and cobbles						1	106.70					
<b>GLACIAL TILL:</b> Grey-brown silty sand, some gravel, cobbles and boulders, trace clay						2	105.70					
						3	104.70					
End of Test Pit												
TP terminated on bedrock surface at 3.70m depth  (GW infiltration at 1.4m depth)												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded



## SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel





DATE April 14, 2008

FILE NO.

PG0783

HOLE NO.

TP33-08

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
FILL: Organics, trace blast rock						0	108.10					
	0.30											
TOPSOIL												
	0.62											
						1	107.10					
GLACIAL TILL: Brown sand with gravel and cobbles												
	2.20					2	106.10					
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders						3	105.10					
	3.10											
End of Test Pit												
TP terminated on bedrock surface at 3.10m depth												

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP34-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP35-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY <small>%</small>	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>												
FILL: Crushed stone ----- 0.15	[Pattern]					0	108.50					
<b>GLACIAL TILL:</b> Brown silty sand, some gravel, cobbles and boulders	[Pattern]											
	[Pattern]											
	[Pattern]											
	[Pattern]											
	[Pattern]											
	[Pattern]											
	[Pattern]											
Inferred <b>BEDROCK</b> ----- 2.50	[Pattern]											
End of Test Pit ----- 2.60	[Pattern]											
(GW infiltration at bedrock surface)												

Shear Strength (kPa)  
 ▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP36-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	107.44					
FILL: Brown silty sand, trace gravel, cobbles and clay												
0.60												
TOPSOIL												
0.80												
Brown SILTY CLAY						1	106.44					
1.20												
						2	105.44					
GLACIAL TILL: Dense, brown silty sand, some gravel, cobbles and boulders						3	104.44					
- grey by 3.3m depth												
						4	103.44					
4.40												
End of Test Pit												
TP terminated on bedrock surface at 4.40m depth												
											</	

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP37-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP38-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	108.36					
<b>FILL:</b> Brown silty sand, some gravel, cobbles and boulders, trace clay												
0.90						1	107.36					
<b>GLACIAL TILL:</b> Dense, brown silty sand, some gravel, cobbles and boulders												
2.10						2	106.36					
End of Test Pit												
TP terminated in glacial till at 2.10m depth												

20406080100

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded



## SOIL PROFILE AND TEST DATA

Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic



REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP39-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
FILL: Brown silty sand with gravel, cobbles, some crushed stone 0.30						0	109.10					
GLACIAL TILL: Brown silty sand, some gravel, cobbles and boulders 1.50						1	108.10					
End of Test Pit												
TP terminated on bedrock surface at 1.50m depth												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP40-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>GLACIAL TILL:</b> Brown silty sand, some gravel, cobbles and boulders  <div style="text-align: right;">0.90</div> End of Test Pit  TP terminated on bedrock surface at 0.90m depth						0	109.34					
<div style="display: flex; justify-content: space-between;"> <div> <p>20 40 60 80 100</p> <p><b>Shear Strength (kPa)</b></p> <p>▲ Undisturbed    △ Remoulded</p> </div> </div>												


## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP41-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>FILL:</b> Blast rock with crushed stone						0	108.94					
						1	107.94					
						2	106.94					
End of Test Pit  TP terminated on bedrock surface at 2.80m depth	2.80											
<div> <div>20406080100</div> <div>Shear Strength (kPa)</div> <div> <div>▲ Undisturbed</div> <div>△ Remoulded</div> </div> </div>												

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic

FILE NO.  
**PG0783**

REMARKS

HOLE NO.  
**TP42-08**

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>						0	108.99					
<b>FILL:</b> Crushed stone												
End of Test Pit												
TP terminated on bedrock surface at 0.40m depth												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded


## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP43-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>FILL:</b> Blast rock, some asphalt  End of Test Pit  TP terminated on bedrock surface at 0.60m depth						0	109.06					

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keeffe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP44-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	109.35					
FILL: Blast rock, some asphalt												
1.10						1	108.35					
FILL: Blast rock with crushed stone												
2						2	107.35					
3						3	106.35					
End of Test Pit												
TP terminated in blast rock fill at 3.50m depth												

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded





## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP45-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	109.48					
FILL: Crushed stone												
0.40												
GLACIAL TILL: Brown silty sand, some gravel, cobbles and boulders												
0.90												
End of Test Pit												
TP terminated on bedrock surface at 0.90m depth												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP46-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>FILL:</b> Blast rock with asphalt  <div style="border-top: 1px dashed black; padding-top: 5px;">End of Test Pit</div>						0	109.84					
						1	108.84					
TP terminated on bedrock surface at 1.50m depth												

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. PG0783

REMARKS

HOLE NO. **TP47-08**

**BORINGS BY** Hydraulic Shovel

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel


DATE April 14, 2008

FILE NO.

PG0783

HOLE NO.

TP48-08

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>FILL:</b> Blast rock, some crushed stone, sand, trace asphalt						0	110.01					
						1	109.01					
End of Test Pit  TP terminated on bedrock surface at 1.70m depth	1.70											

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP49-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>GLACIAL TILL:</b> Brown silty sand, some gravel, cobbles and boulders						0	108.91					
						1	107.91					
						2	106.91					
End of Test Pit  TP terminated on bedrock surface at 2.30m depth  (GW infiltration at 2.1m depth)	2.30											

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic


REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP50-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	108.85						
FILL: Crushed stone and blast rock						1	107.85						
						2	106.85						
						3	105.85						
End of Test Pit													
TP terminated on bedrock surface at 3.20m depth													

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded



## SOIL PROFILE AND TEST DATA

Geotechnical Investigation  
Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP51-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
GLACIAL TILL: Brown silty sand, some gravel, cobbles and boulders						0	108.90					
						1	107.90					
End of Test Pit												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**  
**Office/Warehouse Development - 449 O'Keeffe Court**  
**Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP52-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	107.18					
<b>FILL:</b> Grey-brown silty clay, some sand, gravel, cobbles, boulders, trace asphalt						1	106.18					
						2	105.18					
						3	104.18					
						4	103.18					
		</										

[illegible]



DATUM Ground surface elevation interpolated from topographic plan.

FILE NO.

PH0521




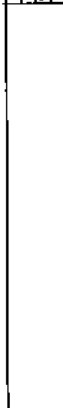
REMARKS

HOLE NO.

TP3-07

BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	105.50						
FILL: Boulders													
TOPSOIL						1	104.50						
Dense to very dense SANDY SILT to SILTY SAND, some clay						2	103.50						
End of Test Pit (Open hole GWL @ 1.0m depth)						3	102.50						
								20	40	60	80	100	
								Shear Strength (kPa)					
								▲ Undisturbed    △ Remoulded					

## SOIL PROFILE & TEST DATA

**Proposed Office/Warehouse Development**  
**4497 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM** Ground surface elevation interpolated from topographic plan.

FILE NO.

PH0521

REMARKS

HOLE NO.

TP4-07

## BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	104.90					
FILL: Boulders												
0.45												
FILL: Boulders with organics												
0.90												
TOPSOIL						1	103.90					
1.15												
Stiff, grey SANDY SILTY CLAY						2	102.90					
3.00						3	101.90					
End of Test Pit (Open hole GWL @ 0.4m depth)												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

**28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7**

**Proposed Office/Warehouse Development**  
**4497 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM** Ground surface elevation interpolated from topographic plan.

FILE NO.

PH0521

REMARKS

HOLE NO.

**TP5-07**

## BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	104.90						
FILL: Gravel						1	103.90						
1.40						2	102.90						
Light brown to grey SANDY SILTY CLAY						3	101.90						
3.00													
End of Test Pit (Open hole GWL @ 0.3m depth)													

20406080100

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded



DATUM Ground surface elevation interpolated from topographic plan.

FILE NO.

PH0521

REMARKS

HOLE NO.

TP6-07

BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	105.10						
FILL: Gravel with silt and sand													
TOPSOIL						1	104.10						
Stiff, grey SILTY CLAY, trace sand						2	103.10						
End of Test Pit						3	102.10						

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded



## SOIL PROFILE & TEST DATA

**Proposed Office/Warehouse Development**  
**4497 O'Keefe Court**  
**Ottawa, Ontario**

**DATUM** Ground surface elevation interpolated from topographic plan.

FILE NO.

PH0521

REMARKS

HOLE NO.

**TP8-07**

## BORINGS BY Backhoe

DATE 16 NOV 07

[illegible]

## SOIL PROFILE & TEST DATA

**Geotechnical Investigation  
O'Keefe Court and Highway 416  
Ottawa, Ontario**

**DATUM** TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

FILE NO.

**PG0783**

REMARKS

HOLE NO.

**BH1-06**

**BORINGS BY CME 75 Power Auger**

DATE 14 MAR 06

[illegible]

DATUM TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by  
Paterson Group Report No. PH0208-1.

REMARKS

FILE NO.

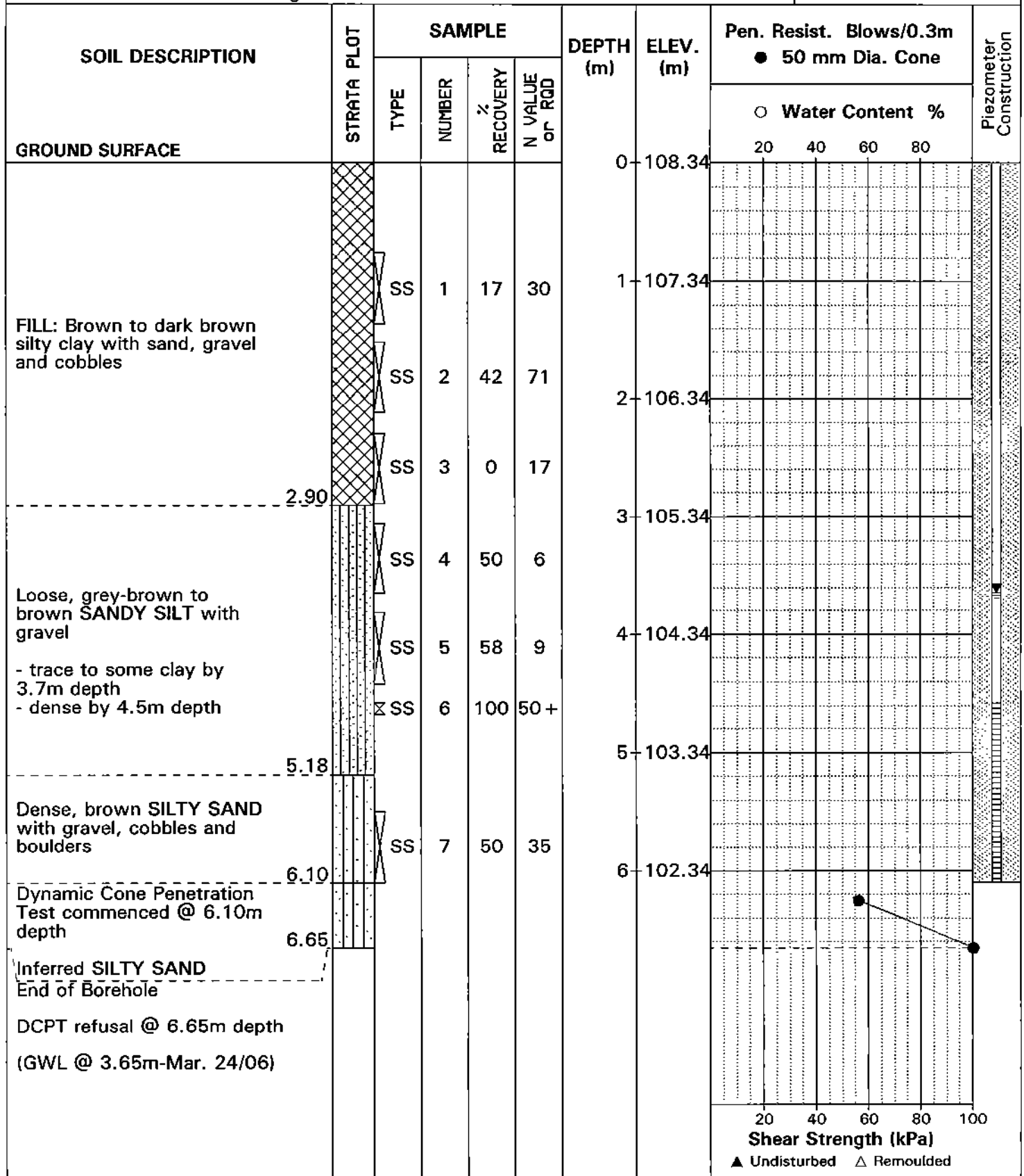
PG0783

HOLE NO.

BH2-06

BORINGS BY CME 75 Power Auger

DATE 14 MAR 06



**28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7**

## SOIL PROFILE & TEST DATA

**Geotechnical Investigation  
O'Keefe Court and Highway 416  
Ottawa, Ontario**

**DATUM** TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

FILE NO.

PG0783

REMARKS

HOLE NO.

**BH3-06**

**BORINGS BY CME 75 Power Auger**

DATE 14 MAR 06

[illegible]

## SOIL PROFILE & TEST DATA

**Geotechnical Investigation  
O'Keefe Court and Highway 416  
Ottawa, Ontario**

**DATUM** TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

FILE NO. PG0783

REMARKS

HOLE NO. **BH4-06**

**BORINGS BY CME 55 Power Auger**

DATE 14 MAR 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	106.91					
TOPSOIL						1	105.91					
	1.37	SS	1	12	24							
		SS	2	36	50 +							
Very dense, brown to grey-brown SILTY SAND with gravel, cobbles and boulders		SS	3	71	58 +	2	104.91					
	3.05					3	103.91					
End of Borehole												
Practical refusal to augering @ 3.05m depth												
(GWL @ ground surface - Mar. 24/06)												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded



## SOIL PROFILE & TEST DATA

**Geotechnical Investigation  
O'Keefe Court and Highway 416  
Ottawa, Ontario**

**DATUM** TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

**FILE NO.**

PG0783

REMARKS

HOLE NO.

**TP1-06**

## BORINGS BY Backhoe

DATE 24 MAR 06

[illegible]

## SOIL PROFILE & TEST DATA

Geotechnical Investigation  
O'Keefe Court and Highway 416  
Ottawa, Ontario


DATUM TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by  
REMARKS Paterson Group Report No. PH0208-1.

FILE NO.  
**PG0783**

HOLE NO.  
**TP2-06**

BORINGS BY Backhoe

DATE 24 MAR 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	107.45						
FILL: Dark brown silty sand mixed with gravel, crushed stone, cobbles, boulders, asphaltic concrete and organic matter		G	1										
		G	2										
		G	3										
		G	4										
End of Test Pit	2.74												
								20 40 60 80 100				Shear Strength (kPa)	
								▲ Undisturbed    △ Remoulded					

## SOIL PROFILE & TEST DATA

**Geotechnical Investigation  
O'Keeffe Court and Highway 416  
Ottawa, Ontario**

**DATUM** TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

FILE NO.

PG0783

REMARKS

HOLE NO.

**TP3-06**

## BORINGS BY Backhoe

DATE 24 MAR 06

[illegible]

**28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7**

## SOIL PROFILE & TEST DATA

**Geotechnical Investigation  
O'Keeffe Court and Highway 416  
Ottawa, Ontario**

**DATUM** TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

FILE NO.

PG0783

REMARKS

HOLE NO.

**TP4-06**

## BORINGS BY Backhoe

DATE 24 MAR 06

[illegible]



[illegible]

## SOIL PROFILE & TEST DATA

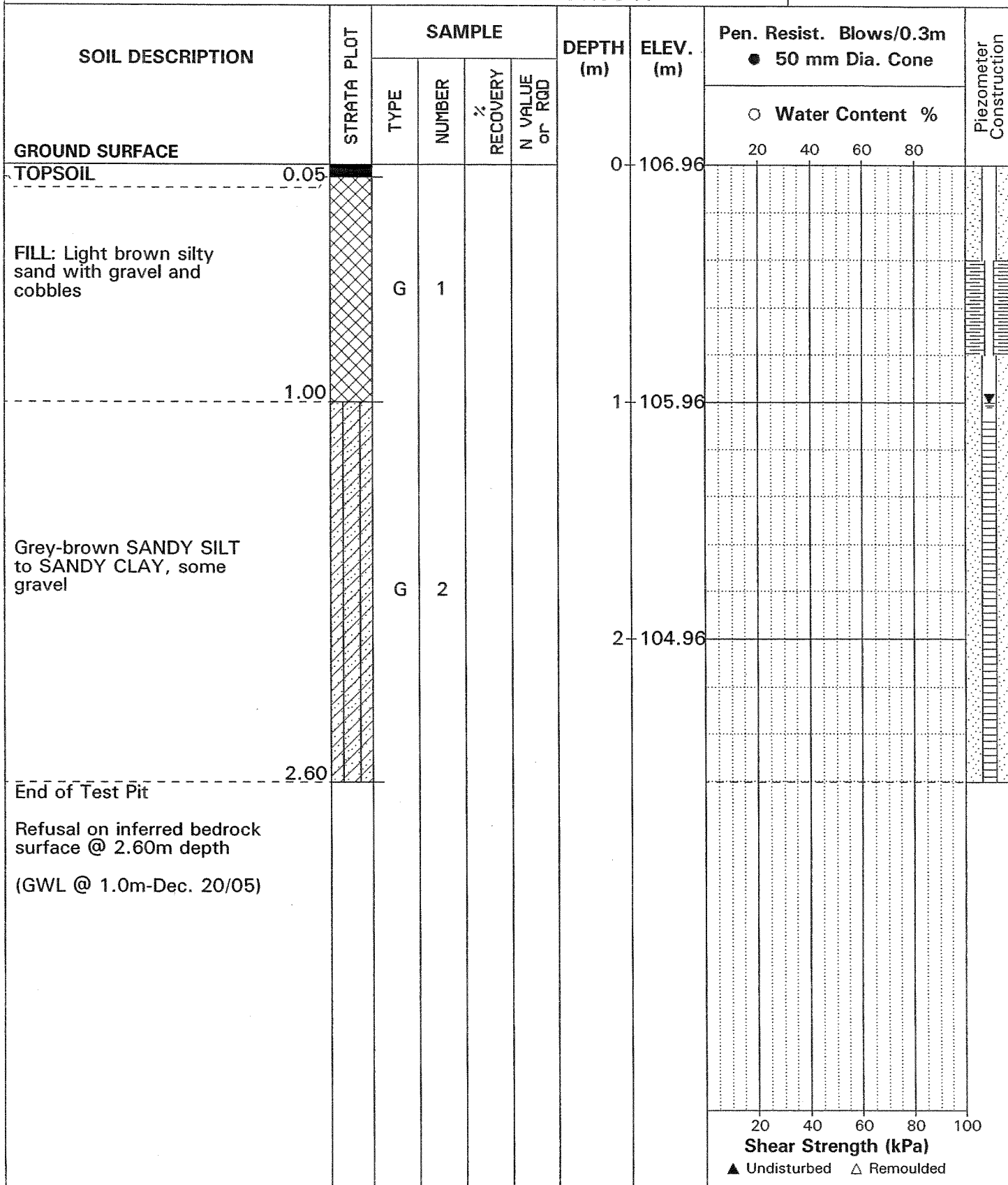
Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

DATUM Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.  
REMARKS Ground surface elevations based on vertical elevation survey by Paterson  
Group.  
BORINGS BY Excavator

DATE 15 AUG 05

FILE NO.  
**PH0208**

HOLE NO.  
**TP1/MW1**





## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

DATUM Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.  
REMARKS Ground surface elevations based on vertical elevation survey by Paterson  
Group.  
BORINGS BY Excavator

DATE 15 AUG 05

FILE NO.  
**PH0208**

HOLE NO.  
**TP 2**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	108.89						
TOPSOIL	0.20												

## SOIL PROFILE & TEST DATA

**Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario**

FILE NO. PH0208

HOLE NO. **TP3/MW2**

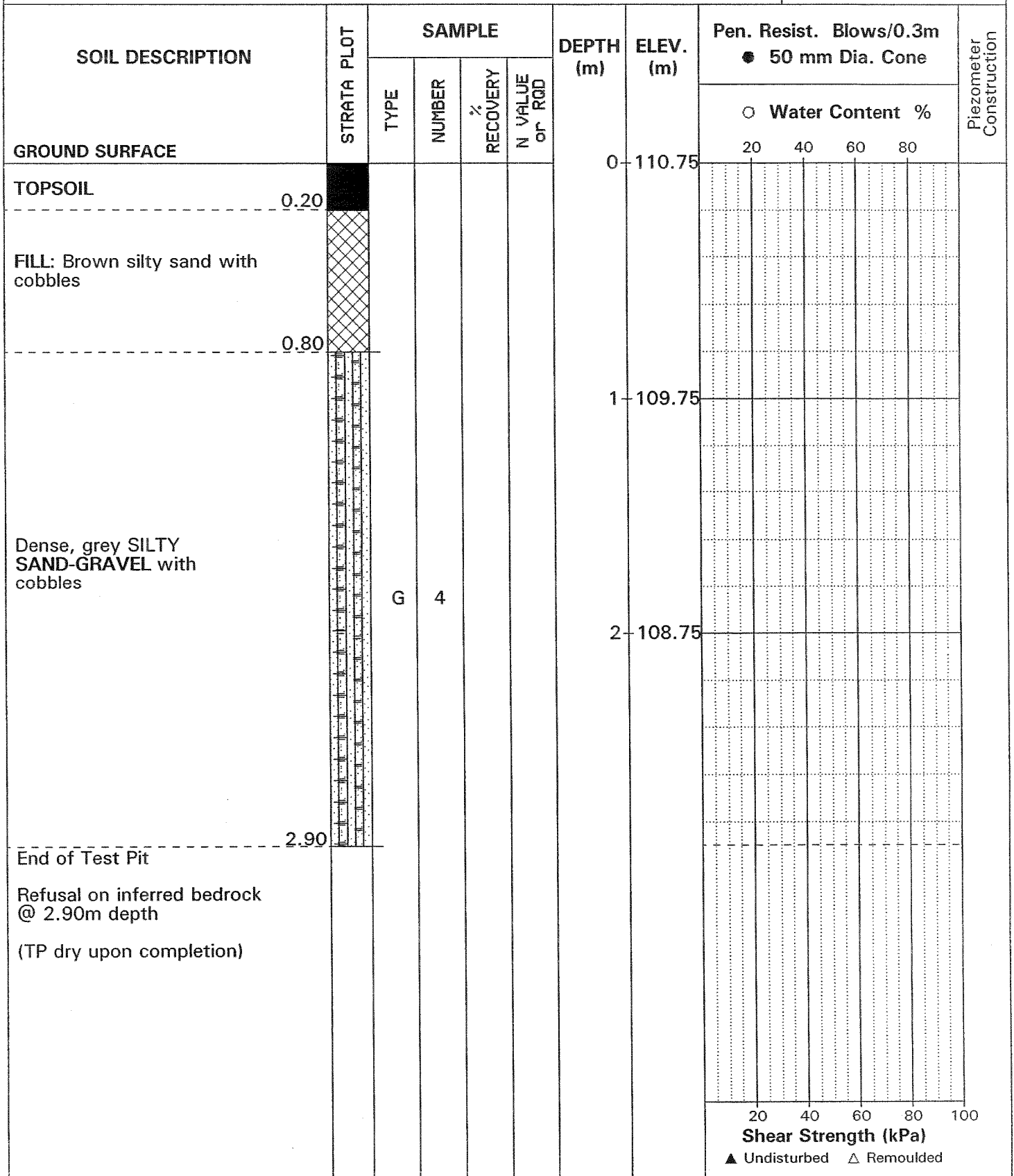
[illegible]

## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

DATUM Geodetic elevation information taken from base mapping provided by Fotenn Consultants Inc.  
REMARKS Ground surface elevations based on vertical elevation survey by Paterson Group.  
BORINGS BY Excavator DATE 15 AUG 05

FILE NO. PH0208  
HOLE NO. TP 4



## SOIL PROFILE & TEST DATA

**Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario**

DATUM	Geodetic elevation information taken from base mapping provided by Fotenn Consultants Inc.		
REMARKS	Ground surface elevations based on vertical elevation survey by Paterson Group.		
BORINGS BY	Excavator	DATE	15 AUG 05

FILE NO.	PH0208
HOLE NO.	TP 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	109.00					
FILL: Brown silty sand with gravel and cobbles	[Cross-hatched pattern]											
						1	108.00					
- - - - - 1.20												
TOPSOIL	[Solid black pattern]											
- - - - - 1.80												
						2	107.00					
Dense, grey-brown SILTY SAND with cobbles and boulders	[Vertical lines pattern]	G	5									
						3	106.00					
- - - - - 3.50												
End of Test Pit (TP dry upon completion)												

**Shear Strength (kPa)**

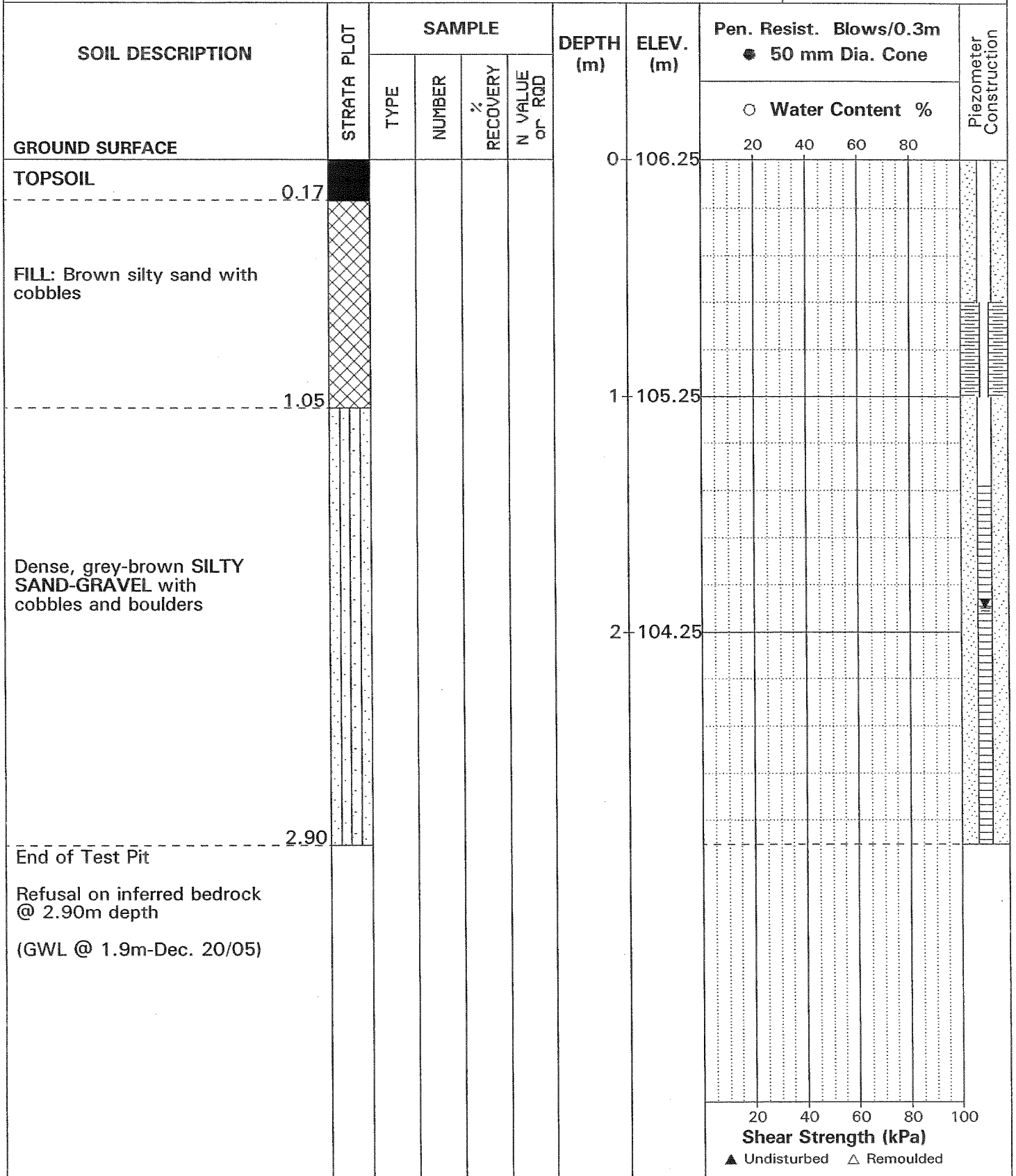
▲ Undisturbed    △ Remoulded

## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

DATUM Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.  
REMARKS Ground surface elevations based on vertical elevation survey by Paterson  
Group.  
BORINGS BY Excavator DATE 15 AUG 05

FILE NO. PH0208  
HOLE NO. TP6/MW3



## SOIL PROFILE & TEST DATA

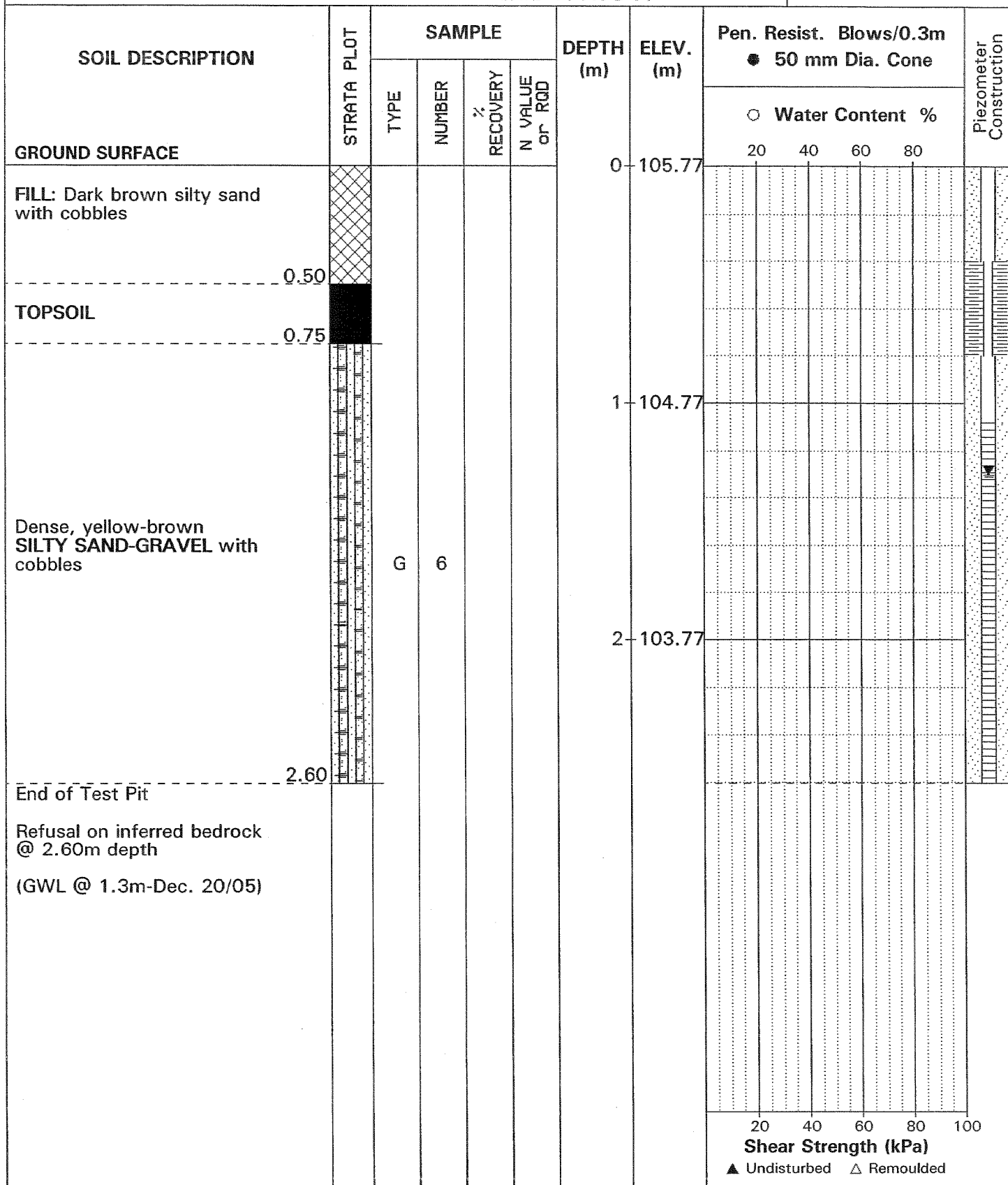
Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

**DATUM** Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.  
**REMARKS** Ground surface elevations based on vertical elevation survey by Paterson  
Group.  
**BORINGS BY** Excavator

DATE 15 AUG 05

**FILE NO.**  
**PH0208**

**HOLE NO.**  
**TP7/MW4**







## SOIL PROFILE & TEST DATA

FILE NO. PH0208

HOLE NO. TP 9

DATUM	Geodetic elevation information taken from base mapping provided by Fotenn Consultants Inc.		
REMARKS	Ground surface elevations based on vertical elevation survey by Paterson Group.		
BORINGS BY	Excavator	DATE	15 AUG 05

DATE 15 AUG 05

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	105.40					
FILL: Gravel with silty sand												
0.70												
FILL: Blast rock												
1.00												
TOPSOIL						1	104.40					
1.10												
Dense, brown-grey SILTY SAND-GRAVEL with cobbles		G	9									
2.30						2	103.40					
Light brown SANDY SILTY CLAY		G	8									
3.50						3	102.40					
End of Test Pit												
(Water infiltration @ 1.1m depth)												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

## SOIL PROFILE & TEST DATA

**Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario**

DATUM	Geodetic elevation information taken from base mapping provided by Fotenn Consultants Inc.		
REMARKS	Ground surface elevations based on vertical elevation survey by Paterson Group.		
BORINGS BY	Excavator	DATE	15 AUG 05

FILE NO.	PH0208
HOLE NO.	TP10

[illegible]

FILE NO. PH0208

HOLE NO. TP11

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	109.25					
TOPSOIL												
						1	108.25					
FILL: Brown silty sand with cobbles, boulders, wood and rebar						2	107.25					
						3	106.25					
End of Test Pit (TP dry upon completion)												

20    40    60    80    100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

# SYMBOLS AND TERMS

## SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

## **SYMBOLS AND TERMS (continued)**

### **SOIL DESCRIPTION (continued)**

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

### **ROCK DESCRIPTION**

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

<b>RQD %</b>	<b>ROCK QUALITY</b>
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

### **SAMPLE TYPES**

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

## SYMBOLS AND TERMS (continued)

### GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
Cu	-	Uniformity coefficient = $D_{60} / D_{10}$

Cc and Cu are used to assess the grading of sands and gravels:

Well-graded gravels have:  $1 < Cc < 3$  and  $Cu > 4$

Well-graded sands have:  $1 < Cc < 3$  and  $Cu > 6$

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

Cc and Cu are not applicable for the description of soils with more than 10% silt and clay  
(more than 10% finer than 0.075 mm or the #200 sieve)

### CONSOLIDATION TEST

$p'_o$	-	Present effective overburden pressure at sample depth
$p'_c$	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below $p'_c$ )
Cc	-	Compression index (in effect at pressures above $p'_c$ )
OC Ratio		Overconsolidation ratio = $p'_c / p'_o$
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

### PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.
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## SYMBOLS AND TERMS (continued)

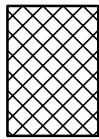
### STRATA PLOT



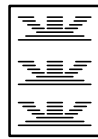
Topsoil



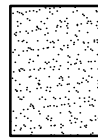
Asphalt



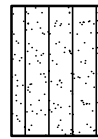
Fill



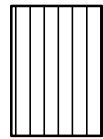
Peat



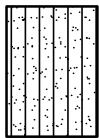
Sand



Silty Sand



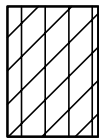
Silt



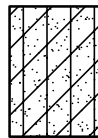
Sandy Silt



Clay



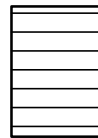
Silty Clay



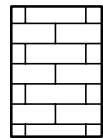
Clayey Silty Sand



Glacial Till



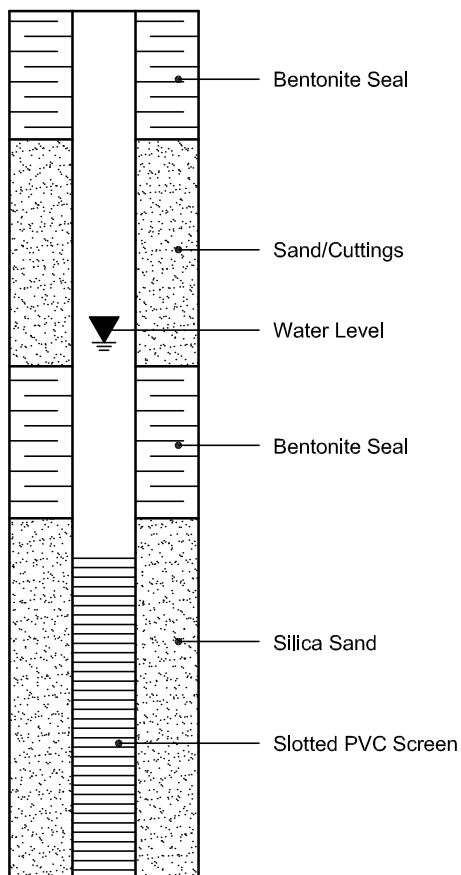
Shale



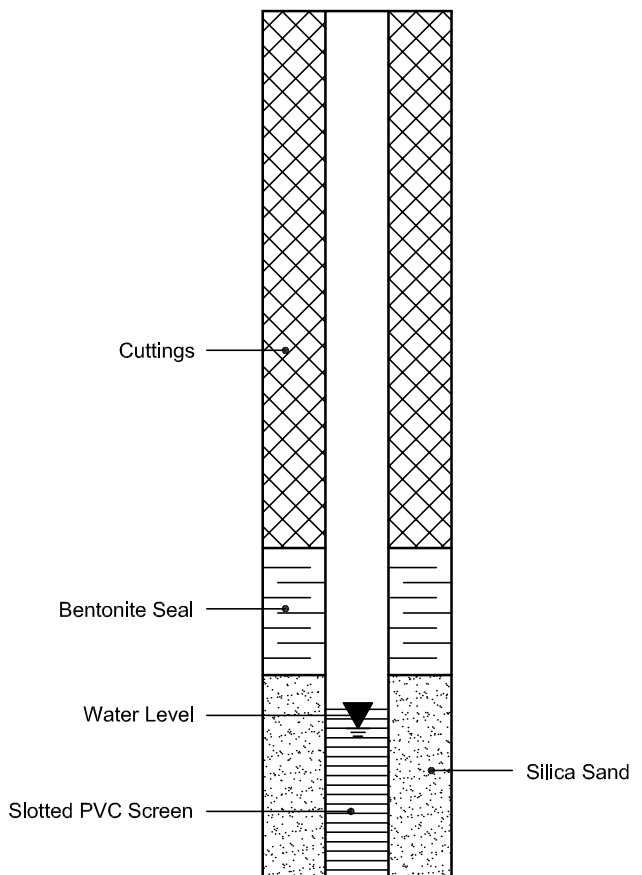
Bedrock

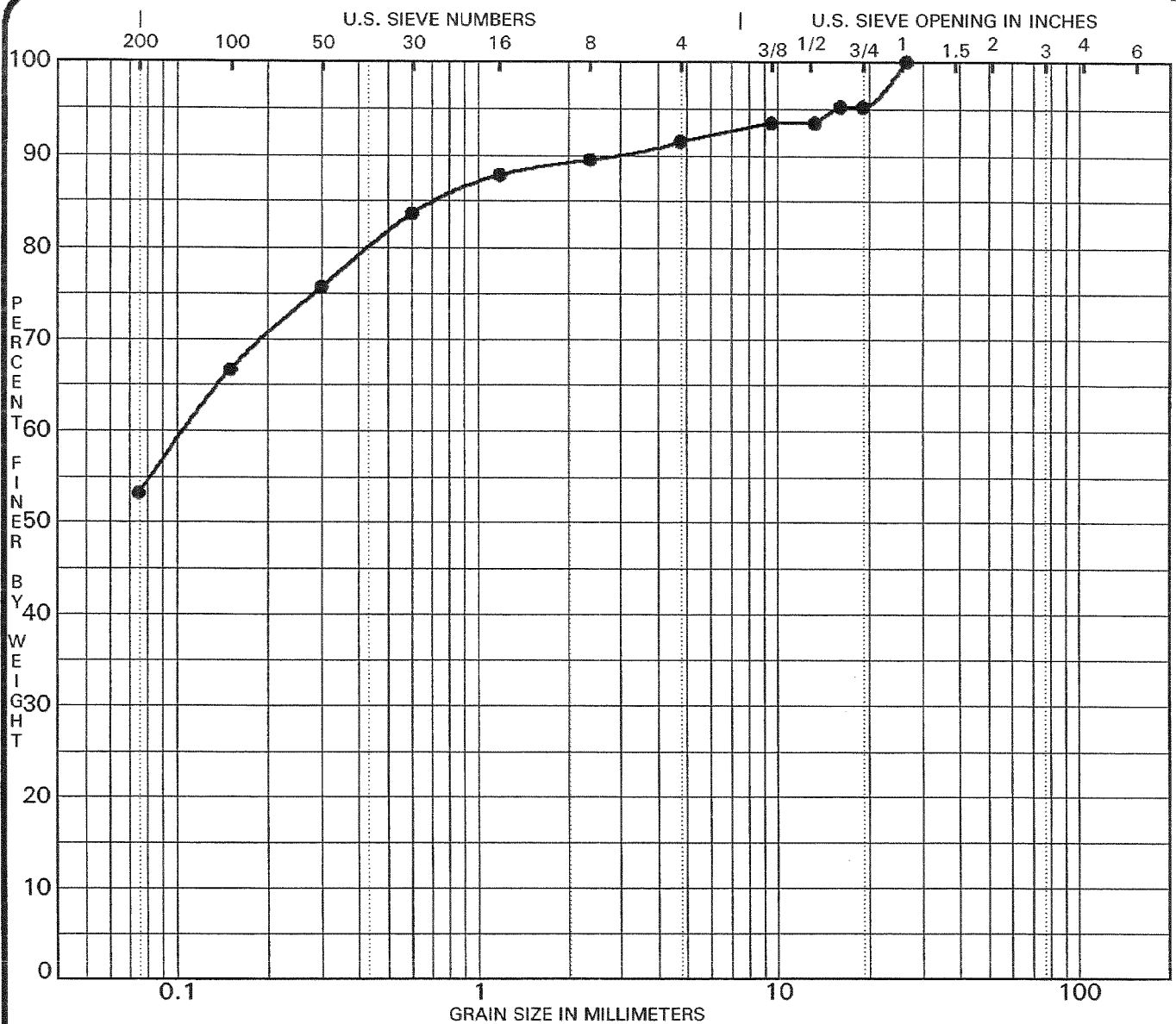
### MONITORING WELL AND PIEZOMETER CONSTRUCTION

#### MONITORING WELL CONSTRUCTION



#### PIEZOMETER CONSTRUCTION





SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification				MC%	LL	PL	PI	Cc	Cu
●	TP1/MW1	G2	Sandy Silt to Sandy Clay, some gravel (SM-SC)									
			Based on ASTM D 2487									
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	TP1/MW1	G2	26.50	0.11			8.5	38.3	53.2			

CLIENT Lafarge North America

PROJECT Proposed Commercial Development - Part 14,  
Lot 21, Concession 4 (R.F.)

FILE NO. PH0208

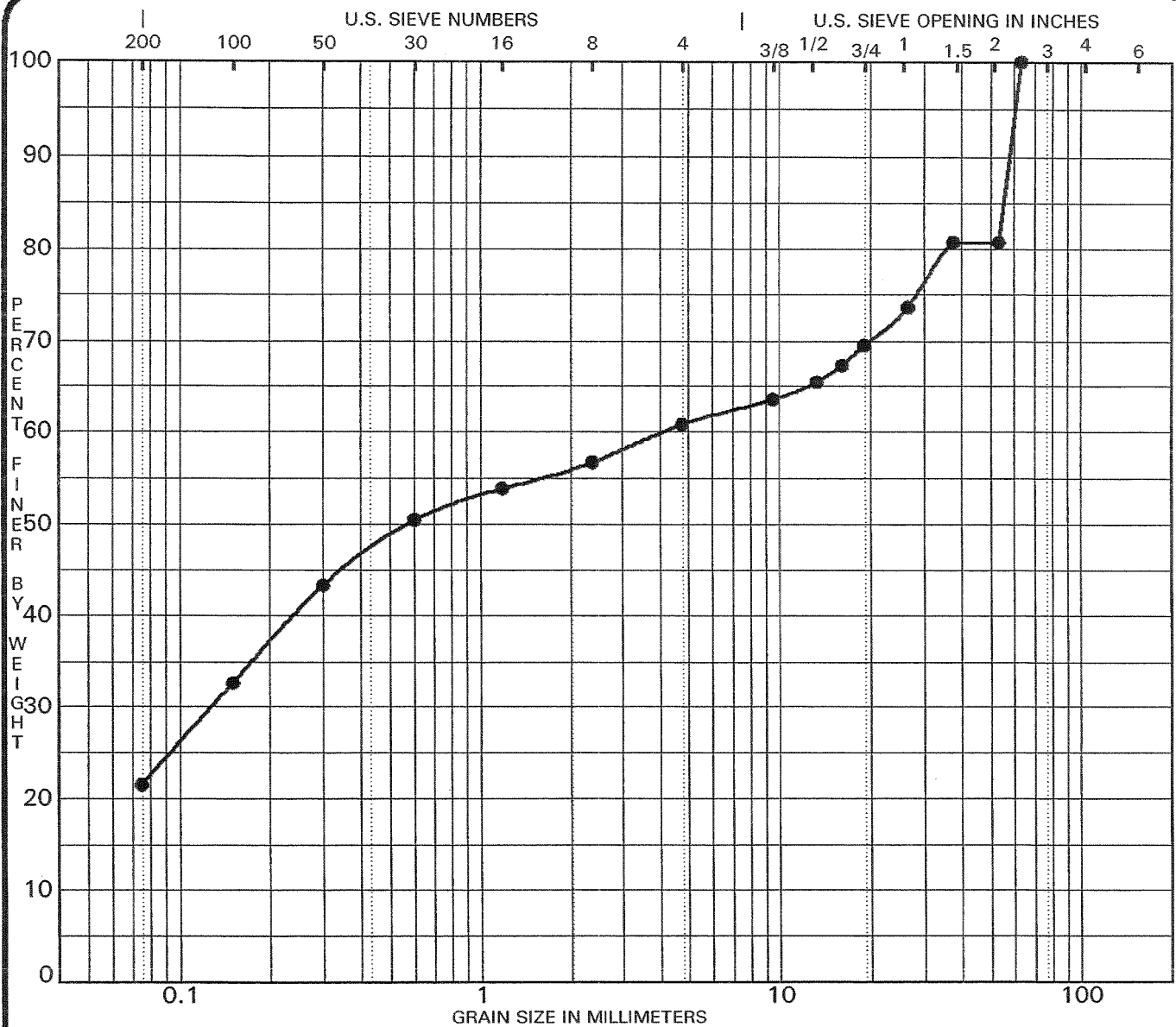
DATE 15 AUG 05

**patersongroup** Consulting Engineers  
28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

**GRAIN SIZE DISTRIBUTION**







SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification				MC%	LL	PL	PI	Cc	Cu
●	TP7/MW4	G6	Gravel, Sand, Clay mixture (GC)									
			Based on ASTM D 2487									
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	TP7/MW4	G6	63.00	4.14	0.127		39.2	39.3	21.5			

CLIENT Lafarge North America

PROJECT Proposed Commercial Development - Part 14,  
Lot 21, Concession 4 (R.F.)

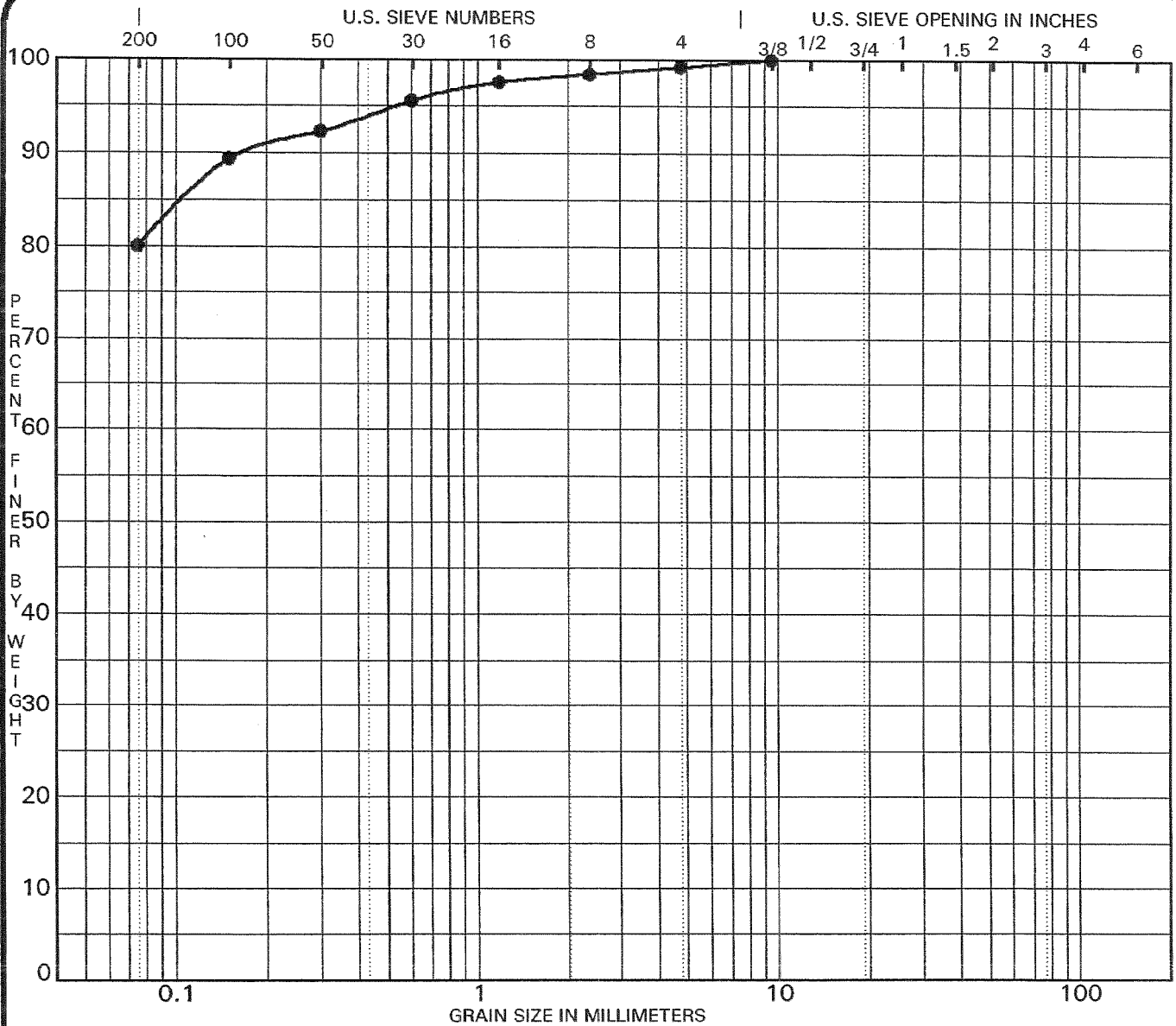
FILE NO. PH0208

DATE 15 AUG 05

**patersongroup** Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

**GRAIN SIZE DISTRIBUTION**



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification				MC%	LL	PL	PI	Cc	Cu
●	TP 9	G8	Inorganic Clay - Silty Clay (CL)									
			Based on ASTM D 2487									
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	TP 9	G8	9.50				0.8	19.2	80.0			

CLIENT Lafarge North America

PROJECT Proposed Commercial Development - Part 14,  
Lot 21, Concession 4 (R.F.)

FILE NO. PH0208

DATE 15 AUG 05

**patersongroup** Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

**GRAIN SIZE DISTRIBUTION**

## Certificate of Analysis

Client: Paterson Group Inc.

Client PO: 2174

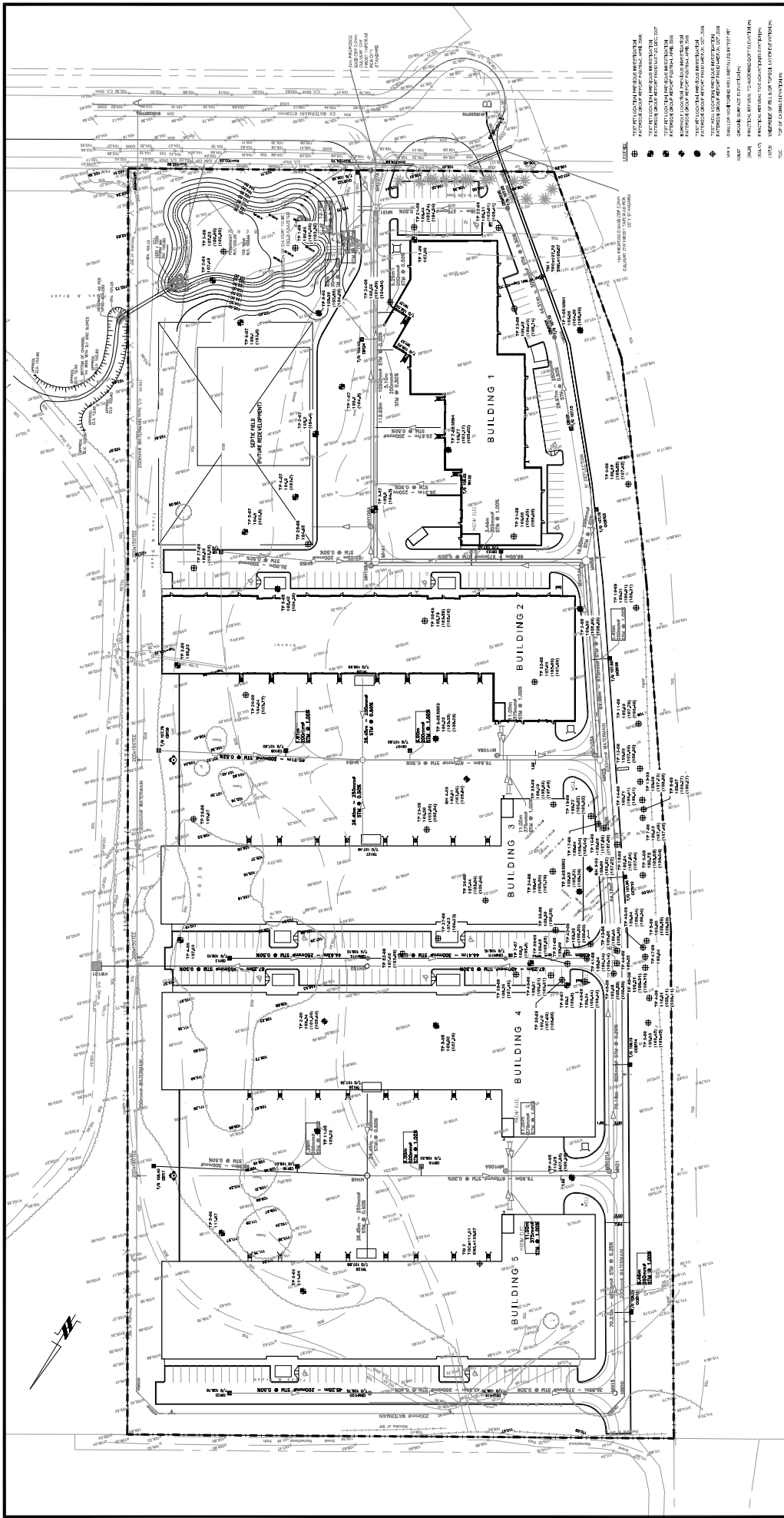
Project: PG0783

Report Date: 10-Apr-2006

Order Date: 04-Apr-2006

Matrix: Soil

Parameter	Sample ID:	BH4 SS3	TP4 G2
	Sample Date:	04/04/2006	04/04/2006
	MDL/Units	L5343.1	L5343.2
Chloride	5 ug/g	150	5
Sulphate	5 ug/g	50	30
pH	0.05 pH units	8.49	7.90
Resistivity	0.1 ohm.m	29	68



**paterson group**  
consulting engineers

184 Colborne Road South  
Ottawa, Ontario K1Z 7J9  
Tel: (613) 237-8100 Fax: (613) 237-8104

**TEST HOLE LOCATION PLAN**

**PG0783-2**

**PROJ. OFFICE / WAREHOUSE DEVELOPMENT - 449 O'KEEFE COURT  
OTTAWA, ONTARIO**

**TEST HOLE LOCATION PLAN**

**PG0783-2**

**REVISIONS**

NO.	DATE	DESCRIPTION
1		
2		

**REVISIONS**

NO.	DATE	DESCRIPTION
1		
2		

**PG0783**

**PG0783-2**

**PG0783**

**PG0783-2**

184 Colborne Road South  
Ottawa, Ontario K1Z 7J9  
Tel: (613) 237-8100 Fax: (613) 237-8104

# **APPENDIX 1**

**SOIL PROFILE AND TEST DATA SHEETS**

**SYMBOLS AND TERMS**

**GRAIN SIZE DISTRIBUTION SHEETS**

**ANALYTICAL TESTING RESULTS**

[illegible]

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel

DATE April 11, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP 2-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	107.29					
FILL: Brown silty sand, some crushed stone, trace asphalt	[diagonal lines]	G	1			1	106.29					
	1.70											
FILL: Grey crushed stone, some clay, sand, trace asphalt	[diagonal lines]	G	2			2	105.29					
	2.30											
FILL: Grey crushed stone	[triangles]					3	104.29					
	4.10					4	103.29					
TOPSOIL	[solid black]											
	4.40											
Grey-brown SILTY CLAY, some sand	[diagonal lines]	G	3			5	102.29					
	5.20											
GLACIAL TILL: Brown silty sand, some gravel, cobbles, boulders, trace clay	[triangles]	G	4			6	101.29					
- grey by 5.7m depth		G	5									
	6.30											
End of Test Pit												
TP terminated on bedrock surface at 6.30m depth												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				



## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 2-08**

DATE April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA


**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 3-08**

**DATE** April 11, 2008

[illegible]

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
FILL: Brown silty sand						0	110.01					
						1	109.01					
End of Test Pit												
TP terminated on bedrock surface at 1.90m depth												

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 5-08**

DATE April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 6-08**

**DATE** April 11, 2008

[illegible]

DATUM Approximate geodetic


REMARKS

BORINGS BY Hydraulic Shovel

DATE April 11, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP 7-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>FILL:</b> Brown silty sand with crushed stone, blast rock and boulders						0	109.63					
						1	108.63					
						2	107.63					
End of Test Pit  TP terminated on bedrock surface at 2.15m depth	2.15											
								20	40	60	80	100
								<b>Shear Strength (kPa)</b>				
								▲ Undisturbed    △ Remoulded				

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 8-08**

**DATE** April 11, 2008

[illegible]




## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP 9-08**

**DATE** April 11, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	108.85					
<b>FILL:</b> Brown silty sand with crushed stone  1.10 <b>TOPSOIL</b> 1.40	 					1	107.85					
<b>GLACIAL TILL:</b> Brown silty sand with gravel, cobbles and boulders  3.20 End of Test Pit  TP terminated on bedrock surface at 3.20m depth  (GWL @ 1.8m depth based on field observations)						2	106.85					
						3	105.85					
								20	40	60	80	100
								<b>Shear Strength (kPa)</b>				
								▲ Undisturbed    △ Remoulded				



## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP10-08**

DATE April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP11-08**

DATE April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP12-08**

**DATE** April 11, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP13-08**

DATE April 11, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>						0	109.68					
<b>FILL:</b> Crushed stone												
----- 0.30												
<b>FILL:</b> Brown silty sand with crushed stone												
----- 1.10						1	108.68					
<b>GLACIAL TILL:</b> Brown silty sand with gravel, cobbles and boulders												
----- 1.95												
End of Test Pit												
TP terminated on bedrock surface at 1.95m depth												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario

DATUM Approximate geodetic


REMARKS

BORINGS BY Hydraulic Shovel

DATE April 11, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP14-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>FILL:</b> Blast rock with sand						0	109.71					
						1	108.71					
						2	107.71					
						3	106.71					
End of Test Pit												
TP terminated on bedrock surface at 3.30m depth												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP15-08**

**DATE** April 11, 2008

[illegible]

[illegible]

**154 Colonnade Road South, Ottawa, Ontario K2E 7J5**

## SOIL PROFILE AND TEST DATA

## Geotechnical Investigation

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

**DATUM**      Approximate geodetic

FILE NO. PG0783

REMARKS

HOLE NO. **TP17-08**

**BORINGS BY** Hydraulic Shovel

DATE April 11, 2008

[illegible]



DATUM Approximate geodetic


REMARKS

BORINGS BY Hydraulic Shovel

DATE April 11, 2008

FILE NO.  
**PG0783**





HOLE NO.  
**TP18-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>FILL:</b> Brown silty sand with blast rock <div style="text-align: right;">1.00</div>						0	108.72					
<b>FILL:</b> Blast rock <div style="text-align: right;">1.80</div>						1	107.72					
End of Test Pit TP terminated on bedrock surface at 1.80m depth												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	108.44					
<b>FILL:</b> Grey-brown silty sand with crushed stone, trace asphalt		G	1			1	107.44					
						2	106.44					
3.50		G	2			3	105.44					
<b>TOPSOIL</b>												
3.80												
Brown <b>SILTY CLAY</b>						4	104.44					
3.95												
<b>GLACIAL TILL:</b> Brown silty sand with gravel, cobbles and boulders		G	3									
4.70												
End of Test Pit												
TP terminated on bedrock surface at 4.70m depth												
<div><div>20406080100</div><div>Shear Strength (kPa)</div><div>▲ Undisturbed    △ Remoulded</div></div>												

DATUM Approximate geodetic






REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP22-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %					
GROUND SURFACE								20	40	60	80		
FILL: Brown silty sand with crushed stone, gravel, cobbles, trace asphalt		G	1			0	109.31						
						1	108.31						
						2	107.31						
FILL: Crushed stone, trace asphalt		G	2			3	106.31						
TOPSOIL Brown SILTY CLAY with sand, trace gravel	 					4	105.31						
GLACIAL TILL: Brown silty sand, some clay, gravel, cobbles and bouldes		G	4			5	104.31						
End of Test Pit													
TP terminated on bedrock surface at 5.40m depth													
								20	40	60	80	100	
								Shear Strength (kPa)					
								▲ Undisturbed    △ Remoulded					

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP23-08**

**DATE** April 14, 2008

[illegible]

FILE NO. PG0783

HOLE NO. TP24-08

**DATE** April 14, 2008

[illegible]

FILE NO. PG0783

HOLE NO. **TP25-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

## Geotechnical Investigation

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

**DATUM**      Approximate geodetic

REMARKS

**BORINGS BY** Hydraulic Shovel

**DATE** April 14, 2008

FILE NO. PG0783

HOLE NO. **TP26-08**

[illegible]

DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP27-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
FILL: Crushed stone, some sand, trace topsoil, cobbles and boulders	[Cross-hatched]	G	1			0	108.55					
						1	107.55					
	[Cross-hatched]	G	2			2	106.55					
						3	105.55					
FILL: Crushed stone	[Cross-hatched]					3.15						
FILL: Brown silty clay, some organics	[Cross-hatched]					3.85						
	[Cross-hatched]					4.10						
FILL: Crushed stone and blast rock	[Cross-hatched]											
	[Cross-hatched]					5.10						
TOPSOIL	[Solid black]					5.30						
Bluish brown SILTY CLAY	[Diagonal lines]											
End of Test Pit						5.90						
TP terminated in silty clay at 5.90m depth												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				



DATUM Approximate geodetic






REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP28-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	109.67						
<b>FILL:</b> Brown silty sand, trace crushed stone		G	1			1	108.67						
1.10						2	107.67						
<b>FILL:</b> Blast rock, some silty sand		G	2			3	106.67						
2.00						4	105.67						
<b>FILL:</b> Brown silty sand, some clay, gravel, cobbles and boulders		G	3			5	104.67						
2.90													
<b>FILL:</b> Grey silty clay, some sand, gravel, cobbles and boulders													
5.10													
<b>FILL:</b> Crushed stone													
5.20													
End of Test Pit													
(GW infiltration at 5.0m depth)													

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP29-08**

**DATE** April 14, 2008

[illegible]

FILE NO. PG0783

HOLE NO. **TP30-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP31-08**

**DATE** April 14, 2008

[illegible]

DATUM Approximate geodetic





REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP32-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
FILL: Organics, some crushed stone						0	107.70					
0.30												
TOPSOIL												
0.60												
GLACIAL TILL: Brown silty clay, some sand, gravel and cobbles						1	106.70					
1.50												
GLACIAL TILL: Grey-brown silty sand, some gravel, cobbles and boulders, trace clay						2	105.70					
3.70						3	104.70					
End of Test Pit												
TP terminated on bedrock surface at 3.70m depth												
(GW infiltration at 1.4m depth)												

## SOIL PROFILE AND TEST DATA

## Geotechnical Investigation

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

<b>DATUM</b>	Approximate geodetic
--------------	----------------------

REMARKS

**BORINGS BY** Hydraulic Shovel

**DATE** April 14, 2008

FILE NO. PG0783

HOLE NO. **TP33-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
<b>GROUND SURFACE</b>												
FILL: Organics, trace blast rock	[Cross-hatch pattern]					0	108.10					
	0.30											
<b>TOPSOIL</b>	[Solid black pattern]											
	0.62											
<b>GLACIAL TILL:</b> Brown sand with gravel and cobbles	[Upward triangle pattern]					1	107.10					
						2	106.10					
<b>GLACIAL TILL:</b> Brown silty sand with gravel, cobbles and boulders	[Upward triangle pattern]					3	105.10					
End of Test Pit												
TP terminated on bedrock surface at 3.10m depth												

Shear Strength (kPa)  
▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

## Geotechnical Investigation

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

<b>DATUM</b>	Approximate geodetic
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REMARKS

**BORINGS BY** Hydraulic Shovel

**DATE** April 14, 2008

FILE NO. PG0783

HOLE NO. **TP34-08**

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP35-08**

**DATE** April 14, 2008

[illegible]



## SOIL PROFILE AND TEST DATA

## Geotechnical Investigation

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

**DATUM**      Approximate geodetic

REMARKS

**BORINGS BY** Hydraulic Shovel

**DATE** April 14, 2008

FILE NO. PG0783

HOLE NO. **TP36-08**

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP37-08**

**DATE** April 14, 2008

[illegible]



## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP38-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	108.36					
<b>FILL:</b> Brown silty sand, some gravel, cobbles and boulders, trace clay <div style="text-align: right;">0.90</div>												
<b>GLACIAL TILL:</b> Dense, brown silty sand, some gravel, cobbles and boulders <div style="text-align: right;">2.10</div>						1	107.36					
End of Test Pit  TP terminated in glacial till at 2.10m depth						2	106.36					
								20	40	60	80	100
								<b>Shear Strength (kPa)</b>				
								▲ Undisturbed    △ Remoulded				

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP39-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP40-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

## Geotechnical Investigation

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

**DATUM**      Approximate geodetic

REMARKS

### BORINGS BY Hydraulic Shovel

**DATE** April 14, 2008

FILE NO. PG0783

HOLE NO. **TP41-08**

[illegible]

DATUM Approximate geodetic


REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP42-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
<b>FILL:</b> Crushed stone ----- 0.40 End of Test Pit  TP terminated on bedrock surface at 0.40m depth						0	108.99					
<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"></div> <div style="width: 35%;"> <p>20 40 60 80 100</p> <p><b>Shear Strength (kPa)</b></p> <p>▲ Undisturbed    △ Remoulded</p> </div> </div>												

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP43-08**

DATE April 14, 2008

[illegible]



## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. TP44-08

**DATE** April 14, 2008

[illegible]



## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP45-08**

**DATE** April 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	109.48					
FILL: Crushed stone												
----- 0.40												
GLACIAL TILL: Brown silty sand, some gravel, cobbles and boulders												
----- 0.90												
End of Test Pit												
TP terminated on bedrock surface at 0.90m depth												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP46-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP47-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

## Geotechnical Investigation

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP48-08**

DATE April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP49-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP50-08**

**DATE** April 14, 2008

[illegible]

## SOIL PROFILE AND TEST DATA

**Office/Warehouse Development - 449 O'Keefe Court  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP51-08**

**DATE** April 14, 2008

[illegible]



DATUM Approximate geodetic

REMARKS

BORINGS BY Hydraulic Shovel

DATE April 14, 2008

FILE NO.  
**PG0783**

HOLE NO.  
**TP52-08**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction					
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %									
GROUND SURFACE								20	40	60	80						
<b>FILL:</b> Grey-brown silty clay, some sand, gravel, cobbles, boulders, trace asphalt						0	107.18										
						1	106.18										
						2	105.18										
						3	104.18										
TOPSOIL 3.30 3.40																	
<b>GLACIAL TILL:</b> Grey silty sand, some gravel, cobbles and boulders 4.10 End of Test Pit TP terminated on bedrock surface at 4.10m depth						4	103.18										
								20	40	60	80	100					
								<b>Shear Strength (kPa)</b>									
								▲ Undisturbed    △ Remoulded									

[illegible]

DATUM Ground surface elevation interpolated from topographic plan.

FILE NO. **PH0521**

REMARKS

HOLE NO. **TP2-07**

BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE						0	105.30	20	40	60	80	
FILL: Boulders												
0.80						1	104.30					
Stiff to very stiff SANDY SILTY CLAY												
2.50						2	103.30					
End of Test Pit (Open hole GWL @ 0.6m depth)												
								20	40	60	80	
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				

DATUM Ground surface elevation interpolated from topographic plan.

FILE NO.  
**PH0521**

REMARKS

HOLE NO.  
**TP3-07**

BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE						0	105.50	20	40	60	80	
FILL: Boulders						1	104.50					
TOPSOIL												
Dense to very dense SANDY SILT to SILTY SAND, some clay						2	103.50					
End of Test Pit (Open hole GWL @ 1.0m depth)						3	102.50					
								20	40	60	80	
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	104.90						
FILL: Boulders													
0.45													
FILL: Boulders with organics													
0.90													
TOPSOIL						1	103.90						
1.15													
Stiff, grey SANDY SILTY CLAY						2	102.90						
3.00						3	101.90						
End of Test Pit													
(Open hole GWL @ 0.4m depth)													

20406080100

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded

## SOIL PROFILE & TEST DATA

Proposed Office/Warehouse Development  
4497 O'Keefe Court  
Ottawa, Ontario

DATUM Ground surface elevation interpolated from topographic plan.

FILE NO.

PH0521

REMARKS

HOLE NO.

TP5-07

BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or ROD			○ Water Content %				
GROUND SURFACE						0	104.90	20	40	60	80	
FILL: Gravel						1	103.90					
Light brown to grey SANDY SILTY CLAY						2	102.90					
End of Test Pit (Open hole GWL @ 0.3m depth)						3	101.90					

20406080100

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

## SOIL PROFILE & TEST DATA

Proposed Office/Warehouse Development  
4497 O'Keefe Court  
Ottawa, Ontario

DATUM Ground surface elevation interpolated from topographic plan.

FILE NO.

PH0521

REMARKS

HOLE NO.

TP6-07

BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or Rqd			○ Water Content %				
GROUND SURFACE						0	105.10	20	40	60	80	
FILL: Gravel with silt and sand						1	104.10					
TOPSOIL												
						2	103.10					
Stiff, grey SILTY CLAY, trace sand						3	102.10					
End of Test Pit												

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

## SOIL PROFILE & TEST DATA

Proposed Office/Warehouse Development  
4497 O'Keefe Court  
Ottawa, Ontario

DATUM Ground surface elevation interpolated from topographic plan.

FILE NO.

PH0521

REMARKS

HOLE NO.

TP7-07

BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
FILL: Blast rock						0	108.10					
						1	107.10					
						2	106.10					
End of Test Pit (Heavy groundwater infiltration)						2.50						
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				



## SOIL PROFILE & TEST DATA

**DATUM** Ground surface elevation interpolated from topographic plan.

REMARKS

HOLE NO. TP8-07

## BORINGS BY Backhoe

DATE 16 NOV 07

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	109.20					
FILL: Blast rock						1	108.20					
						2	107.20					
End of Test Pit (Heavy groundwater infiltration)												

FILE NO. PG0783

HOLE NO. **BH1-06**

DATE 14 MAR 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	105.67					
FILL: Brown silty sand with gravel												
0.76												
FILL: Topsoil with sand and gravel		SS	1	17	21	1	104.67					
1.37												
FILL: Dark brown silty clay with sand, gravel and organic matter		SS	2	0	23	2	103.67					
2.13												
		SS	3	67	30							
		SS	4	67	77+	3	102.67					
Dense to very dense, brown SILTY SAND with gravel, cobbles and boulders												
- loose by 3.8m depth		SS	5	50	7	4	101.67					
- dense by 4.5m depth		SS	6	33	38	5	100.67					
		SS	7									
6.10						6	99.67					
Dynamic Cone Penetration Test commenced @ 6.10m depth												
6.32												
Inferred SILTY SAND												
End of Borehole												
DCPT refusal @ 6.32m depth												
(GWL @ 0.79m-Mar. 24/06)												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded

DATUM TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by  
REMARKS Paterson Group Report No. PH0208-1.

FILE NO.

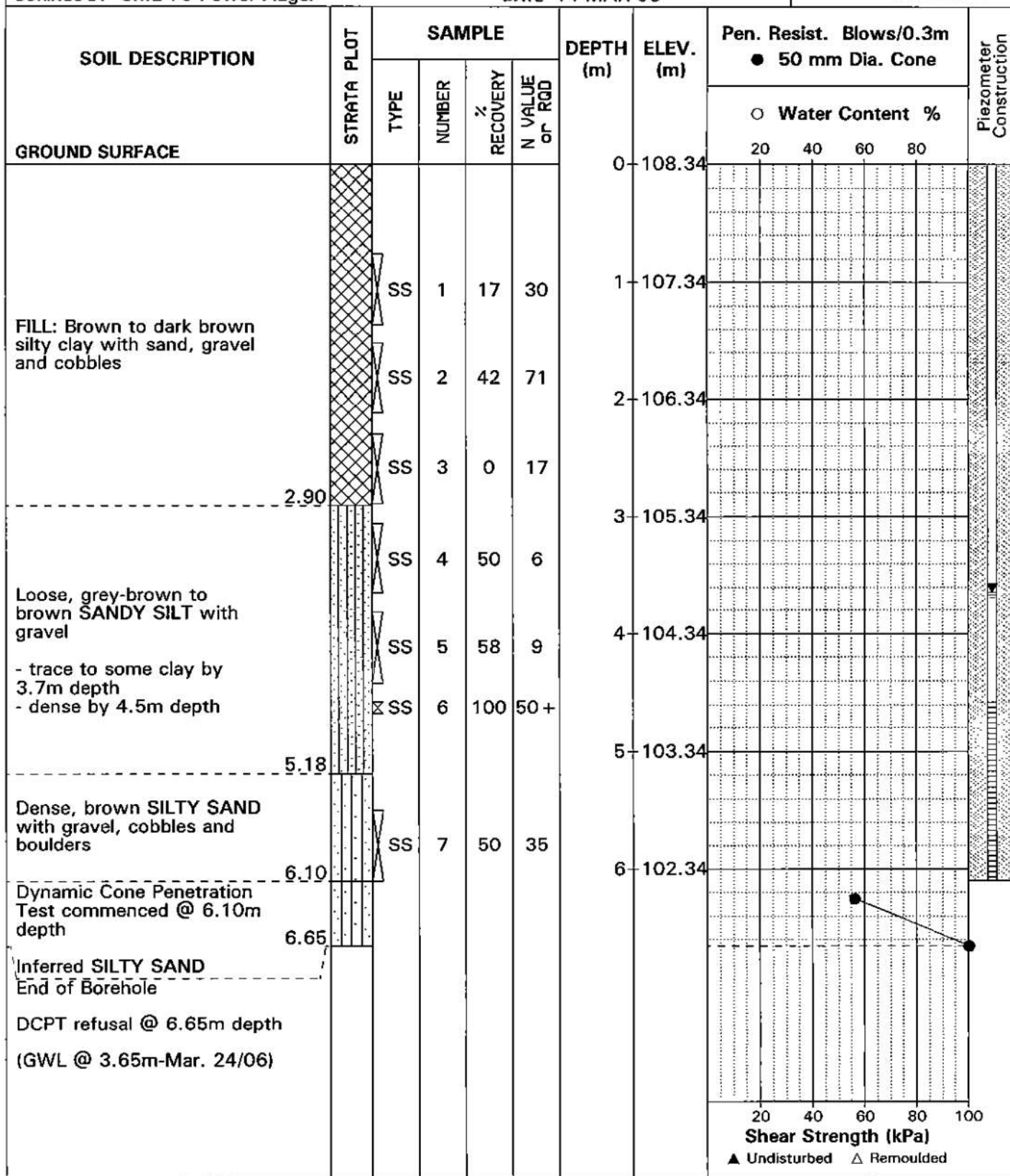
PG0783

HOLE NO.

BH2-06

BORINGS BY CME 75 Power Auger

DATE 14 MAR 06



DATUM TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by  
Paterson Group Report No. PH0208-1.

REMARKS

FILE NO.

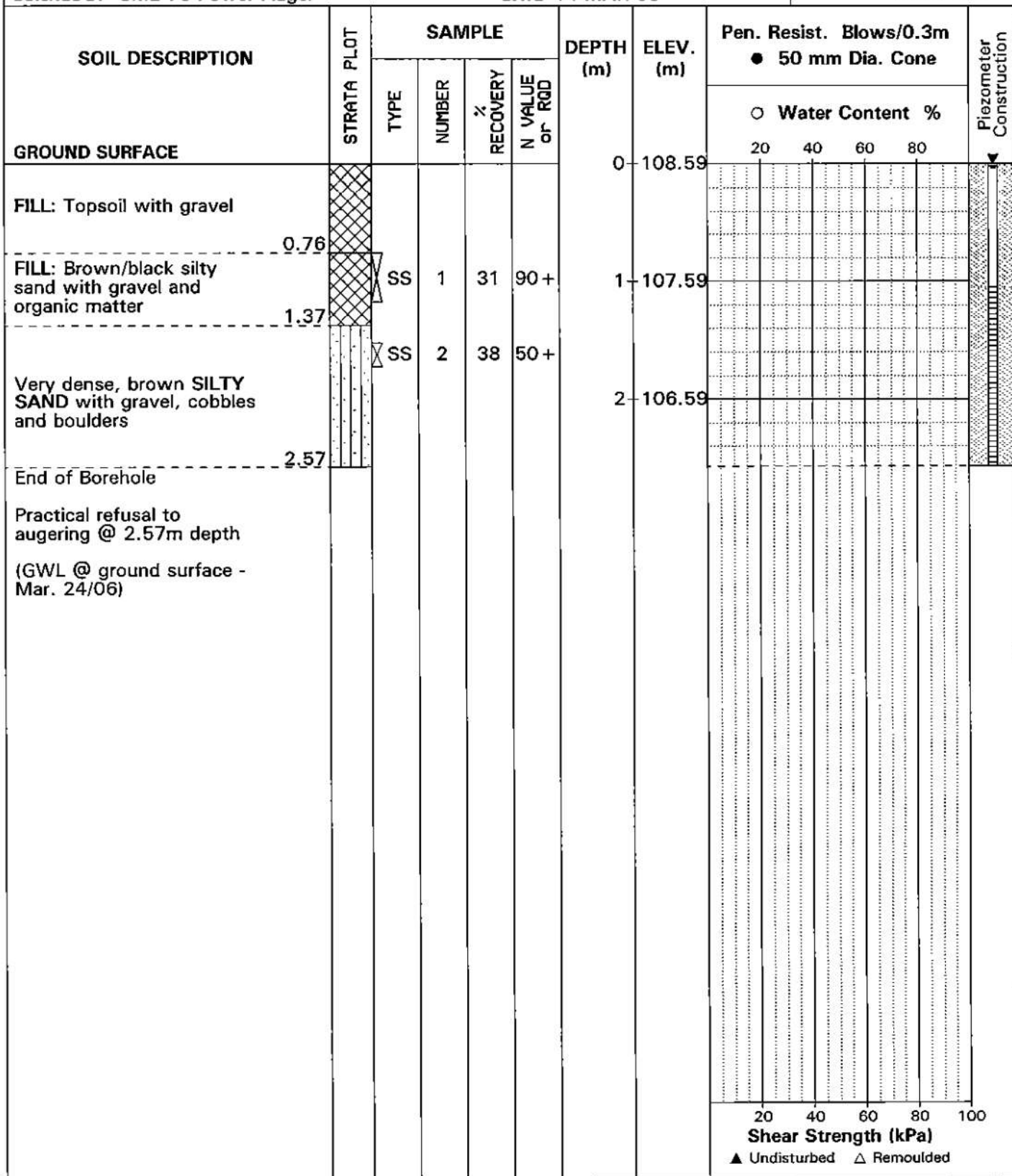
PG0783

HOLE NO.

BH3-06

BORINGS BY CME 75 Power Auger

DATE 14 MAR 06



## SOIL PROFILE & TEST DATA

Geotechnical Investigation  
O'Keefe Court and Highway 416  
Ottawa, Ontario

DATUM TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

REMARKS

FILE NO.

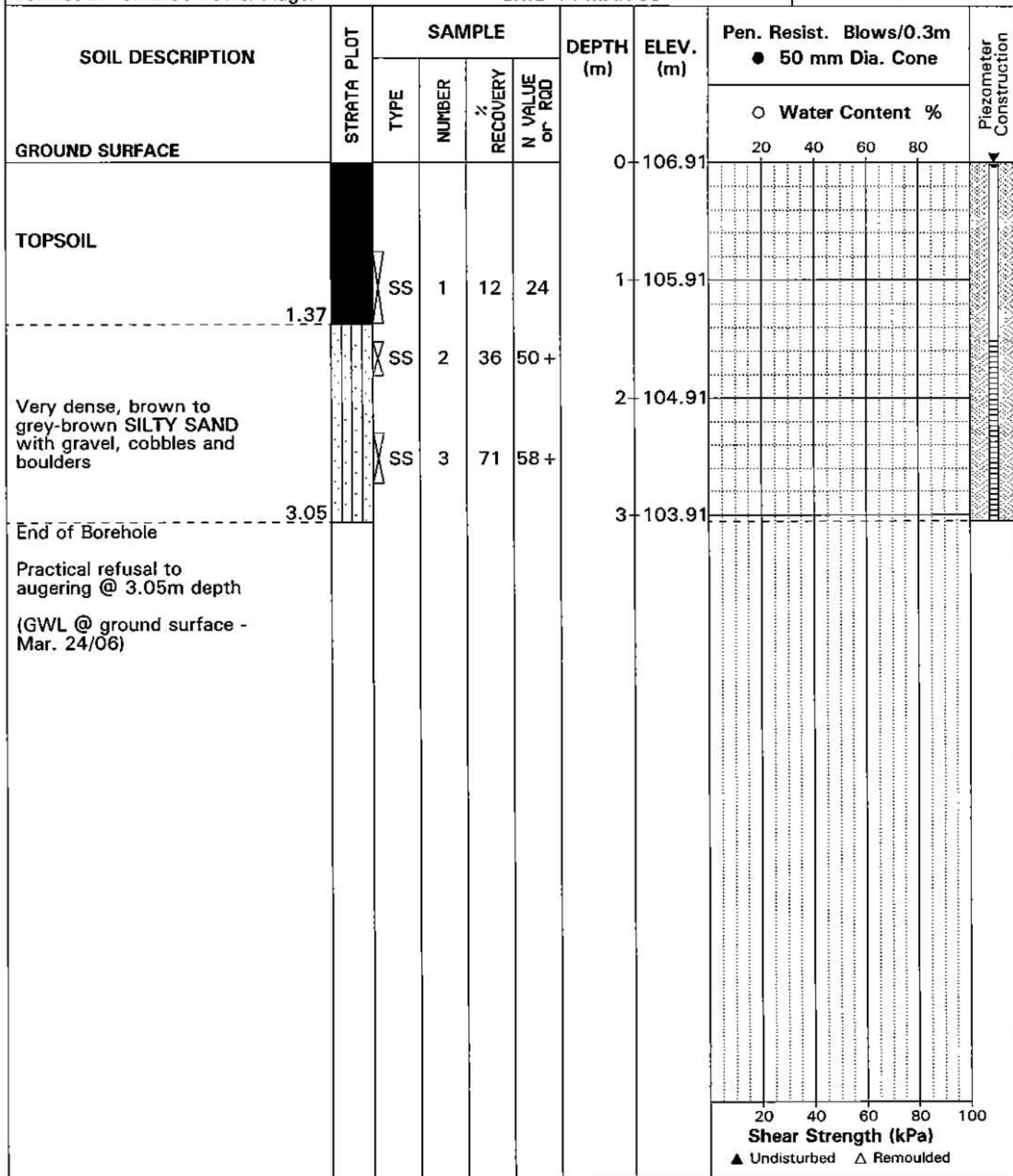
PG0783

HOLE NO.

BH4-06

BORINGS BY CME 55 Power Auger

DATE 14 MAR 06




## SOIL PROFILE & TEST DATA

DATUM TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

**PG0783**

**TP1-06**

DATE 24 MAR 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	107.98					
FILL: Dark brown silty sand mixed with clay, gravel and cobbles		G	1									
0.76		G	2									
FILL: Dark brown silty sand mixed with gravel, crushed stone, cobbles, boulders, asphaltic concrete and organic matter		G	3									
2.59		G	4									
End of Test Pit												

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed    △ Remoulded



## SOIL PROFILE & TEST DATA


**Geotechnical Investigation  
O'Keefe Court and Highway 416  
Ottawa, Ontario**

FILE NO. PG0783

HOLE NO. **TP2-06**

DATE 24 MAR 06

[illegible]

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	108.92					
FILL: Dark brown silty sand with topsoil		G	1									
		G	2									
		G	3									
FILL: Brown to dark brown silty sand mixed with clay, gravel, cobbles, boulders and asphaltic concrete		G	4									
		G	5									
End of Test Pit												

0.76

3.66

107.92

106.92

105.92

20

40

60

80

100

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded





## SOIL PROFILE & TEST DATA

**DATUM** TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

HOLE NO. **TP4-06**



DATE 24 MAR 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %					
								20	40	60	80		
GROUND SURFACE						0	107.69						
FILL: Brown silty sand mixed with organic matter, clay, gravel, cobbles, boulders		G	1										
		G	2										
		G	3										
2.00						2	105.69						
FILL: Dark brown silty clay with sand, gravel and cobbles		G	4										
		G	5										
3.35						3	104.69						
End of Test Pit													

20406080100

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	111.87					
FILL: Reddish brown to dark brown silty sand mixed with gravel, cobbles, boulders and asphaltic concrete		G	1									
		G	2									
		G	3									
		G	4									
FILL: Dark brown silty sand with clay, gravel, cobbles, boulders and organic matter		G	5									
End of Test Pit						3	108.87					

2.60

3.20

20406080100

Shear Strength (kPa)

▲ Undisturbed    △ Remoulded

## SOIL PROFILE & TEST DATA

DATUM TBM - Top of test well casing (TW 1), elevation 107.60m, as provided by Paterson Group Report No. PH0208-1.

HOLE NO. **TP6-06**

DATE 24 MAR 06

[illegible]

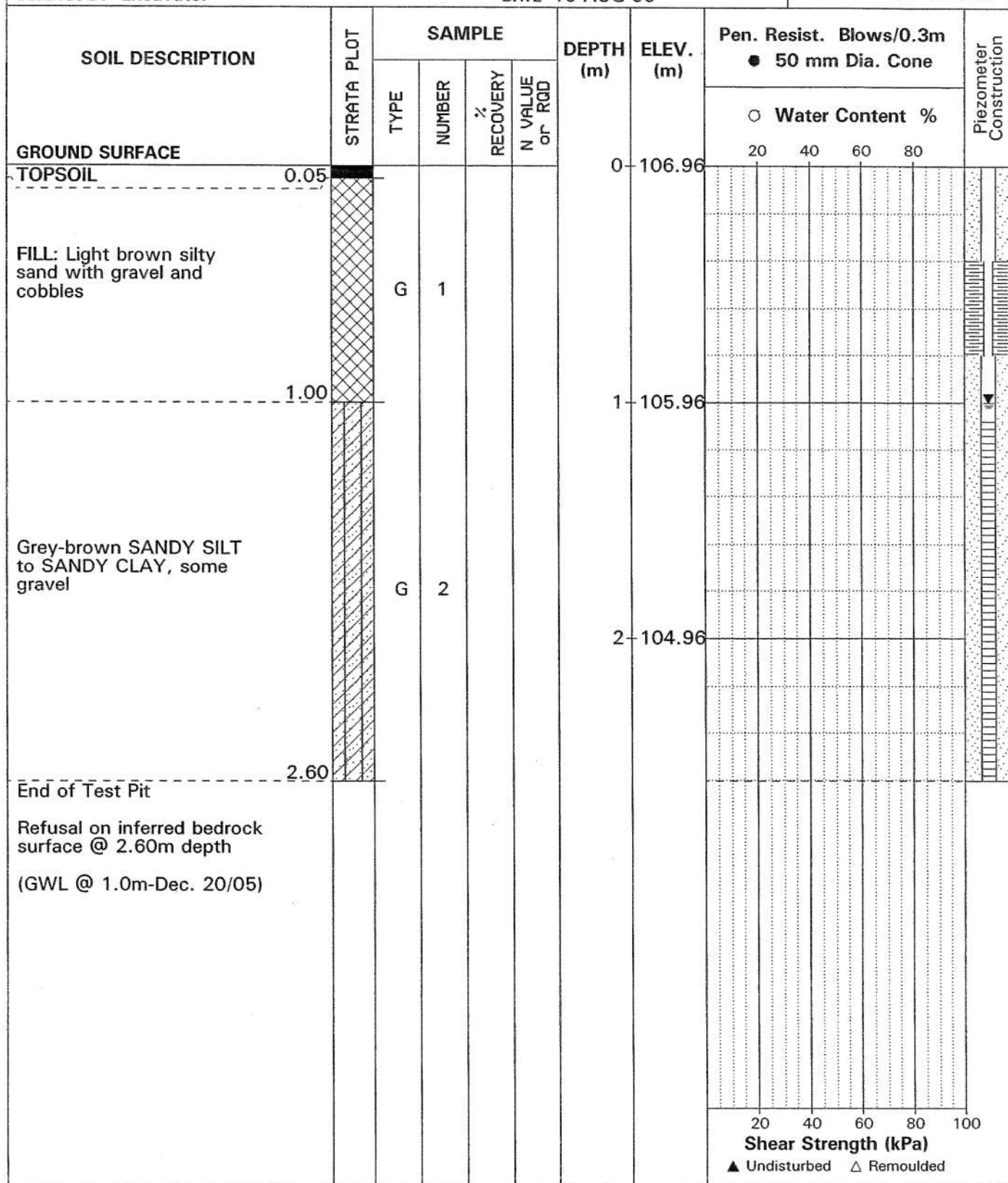
## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

**DATUM** Geodetic elevation information taken from base mapping provided by Fotenn Consultants Inc.  
**REMARKS** Ground surface elevations based on vertical elevation survey by Paterson Group.  
**BORINGS BY** Excavator

DATE 15 AUG 05

**FILE NO.** PH0208  
**HOLE NO.** TP1/MW1



## SOIL PROFILE & TEST DATA

FILE NO. PH0208

HOLE NO. TP 2

DATUM	Geodetic elevation information taken from base mapping provided by Fotenn Consultants Inc.		
REMARKS	Ground surface elevations based on vertical elevation survey by Paterson Group.		
BORINGS BY	Excavator	DATE	15 AUG 05

DATE 15 AUG 05

[illegible]

## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

DATUM Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.

FILE NO.

PH0208

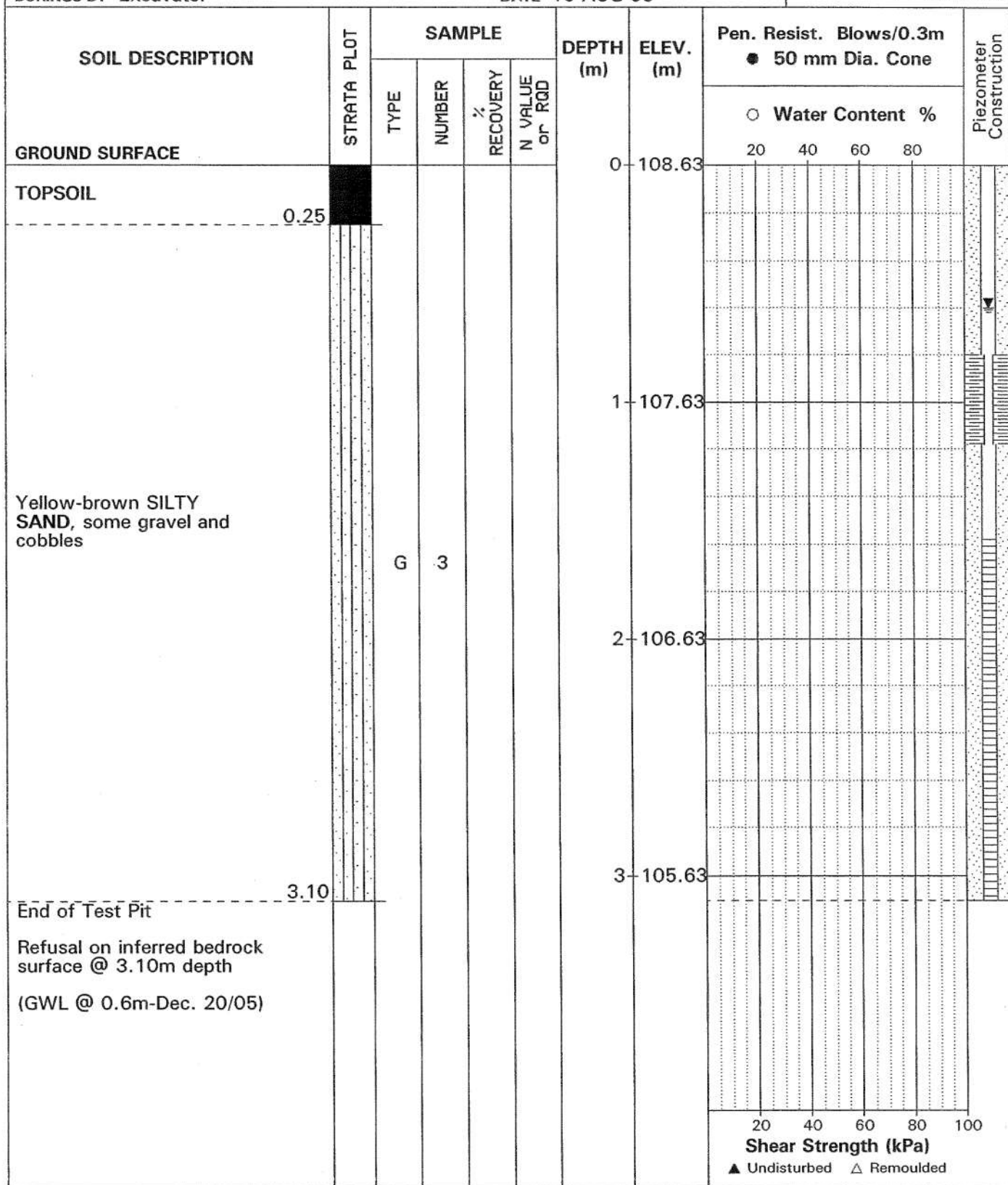
REMARKS Ground surface elevations based on vertical elevation survey by Paterson  
Group.

HOLE NO.

TP3/MW2

BORINGS BY Excavator

DATE 15 AUG 05





## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

DATUM Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.  
REMARKS Ground surface elevations based on vertical elevation survey by Paterson  
Group.  
BORINGS BY Excavator DATE 15 AUG 05

FILE NO. PH0208  
HOLE NO. TP 4





SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
TOPSOIL	0.20						0-110.75					
FILL: Brown silty sand with cobbles	0.80						1-109.75					
Dense, grey SILTY SAND-GRAVEL with cobbles		G	4				2-108.75					
End of Test Pit	2.90											
Refusal on inferred bedrock @ 2.90m depth  (TP dry upon completion)												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				

## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

DATUM Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.  
REMARKS Ground surface elevations based on vertical elevation survey by Paterson  
Group.  
BORINGS BY Excavator DATE 15 AUG 05

FILE NO. **PH0208**  
HOLE NO. **TP 5**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
FILL: Brown silty sand with gravel and cobbles						0	109.00					
TOPSOIL						1	108.00					
Dense, grey-brown SILTY SAND with cobbles and boulders		G	5			2	107.00					
End of Test Pit (TP dry upon completion)						3	106.00					
								20 40 60 80 100				
								Shear Strength (kPa)				
								▲ Undisturbed    △ Remoulded				



DATUM	Geodetic elevation information taken from base mapping provided by Fotenn Consultants Inc.		
REMARKS	Ground surface elevations based on vertical elevation survey by Paterson Group.		
BORINGS BY	Excavator	DATE	15 AUG 05

FILE NO.	PH0208
HOLE NO.	TP6/MW3

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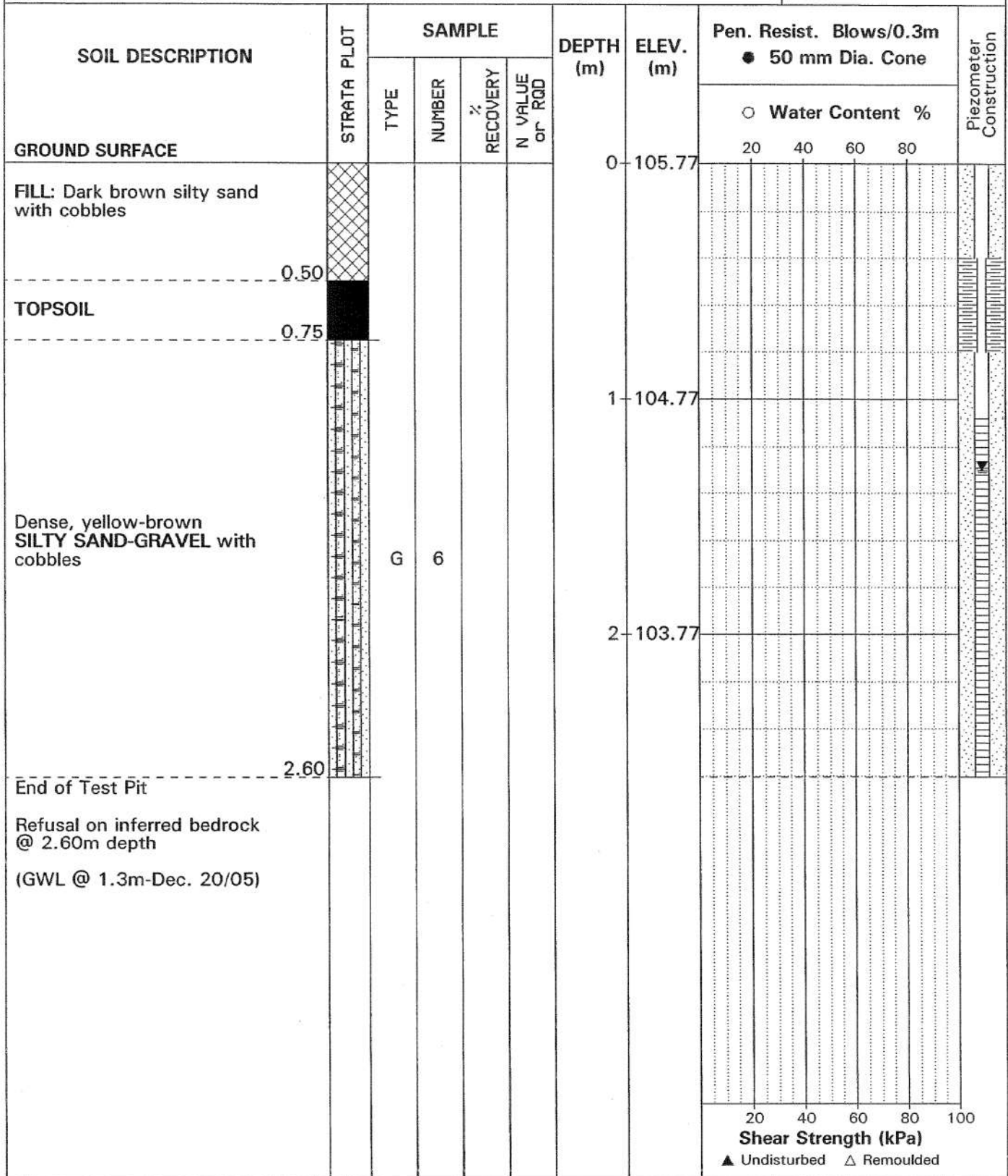
## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

**DATUM** Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.  
**REMARKS** Ground surface elevations based on vertical elevation survey by Paterson  
Group.  
**BORINGS BY** Excavator

DATE 15 AUG 05

**FILE NO.**  
**PH0208**  
**HOLE NO.**  
**TP7/MW4**



[illegible]

**Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario**

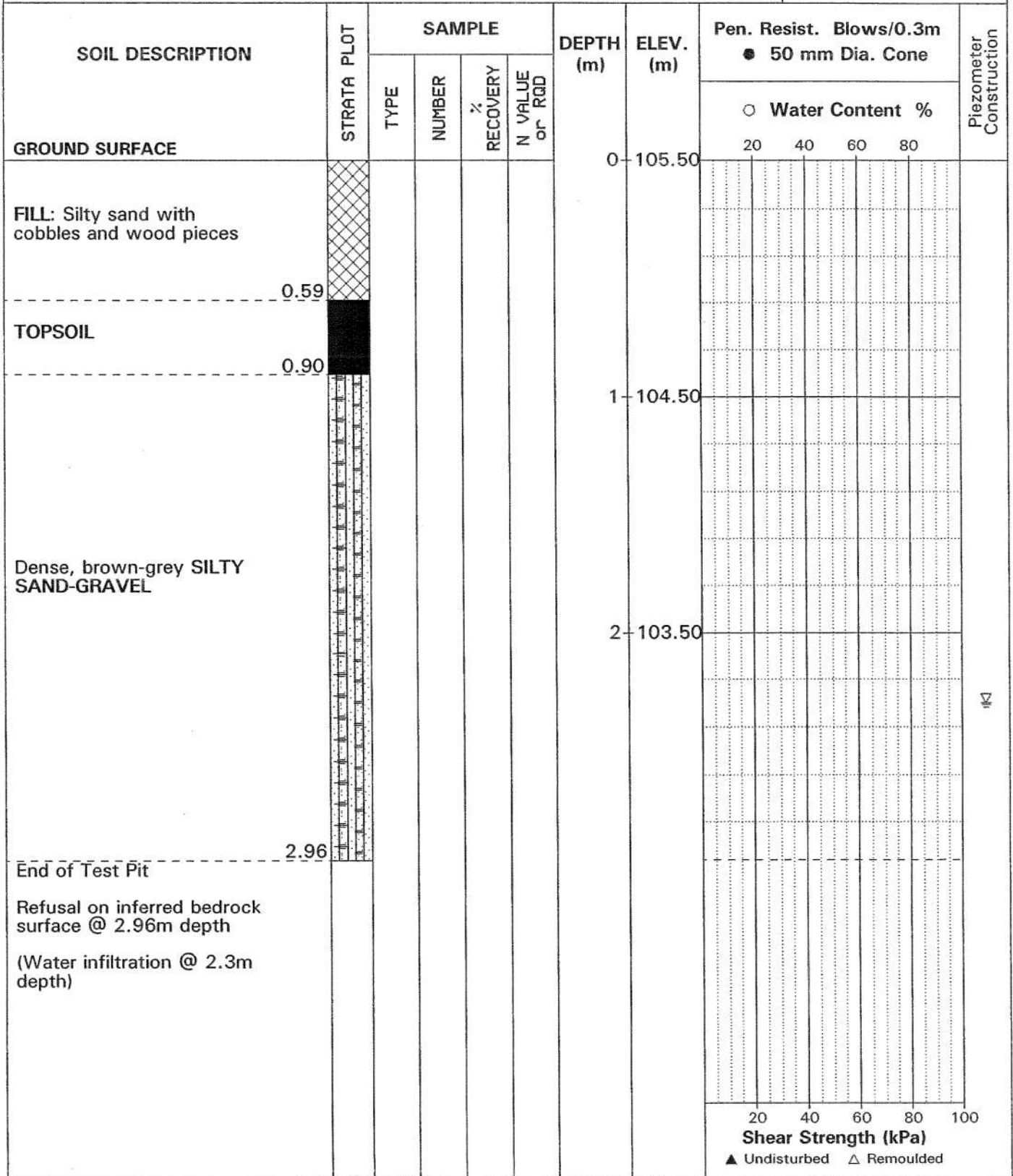
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## SOIL PROFILE & TEST DATA

Proposed Commercial Development  
Part 14, Lot 21, Concession 4 (R.F.)  
Ottawa (Nepean), Ontario

DATUM Geodetic elevation information taken from base mapping provided by  
Fotenn Consultants Inc.  
REMARKS Ground surface elevations based on vertical elevation survey by Paterson  
Group.  
BORINGS BY Excavator DATE 15 AUG 05

FILE NO. **PH0208**  
HOLE NO. **TP10**





## SOIL PROFILE & TEST DATA

FILE NO. PH0208

HOLE NO. TP11

DATUM	Geodetic elevation information taken from base mapping provided by Fotenn Consultants Inc.		
REMARKS	Ground surface elevations based on vertical elevation survey by Paterson Group.		
BORINGS BY	Excavator	DATE	15 AUG 05

DATE 15 AUG 05

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	109.25					
TOPSOIL	0.25					1	108.25					
FILL: Brown silty sand with cobbles, boulders, wood and rebar						2	107.25					
						3	106.25					
End of Test Pit (TP dry upon completion)	3.60											

Shear Strength (kPa)  
▲ Undisturbed    △ Remoulded

## SYMBOLS AND TERMS

### SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

## **SYMBOLS AND TERMS (continued)**

### **SOIL DESCRIPTION (continued)**

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

### **ROCK DESCRIPTION**

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

<b>RQD %</b>	<b>ROCK QUALITY</b>
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

### **SAMPLE TYPES**

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.



## SYMBOLS AND TERMS (continued)

### GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
D <sub>xx</sub>	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D <sub>10</sub>	-	Grain size at which 10% of the soil is finer (effective grain size)
D <sub>60</sub>	-	Grain size at which 60% of the soil is finer
C <sub>c</sub>	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
C <sub>u</sub>	-	Uniformity coefficient = $D_{60} / D_{10}$

C<sub>c</sub> and C<sub>u</sub> are used to assess the grading of sands and gravels:

Well-graded gravels have:  $1 < C_c < 3$  and  $C_u > 4$

Well-graded sands have:  $1 < C_c < 3$  and  $C_u > 6$

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

C<sub>c</sub> and C<sub>u</sub> are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

### CONSOLIDATION TEST

p' <sub>o</sub>	-	Present effective overburden pressure at sample depth
p' <sub>c</sub>	-	Preconsolidation pressure of (maximum past pressure on) sample
C <sub>cr</sub>	-	Recompression index (in effect at pressures below p' <sub>c</sub> )
C <sub>c</sub>	-	Compression index (in effect at pressures above p' <sub>c</sub> )
OC Ratio		Overconsolidation ratio = $p'_c / p'_o$
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
W <sub>o</sub>	-	Initial water content (at start of consolidation test)

### PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.
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## SYMBOLS AND TERMS (continued)

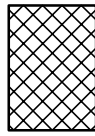
### STRATA PLOT



Topsoil



Asphalt



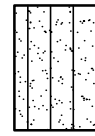
Fill



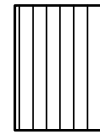
Peat



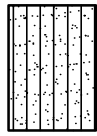
Sand



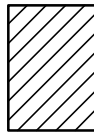
Silty Sand



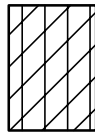
Silt



Sandy Silt



Clay



Silty Clay



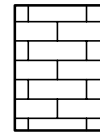
Clayey Silty Sand



Glacial Till



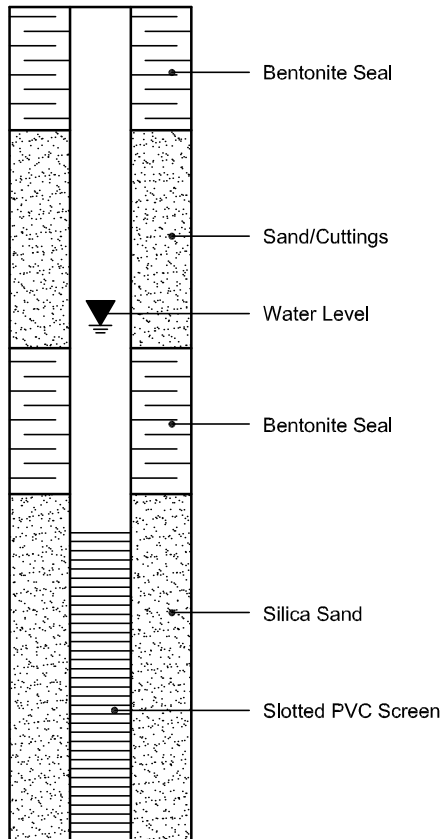
Shale



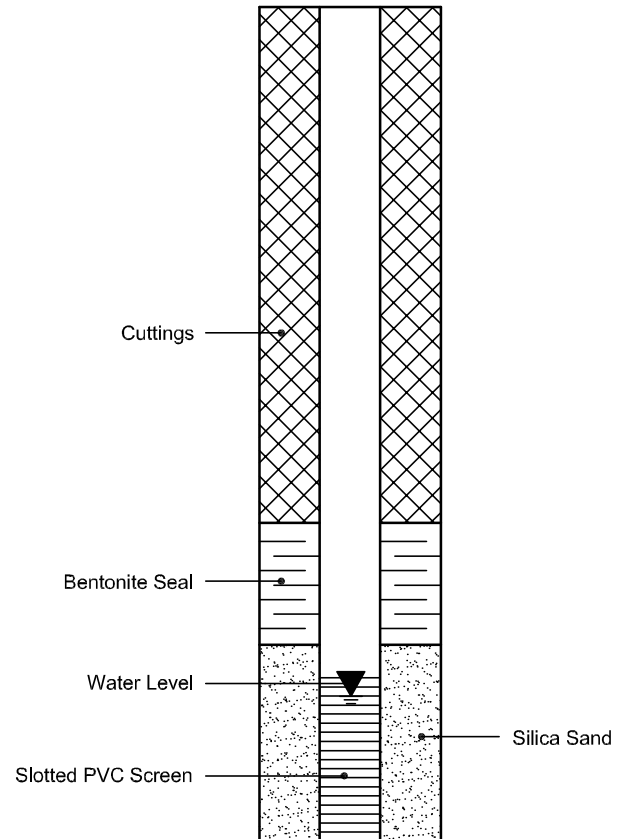
Bedrock

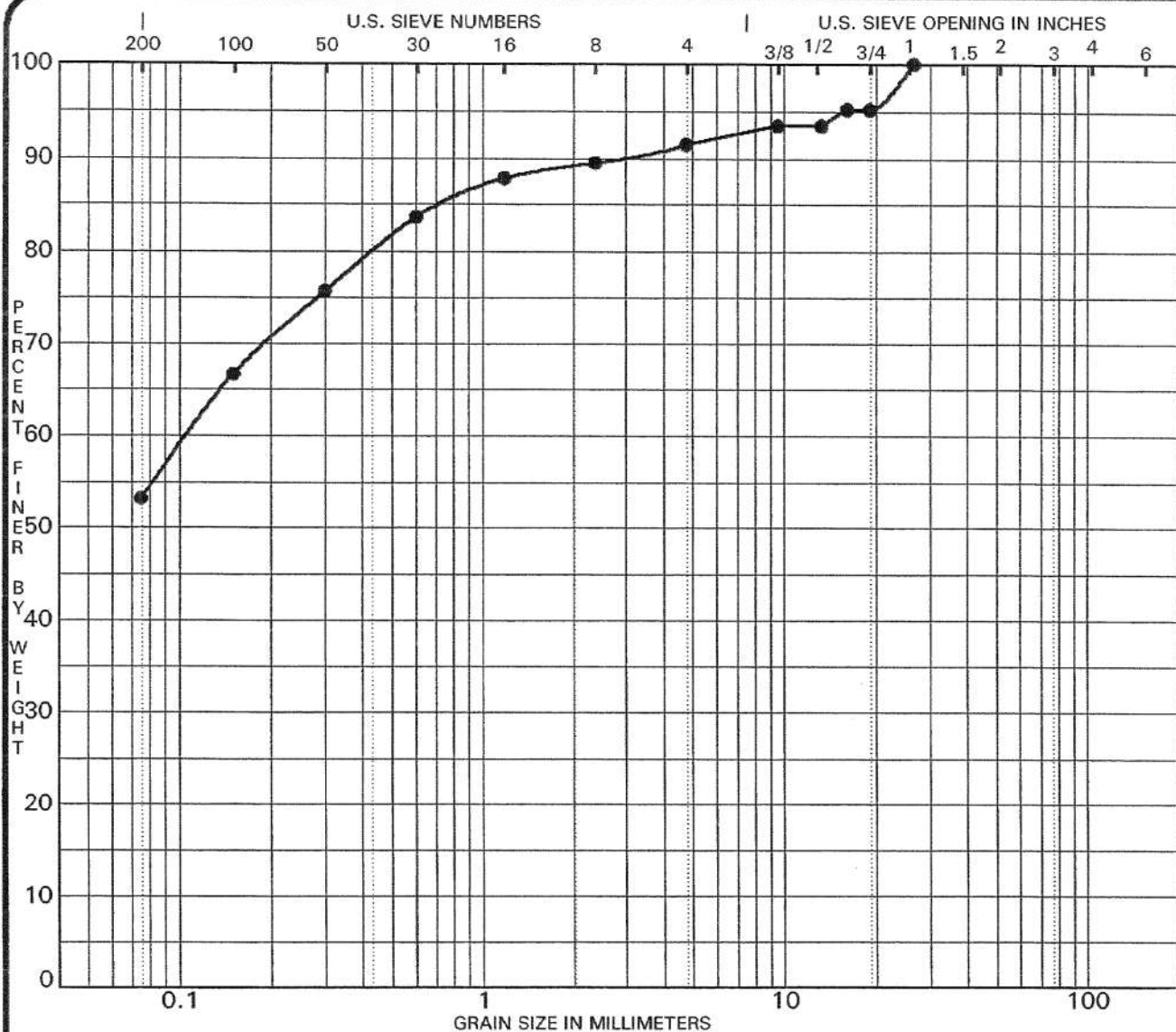
### MONITORING WELL AND PIEZOMETER CONSTRUCTION

#### MONITORING WELL CONSTRUCTION



#### PIEZOMETER CONSTRUCTION





SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

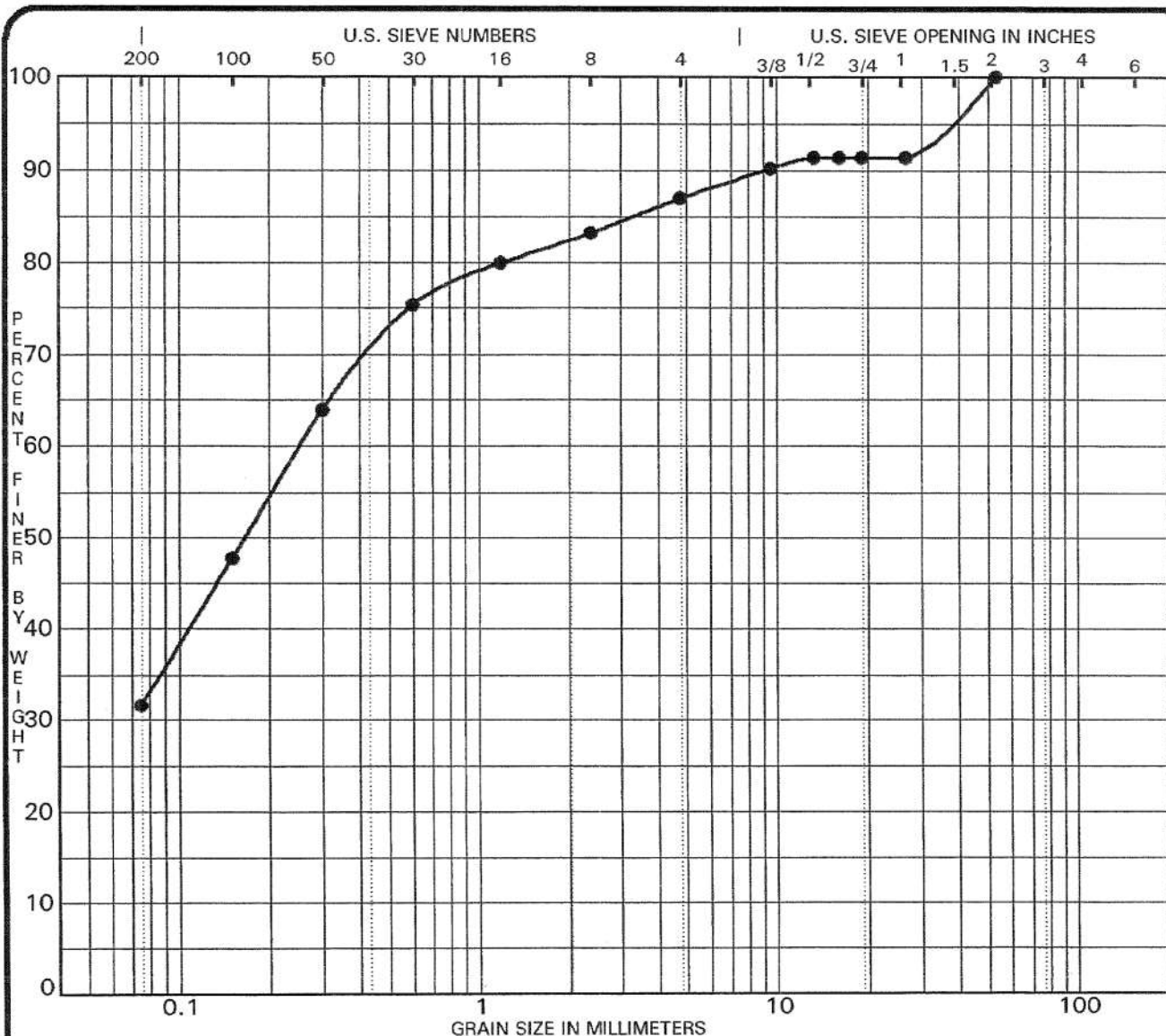
Specimen Identification	Classification				MC%	LL	PL	PI	Cc	Cu
● TP1/MW1 G2	Sandy Silt to Sandy Clay, some gravel (SM-SC)									
	Based on ASTM D 2487									
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
● TP1/MW1 G2	26.50	0.11			8.5	38.3	53.2			

CLIENT Lafarge North America  
 PROJECT Proposed Commercial Development - Part 14,  
Lot 21, Concession 4 (R.F.)

FILE NO. PH0208  
 DATE 15 AUG 05

**patersongroup** Consulting Engineers  
 28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

**GRAIN SIZE  
DISTRIBUTION**



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification			MC%	LL	PL	PI	Cc	Cu
●	TP3/MW2	G3	Silty Sand, some gravel (SM)								
			Based on ASTM D 2487								
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
●	TP3/MW2	G3	53.00	0.25			13.0	55.4	31.6		

CLIENT Lafarge North America

PROJECT Proposed Commercial Development - Part 14,  
Lot 21, Concession 4 (R.F.)

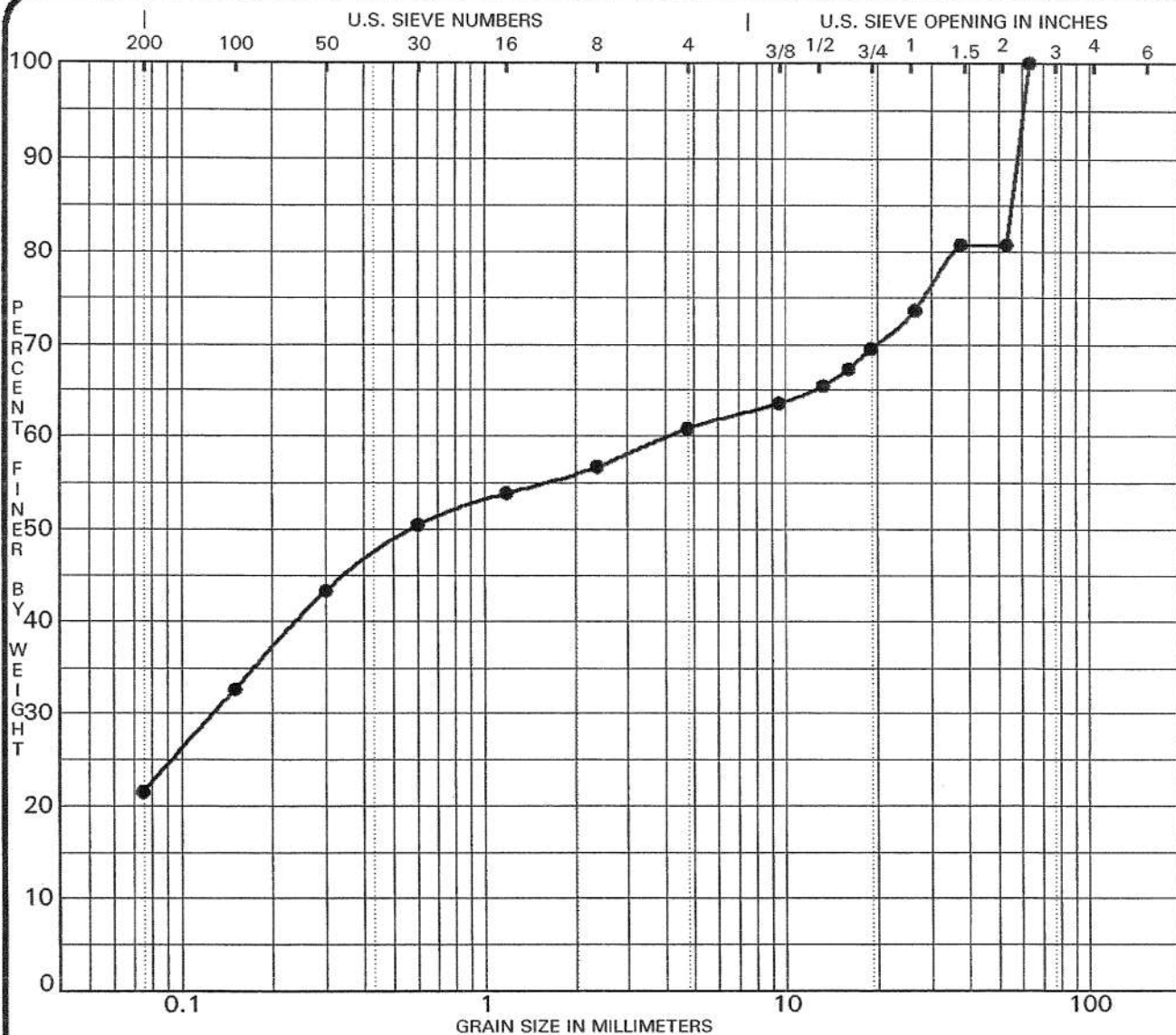
FILE NO. PH0208

DATE 15 AUG 05

**patersongroup** Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

**GRAIN SIZE DISTRIBUTION**



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification	MC%	LL	PL	PI	Cc	Cu
●	TP7/MW4	G6	Gravel, Sand, Clay mixture (GC)						
			Based on ASTM D 2487						

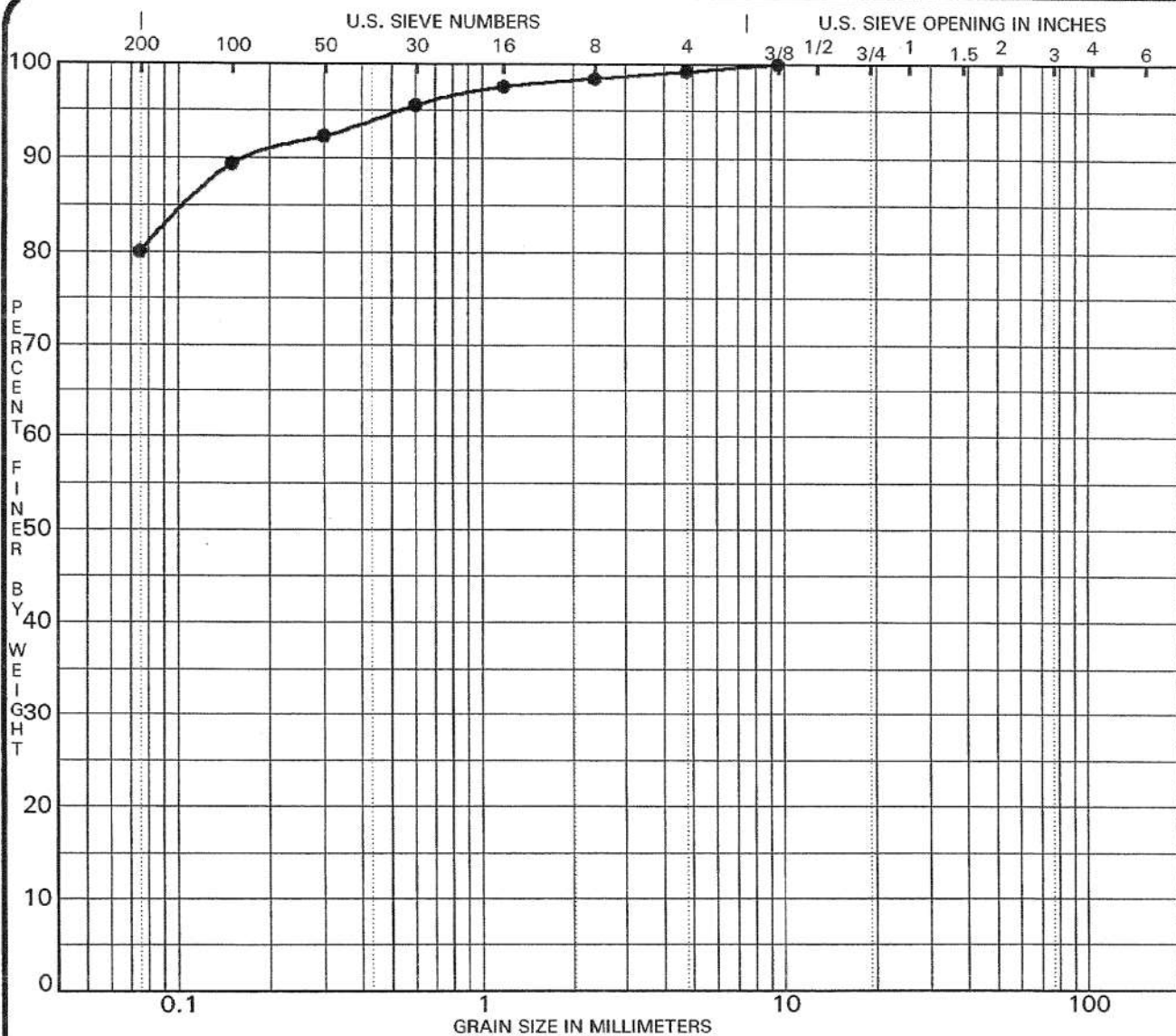
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP7/MW4 G6	63.00	4.14	0.127		39.2	39.3	21.5	

CLIENT Lafarge North America  
 PROJECT Proposed Commercial Development - Part 14,  
Lot 21, Concession 4 (R.F.)

FILE NO. PH0208  
 DATE 15 AUG 05

**patersongroup** Consulting Engineers  
 28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

**GRAIN SIZE DISTRIBUTION**



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification			Classification			MC%	LL	PL	PI	Cc	Cu
●	TP 9	G8	Inorganic Clay - Silty Clay (CL)								
			Based on ASTM D 2487								
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
●	TP 9	G8	9.50				0.8	19.2	80.0		

CLIENT Lafarge North America  
 PROJECT Proposed Commercial Development - Part 14,  
Lot 21, Concession 4 (R.F.)

FILE NO. PH0208  
 DATE 15 AUG 05

**patersongroup** Consulting Engineers  
 28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7

**GRAIN SIZE DISTRIBUTION**

## Certificate of Analysis

Client: Paterson Group Inc.

Client PO: 2174

Project: PG0783

Report Date: 10-Apr-2006

Order Date: 04-Apr-2006

Matrix: Soil

Sample ID:		BH4 SS3	TP4 G2
Sample Date:		04/04/2006	04/04/2006
Parameter	MDL/Units	L5343.1	L5343.2
Chloride	5 ug/g	150	5
Sulphate	5 ug/g	50	30
pH	0.05 pH units	8.49	7.90
Resistivity	0.1 ohm.m	29	68





## **APPENDIX D**


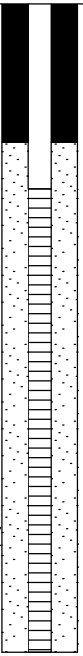
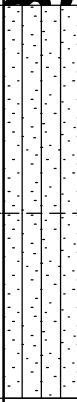
### Record of Test Pit and Borehole Logs



# RECORD OF BOREHOLE MW23-01

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Phase Two Environmental Site Assessment  
 JOB#: 102669.001  
 LOCATION: 4497 O'Keefe Court

SHEET: 1 OF 1  
 DATUM: CGVD2013  
 BORING DATE: Dec 16 2023

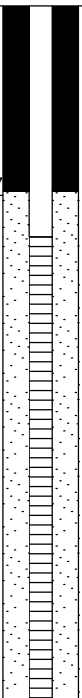





DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA				COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m				
0	Direct Push Casing (89mm (OD))	Ground Surface		109.32								
		Topsoil		0.05								
		Gravel and Sand mix			1	CA			HEX: 30 IBL: 0	None		 Bentonite Seal Sand Filter Pack 10' Screen
1					2	CA			HEX: 70 IBL: 0	None		
		Brown silty sand		107.64 1.68					HEX: 95 IBL: 0	Slight		
2					3	CA			HEX: 70 IBL: 0	Slight		
					4	CA			HEX: 35 IBL: 29	Moderate		
3		dark blue-green sandy silt		106.27 3.05					HEX: 85 IBL: 15	Moderate		
4					5	CA						
					6	CA						
		Auger Refusal.		105.05 4.27								
		End of Borehole										

GROUNDWATER OBSERVATIONS		
DATE	DEPTH (m)	ELEVATION (m)
Dec. 19/23	3.56	105.76

# RECORD OF BOREHOLE MW23-02

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Phase Two Environmental Site Assessment  
 JOB#: 102669.001  
 LOCATION: 4497 O'Keefe Court

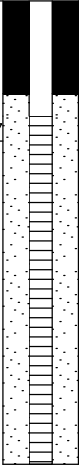
SHEET: 1 OF 1  
 DATUM: CGVD2013  
 BORING DATE: Dec 16 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA				COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m					LABORATORY ANALYSES
0	Direct Push Casing (89mm (OD))	Ground Surface		105.46								 <div>Bentonite Seal</div> <div>Sand Filter Pack</div> <div>10' Screen</div>	
		Topsoil		105.41									
		Brown sand, trace pebbles (Fill)		0.05	1	CA			M&I, PAHs, BTEX, PHCs F1-F4	HEX: 55 IBL: 0	None		
				104.74									
		Grey Gravel		0.72									
1		Brown Silty Sand		104.70	2	CA				HEX: 65 IBL: 0	None		
				0.76									
2					3	CA				HEX: 35 IBL: 0	None		
					4	CA				HEX: 70 IBL: 0	None		
3			Grey sandy silt		102.54								
			2.92										
				5	CA			M&I, PAHs, BTEX, PHCs F1-F4	HEX: 230 IBL: 0	None			
4													
				6	CA			M&I, PAHs, BTEX, PHCs F1-F4	HEX: 210 IBL: 0	None			
		Auger Refusal at 15 feet. End of Borehole.		100.89									
				4.57									
GROUNDWATER OBSERVATIONS													
DATE		DEPTH (m)		ELEVATION (m)									
Dec. 19/23		1.25		▽		104.21							

RECORD OF BOREHOLE MW23-03A

CLIENT: The Properties Group Management Ltd.  
PROJECT: Phase Two Environmental Site Assessment  
JOB#: 102669.001  
LOCATION: 4497 O'Keefe Court

SHEET: 1 OF 1  
DATUM: CGVD2013  
BORING DATE: Dec 15 2023


DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA				COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m				
0	Direct Push Casing (89mm (OD))	Ground Surface		105.17								 <div>Bentonite Seal Sand Filter Pack 7.5' Screen</div>
		brown silt and sand, trace cobbles and pebbles			1	CA			HEX: 0 IBL: 0	None		
1		Brown silty sand.		104.41 0.76	2	CA			HEX: 0 IBL: 0	None		
2					3	CA			HEX: 0 IBL: 0	None		
3					4	CA			HEX: 0 IBL: 0	None		
		Auger Refusal at 10'. Assumed bedrock. End of Borehole.		102.12 3.05								
GROUNDWATER OBSERVATIONS												
DATE		DEPTH (m)		ELEVATION (m)								
Dec. 19/23		0.93		104.24								

ENV - BOREHOLE LOG 102669.001\_02-02-2024.AW.GPJ GEMTEC 2018.GDT 2/14/24

# RECORD OF BOREHOLE MW23-03B

CLIENT: The Properties Group Management Ltd.  
PROJECT: Phase Two Environmental Site Assessment  
JOB#: 102669.001  
LOCATION: 4497 O'Keefe Court

SHEET: 1 OF 1  
DATUM: CGVD2013  
BORING DATE: Dec 15 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLE DATA					COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES				
0	Direct Push Casing (89mm (OD))	Ground Surface		105.25									 <p>Bentonite Seal</p> <p>Sand Filter Pack</p> <p>10' Screen</p> <p>Sand Filter Pack</p>
		brown silt and sand, trace cobbles and pebbles											
1	Brown silty sand.			104.49 0.76									
2													
3													
4	Air Rotary Casing (89mm (OD))	Auger Refusal at assumed bedrock. Air Hammer drilling to continue.		102.20 3.05									
5													
6													
7													
		End of Borehole		97.63 7.62									
GROUNDWATER OBSERVATIONS													
DATE		DEPTH (m)		ELEVATION (m)									
Dec. 19/23		0.43		▽		104.82							

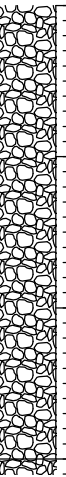
# RECORD OF TEST PIT 23-01

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 23 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPa + NATURAL ⊕ REMOULDED													ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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Test pit loosely backfilled with excavated material



MH

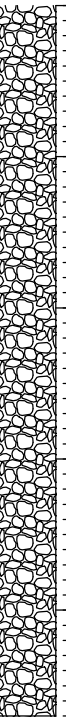
# RECORD OF TEST PIT 23-02

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 26 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED														ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)			WATER CONTENT, % W <sub>p</sub> — W — W <sub>L</sub>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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Test pit  
loosely  
backfilled  
with  
excavated  
material

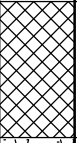

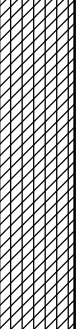


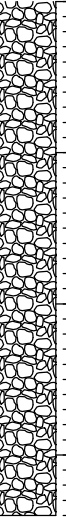
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# RECORD OF TEST PIT 23-03

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 23 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED	WATER CONTENT, %		ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)				W <sub>p</sub>	W		
0	Ground Surface		105.0							
	Brown silty sand and gravel, frequent cobbles and boulders (ROCK FILL)			1	GS	○				Test pit loosely backfilled with excavated material
1	FORMER TOPSOIL		0.9 103.9 1.1	2	GS			○		
	Grey brown sandy clayey silt, trace gravel, cobbles and boulders observed (WEATHERED CRUST)			3	GS	○				
2				4	GS	○				
3										
	End of test pit Refusal on possible bedrock Groundwater observed at 1.1 mbgs; estimated moderate inflow rate.		101.6 3.4							
4										
5										
6										
7										
8										
9										
10										



GEO - TESTPIT LOG 102669.001 TP LOGS 2023-07-05.GPJ GEMTEC 2018.GDT 7/27/23

# RECORD OF TEST PIT 23-04

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 26 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED										ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)			WATER CONTENT, % Wp — W — Wl											
						10	20	30	40	50	60	70	80	90			
0	Ground Surface		106.3														Test pit loosely backfilled with excavated material
	TOPSOIL		0.2	1	GS	○											
	Brown, gravelly silty sand, frequent cobbles and boulders (FILL MATERIAL)		105.7	2	GS		○										
1	Grey sandy silt, some clay, trace gravel, frequent cobbles and boulders (FILL MATERIAL)		0.6														
			104.8	3	GS			○									
	Silty sand and gravel (FILL MATERIAL)		1.5														
2																	
3	Grey brown silty clay (WEATHERED CRUST)		103.3	4	GS					○							
	Grey SILTY CLAY, some sand, with occasional sand seams		102.8	5	GS		○										
4																	
5	End of test pit Refusal on probable bedrock Groundwater observed at 0.5 mbgs		101.5														
			4.8														
6																	
7																	
8																	
9																	
10																	

GEO - TESTPIT LOG 102669.001 TP LOGS 2023-07-05.GPJ GEMTEC 2018.GDT 7/27/23

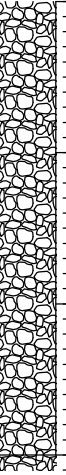


# RECORD OF TEST PIT 23-05

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 26 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED												WATER CONTENT, % W <sub>p</sub> — W — W <sub>L</sub>	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV.																	
			DEPTH (m)																	
0	Ground Surface		105.2																	
	TOPSOIL		0.2	1	GS															
	Grey sand and gravel, trace to some silt / clay, frequent rootlets, cobbles and boulders (FILL MATERIAL)		104.7																	
	Grey brown sand and gravel, trace to some silt and clay (FILL MATERIAL)		0.5	2	GS															
1																				
	Grey brown silty sand, some gravel, trace to some clay, frequent cobbles and boulders (POSSIBLE GLACIAL TILL)		103.7																	
			1.5	3	GS															
2																				
	End of test pit Refusal on probable bedrock Groundwater observed at 1.0 mbgs; estimated slow inflow rate		102.1																	
			3.1																	
4																				
5																				
6																				
7																				
8																				
9																				
10																				









Test pit loosely backfilled with excavated material

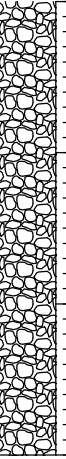
GEO - TESTPIT LOG 102669.001 TP LOGS 2023-07-05.GPJ GEMTEC 2018.GDT 7/27/23

# RECORD OF TEST PIT 23-06

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 26 2023




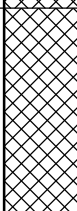
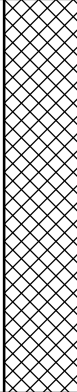
DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPa + NATURAL ⊕ REMOULDED										WATER CONTENT, % Wp — W — Wl			ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV.																	
			DEPTH (m)			10	20	30	40	50	60	70	80	90						
0	Ground Surface		105.2															Test pit loosely backfilled with excavated material		
	TOPSOIL			1	GS															
	Grey silty sand (FILL MATERIAL)		0.3 104.7	2	GS															
	Grey brown silty clay (WEATHERED CRUST)		0.5	3	GS															
1																				
2	Grey silty clayey sand, some gravel, frequent cobbles and boulders (POSSIBLE GLACIAL TILL)		103.2 2.0	4	GS															
3	End of test pit Refusal on probable bedrock Groundwater observed at approximately 3.0 mbgs; estimated slow inflow rate		102.2 3.0																	
4																				
5																				
6																				
7																				
8																				
9																				
10																				



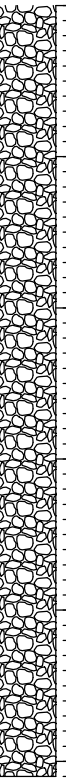
# RECORD OF TEST PIT 23-07

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 23 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED										WATER CONTENT, % W <sub>p</sub> — W — W <sub>L</sub>					ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV.																			
			DEPTH (m)																			
0	Ground Surface		107.3																		Test pit loosely backfilled with excavated material	
	TOPSOIL		0.1																			
	Grey brown silty sand and gravel, frequent cobbles and boulders (FILL MATERIAL)		106.7 0.6	1	GS																	
	Grey and brown sand and gravel, trace to some silt and clay, frequent cobbles, boulders, concrete, and asphalt, frequent voids, occasional roots (FILL MATERIAL)			2	GS																	
1																						
				3	GS																	
2																						
	Grey silty sand and gravel, trace clay, frequent cobbles, boulders, concrete and asphalt, frequent voids (FILL MATERIAL)		104.8 2.5	4	GS																	
3																						
4																						
5																						
	End of test pit Refusal on probable bedrock Groundwater observed in the test pit at approximately 3.5 mbgs; estimated slow inflow rate Instability of the test pit walls observed during investigation		102.2 5.1																			
6																						
7																						
8																						
9																						
10																						


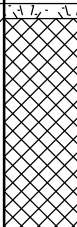
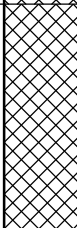
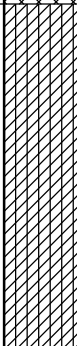
Test pit loosely backfilled with excavated material



# RECORD OF TEST PIT 23-07 A

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 26 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED												WATER CONTENT, % W <sub>p</sub> — W — W <sub>L</sub>			ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV.																			
			DEPTH (m)																			
0	Ground Surface		107.8																		Test pit loosely backfilled with excavated material	
	TOPSOIL		107.7	1	GS																	
	Brown silty sand and gravel, frequent cobbles and boulders, steel cable (FILL MATERIAL)		0.1																			
1																						
	Grey silt and sand, some gravel (FILL MATERIAL)		106.3	2	GS																	
			1.5	3	GS																	
2																						
	Grey brown silty clay, some sand (POSSIBLE WEATHERED CRUST)		104.8	4	GS																	
			3.0																			
3																						
4																						
5																						
	End of test pit Refusal on probable bedrock groundwater observed at approximately 3.0 mbgs; estimated slow inflow rate		102.5																			
			5.3																			
6																						
7																						
8																						
9																						
10																						

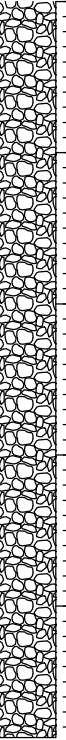
GEO - TESTPIT LOG 102669.001 TP LOGS 2023-07-05.GPJ GEMTEC 2018.GDT 7/27/23

# RECORD OF TEST PIT 23-08

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 23 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPa + NATURAL ⊕ REMOULDED														WATER CONTENT, % Wp — W — Wl	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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





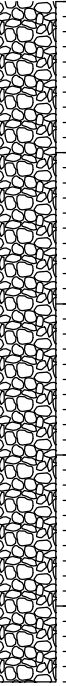
Test pit  
loosely  
backfilled  
with  
excavated  
material

# RECORD OF TEST PIT 23-08 A

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 26 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED										WATER CONTENT, % W <sub>p</sub> — W — W <sub>L</sub>					ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION	
	DESCRIPTION	STRATA PLOT	ELEV.																				
			DEPTH (m)																				
0	Ground Surface		108.6																		Test pit loosely backfilled with excavated material		
	TOPSOIL		108.4 0.3																				
	Brown gravelly silty sand, frequent cobbles and boulders (FILL MATERIAL)			1	GS																		
1																							
	Grey silty sand and gravel (FILL MATERIAL)		107.1 1.5		2	GS																	
2																							
	Grey brown, silty sand and gravel, frequent cobbles and boulders (POSSIBLE GLACIAL TILL)		106.1 2.5		3	GS																	
3																							
4																							
	End of test pit Refusal on probable bedrock Groundwater observed at approximately 3.0 mbgs; estimated slow inflow rate		104.1 4.5																				
5																							
6																							
7																							
8																							
9																							
10																							



Test pit  
loosely  
backfilled  
with  
excavated  
material

GEO - TESTPIT LOG 102669.001 TP LOGS 2023-07-05.GPJ GEMTEC 2018.GDT 7/27/23

# RECORD OF TEST PIT 23-09

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 23 2023


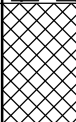
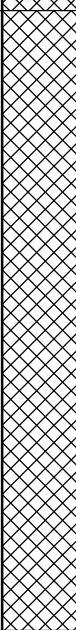
DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED														WATER CONTENT, % W <sub>p</sub> — W — W <sub>L</sub>	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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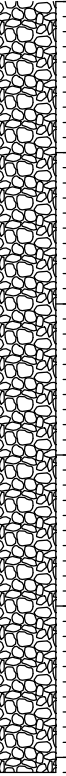
GEO - TESTPIT LOG 102669.001 TP LOGS 2023-07-05.GPJ GEMTEC 2018.GDT 7/27/23

# RECORD OF TEST PIT 23-10

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 23 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPa + NATURAL ⊕ REMOULDED														ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV. DEPTH			WATER CONTENT, %															
			(m)			W <sub>p</sub>	W	W <sub>L</sub>													
	Ground Surface		110.3			10	20	30	40	50	60	70	80	90							
0	TOPSOIL		110.1																		
	Brown, gravel and sand, trace to some silt and clay, frequent cobbles and boulders, occasional rootlets (FILL MATERIAL)			1	GS	○															
1			109.3																		
	Brown sandy gravel, some to trace silt, frequent cobbles and boulders, occasional debris (FILL MATERIAL)		1.0	2	GS	○															
2																					
3																					
4				3	GS	○															
5																					
	End of test pit Refusal on probable bedrock No groundwater observed in test pit		105.2																		
			5.1																		
6																					
7																					
8																					
9																					
10																					



Test pit  
loosely  
backfilled  
with  
excavated  
material

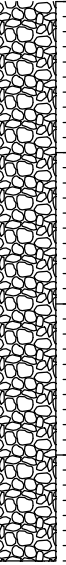


# RECORD OF TEST PIT 23-11

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 23 2023

DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPa + NATURAL ⊕ REMOULDED														ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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Test pit  
loosely  
backfilled  
with  
excavated  
material

M

M

# RECORD OF TEST PIT 23-12

CLIENT: The Properties Group Management Ltd.  
 PROJECT: Geotechnical Investigation, 4997 O'keefe Court, Ottawa, ON  
 JOB#: 102669.001  
 LOCATION: See Figure A.1, Test Pit Location Plan

SHEET: 1 OF 1  
 DATUM: CGVD28  
 BORING DATE: Jun 26 2023


DEPTH SCALE METRES	SOIL PROFILE			SAMPLE NUMBER	SAMPLE TYPE	SHEAR STRENGTH (Cu), kPA + NATURAL ⊕ REMOULDED														ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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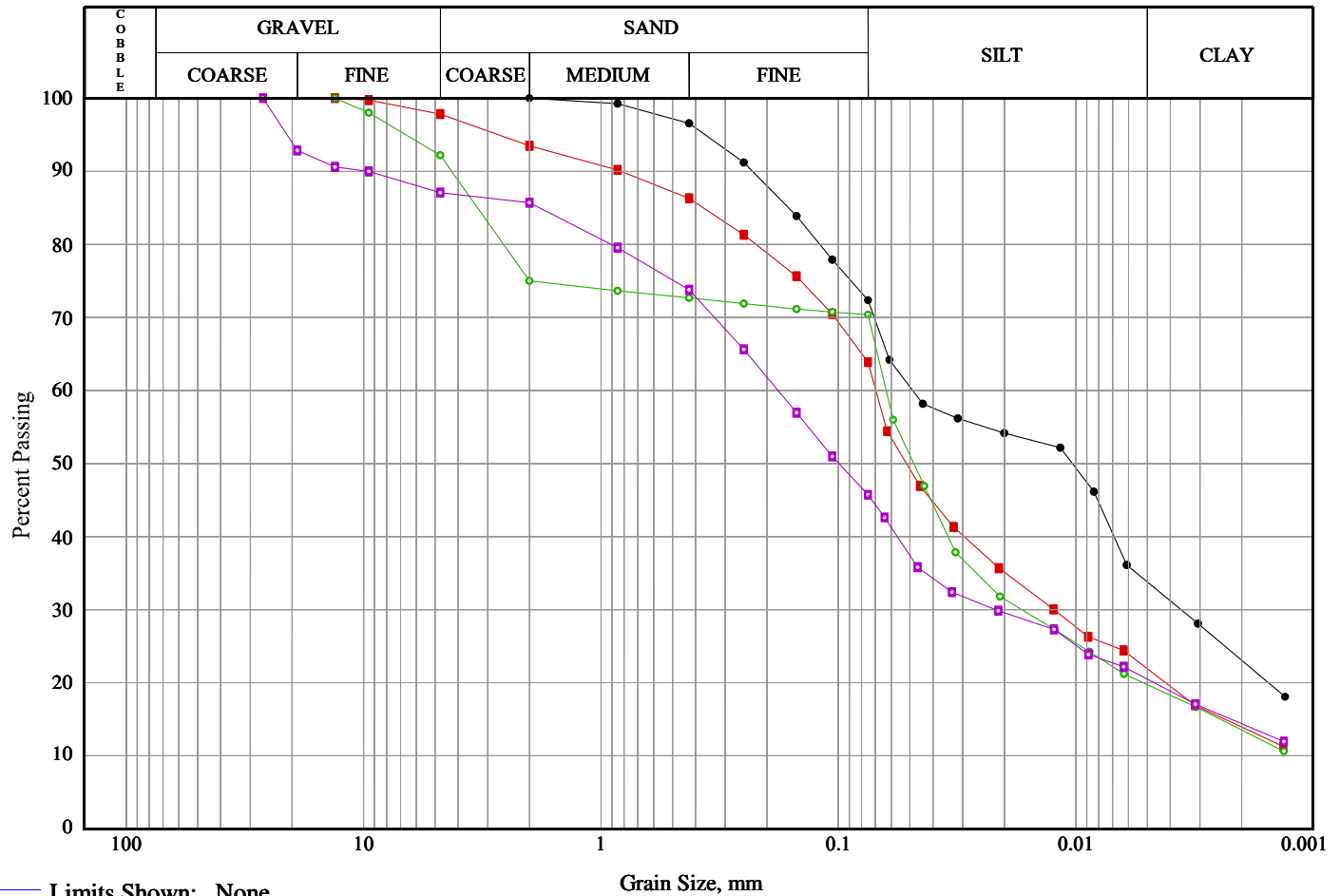
GEO - TESTPIT LOG 102669.001.TP LOGS 2023-07-05.GPJ GEMTEC 2018.GDT 7/27/23



## **APPENDIX E**


### Grain Size Distribution Curves

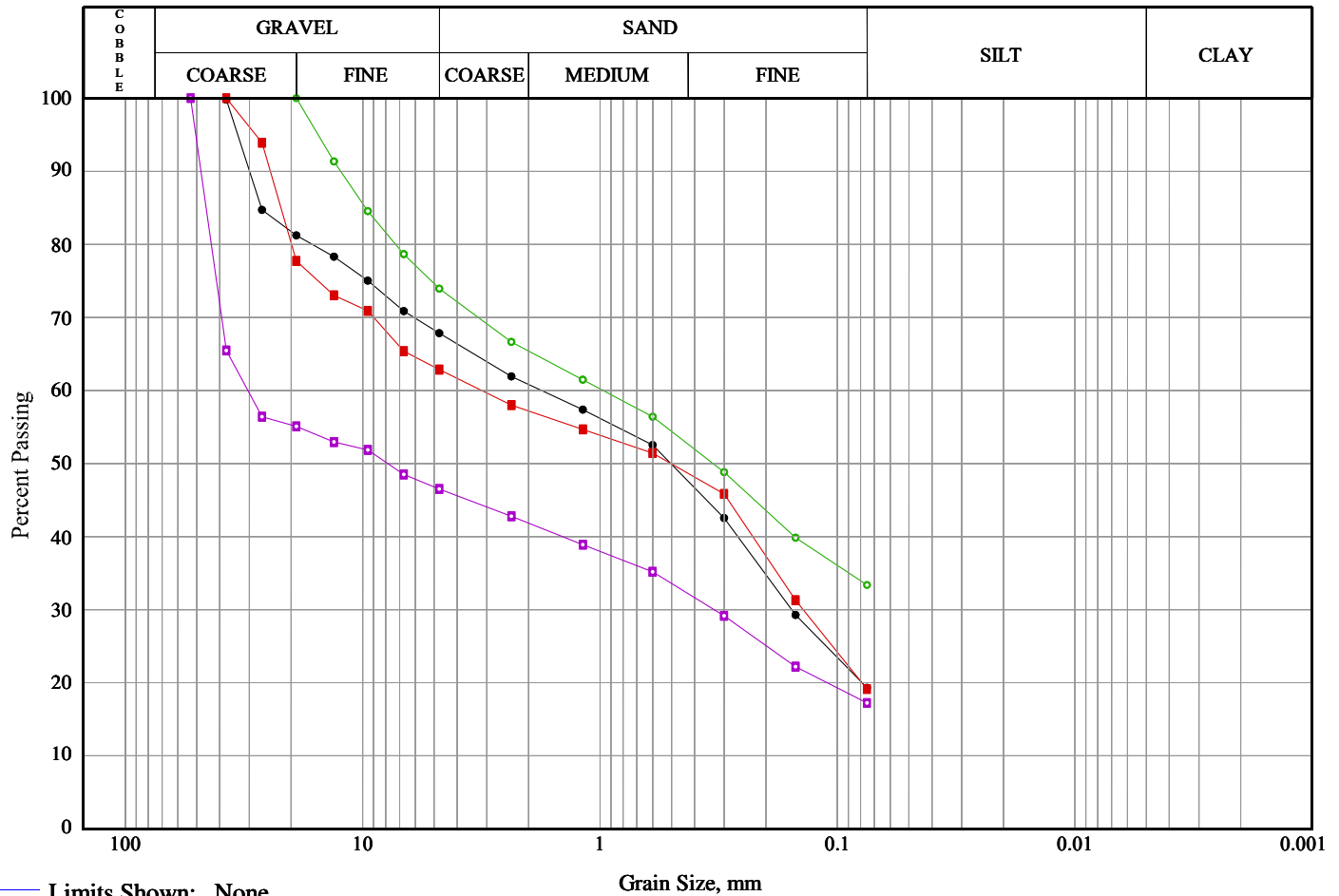
 <b>GEMTEC</b> CONSULTING ENGINEERS AND SCIENTISTS	Client: The Properties Group Management Ltd	<b>Soils Grading Chart</b> (LS-702/ ASTM D-422)
	Project: Geotechnical Investigation, Proposal Industrial Develop	
	Project #: 102669001	



Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	Fill Material	23-01	SA 3	2.2-2.8	0.0	27.6	38.6	33.8
—■—	Weathered Crust	23-03	SA 4	2.1-3.0	2.2	34.0	41.9	21.9
—○—	Fill Material	23-04	SA 3	1.1-1.4	7.8	21.8	50.6	19.7
—□—	Possible Glacial Till	23-06	SA 4	2.1-2.4	12.9	41.4	25.2	20.5

Line Symbol	CanFEM Classification	USCS Symbol	D <sub>10</sub>	D <sub>15</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>85</sub>	% 5-75µm
—●—	Sandy clayey silt	N/A	---	---	0.00	0.01	0.05	0.16	38.6
—■—	Sandy clayey silt , trace gravel	N/A	---	0.00	0.01	0.05	0.07	0.37	41.9
—○—	Sandy silt , some clay , trace gravel	N/A	---	0.00	0.02	0.05	0.06	3.31	50.6
—□—	Silty clayey sand , some gravel	N/A	---	0.00	0.02	0.10	0.18	1.82	25.2

 <b>GEMTEC</b> CONSULTING ENGINEERS AND SCIENTISTS	Client: The Properties Group Management Ltd	<h1>Soils Grading Chart</h1>
	Project: Geotechnical Investigation, Proposal Industrial Develop	
	Project #: 102669001	



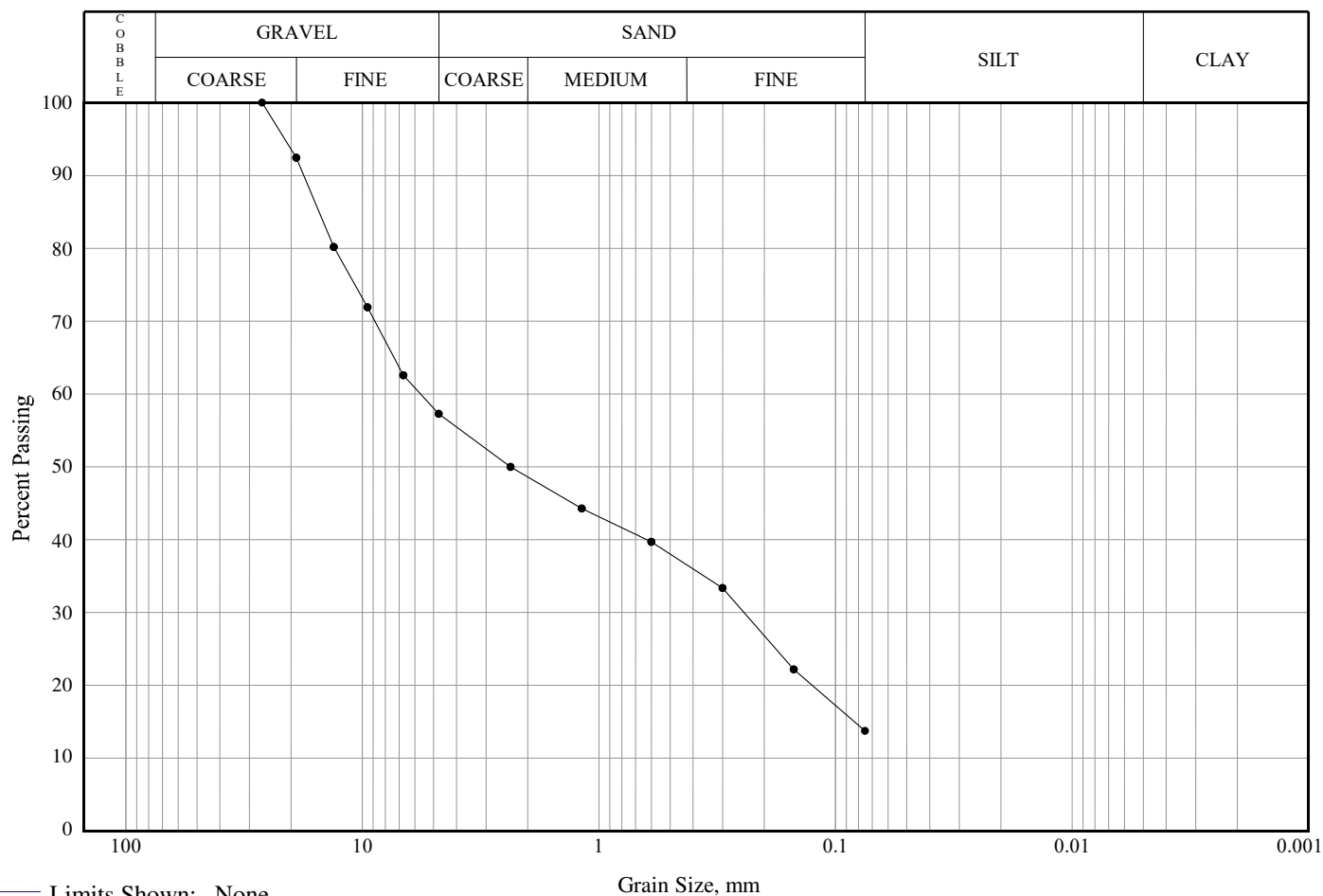
Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	Possible Glacial Till	23-02	SA 4	2.5-3.0	32.2	48.5	19.3	
—■—	Fill Material	23-09	SA 1	0.5-0.9	37.2	43.7	19.1	
—○—	Fill Material	23-11	SA 2	0.60-1.0	26.1	40.6	33.3	
—□—	Fill Material	23-11	SA 4	2.5-3.1	53.5	29.3	17.2	

Line Symbol	CanFEM Classification	USCS Symbol	D <sub>10</sub>	D <sub>15</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>85</sub>	% 5-75µm
—●—	Gravelly sand , some silt	N/A	---	---	0.16	0.50	1.76	26.68	---
—■—	Sand and gravel , some silt	N/A	---	---	0.14	0.50	3.15	22.07	---
—○—	Gravelly silty sand	N/A	---	---	---	0.33	0.97	9.72	---
—□—	Sandy gravel , some silt	N/A	---	---	0.33	7.85	30.43	45.61	---



Project #: 102669001

# Soils Grading Chart



Limits Shown: None

[illegible][illegible]



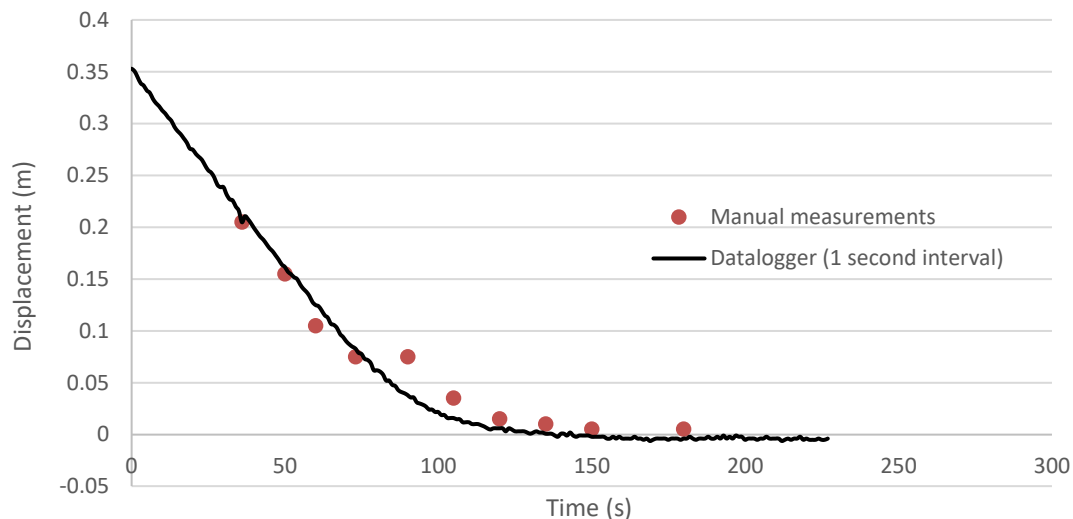
## **APPENDIX F**

### Hydraulic Conductivity Analysis

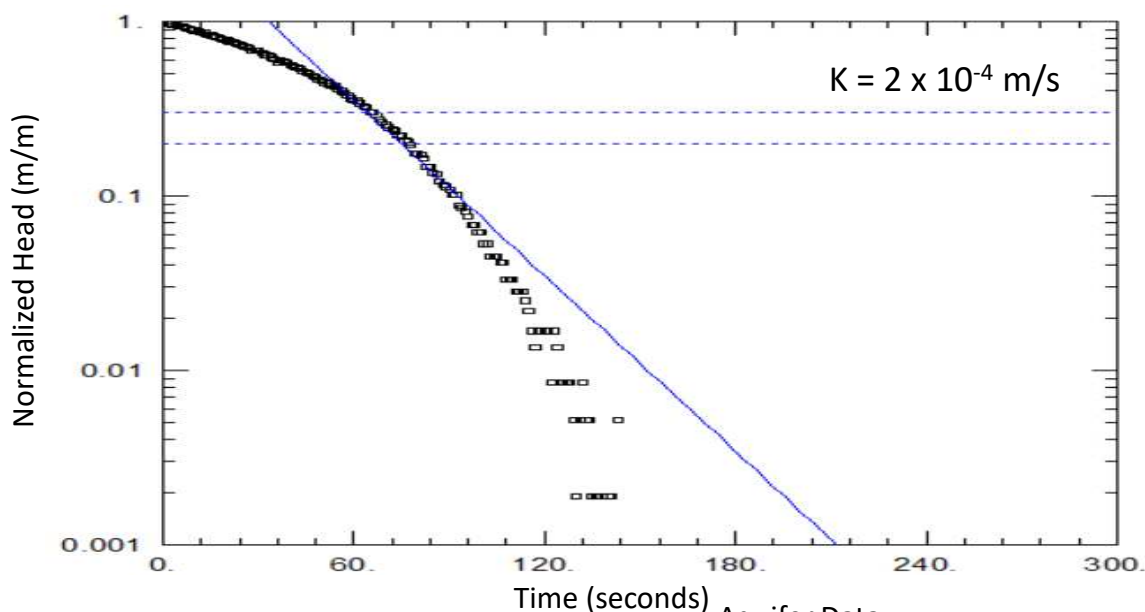
## Slug Test Data

## Figure F1

Borehole 23-01 Rising Head (RH) Test



Borehole 23-01 RH: Bouwer-Rice Analysis



### Well Data:

Displacement observed (slug size): 0.35 metres (0.6 m)

Well Depth: 4.27 metres

Screen Length: 3.36 metres

Well Radius: 0.0254 metres

### Aquifer Data

Saturated Thickness: 0.67 metres

Anisotropy Ratio ( $K_z/K_r$ ): 0.2

Aquifer Model: Unconfined, B-R

Static Water Level: 3.61 metres bgs



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AND SCIENTISTS

Date: March 2024

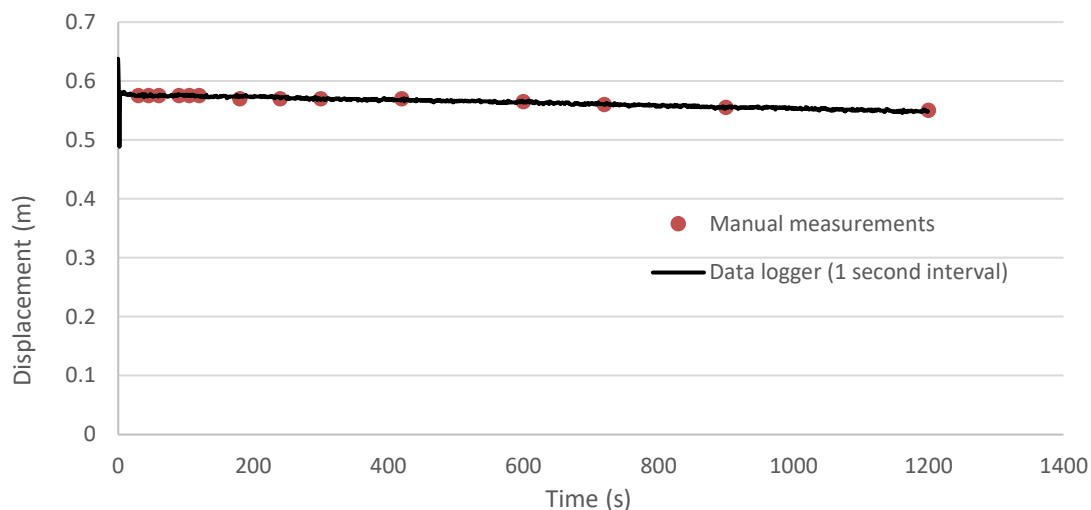
Project: 102669.001



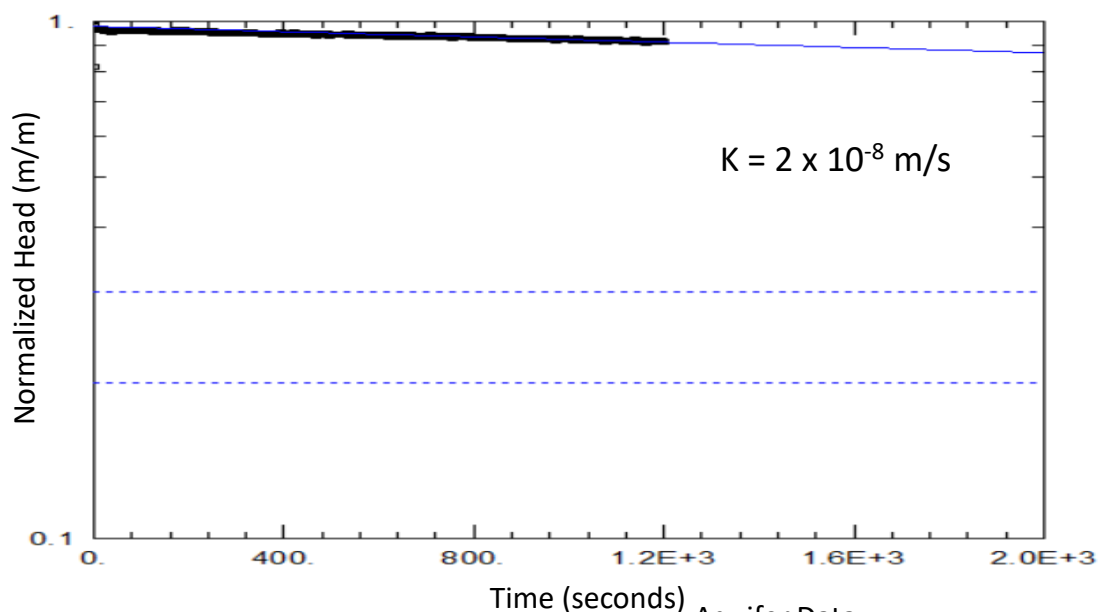
## Slug Test Data

## Figure F2

### Borehole 23-02 Falling Head (FH) Test



### Borehole 23-02 FH: Bouwer-Rice Analysis



#### Well Data:

Displacement observed (slug size): 0.64 metres (0.6 m)

Well Depth: 4.57 metres

Screen Length: 3.35 metres

Well Radius: 0.0254 metres

#### Aquifer Data

Saturated Thickness: 4.26 metres

Anisotropy Ratio ( $K_z/K_r$ ): 0.2

Aquifer Model: Unconfined, B-R

Static Water Level: 0.32 metres bgs



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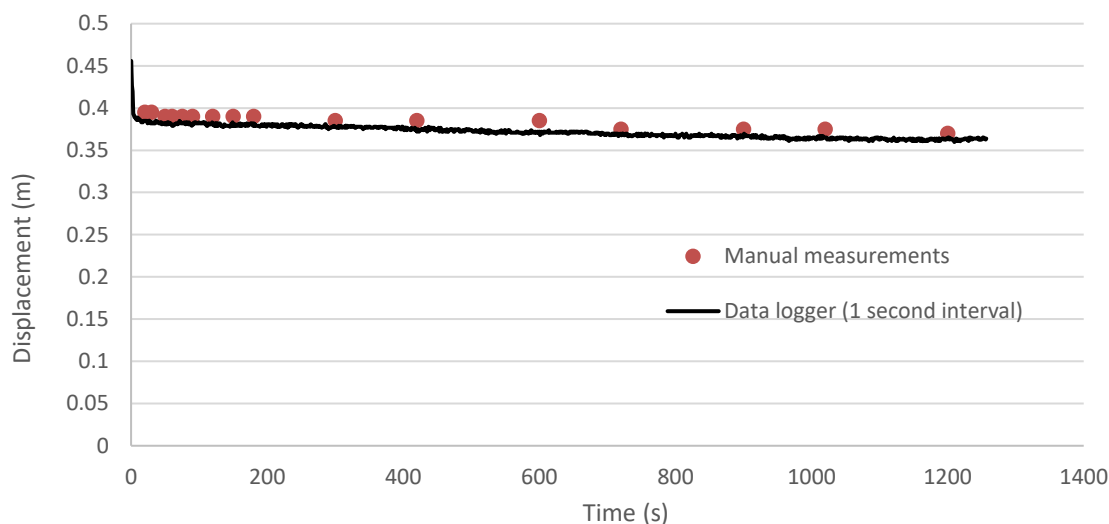
Date: March 2024

Project: 102669.001

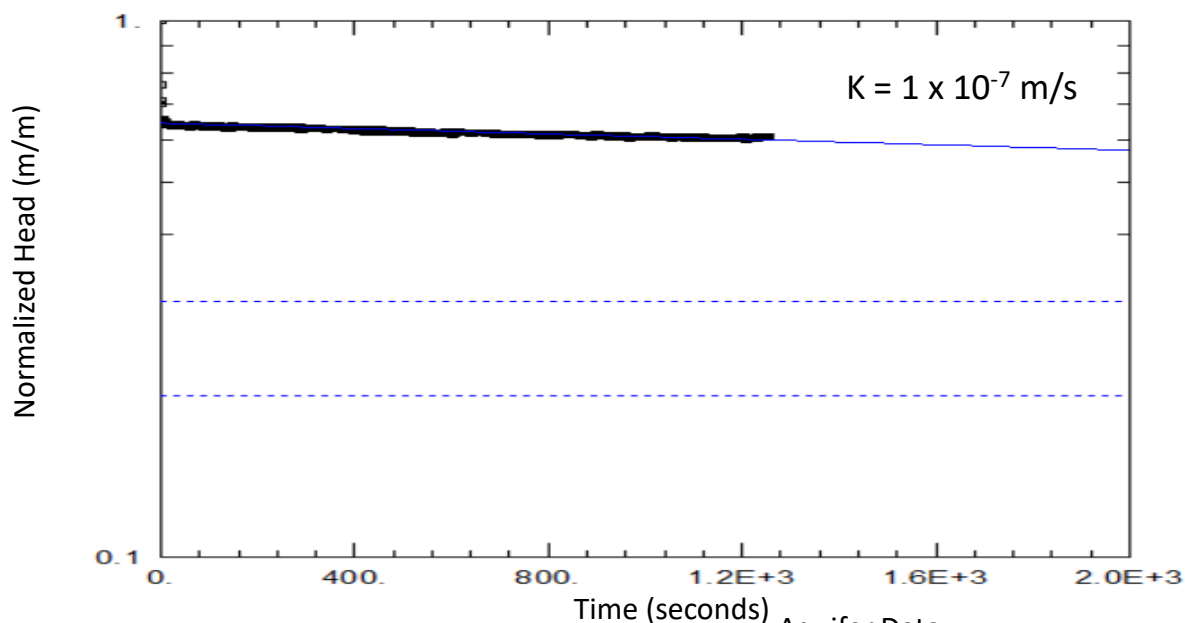
## Slug Test Data

## Figure F3

### Borehole 23-03A Falling Head (FH)



### Borehole 23-03A FH: Bouwer-Rice Analysis



#### Well Data:

Displacement observed (slug size): 0.46 metres (0.60 m)

Well Depth: 3.05 metres

Screen Length: 2.44 metres

Well Radius: 0.0254 metres

#### Aquifer Data

Saturated Thickness: 2.03 metres

Anisotropy Ratio ( $K_z/K_r$ ): 0.2

Aquifer Model: Unconfined, B-R

Static Water Level: 1.02 metres bgs



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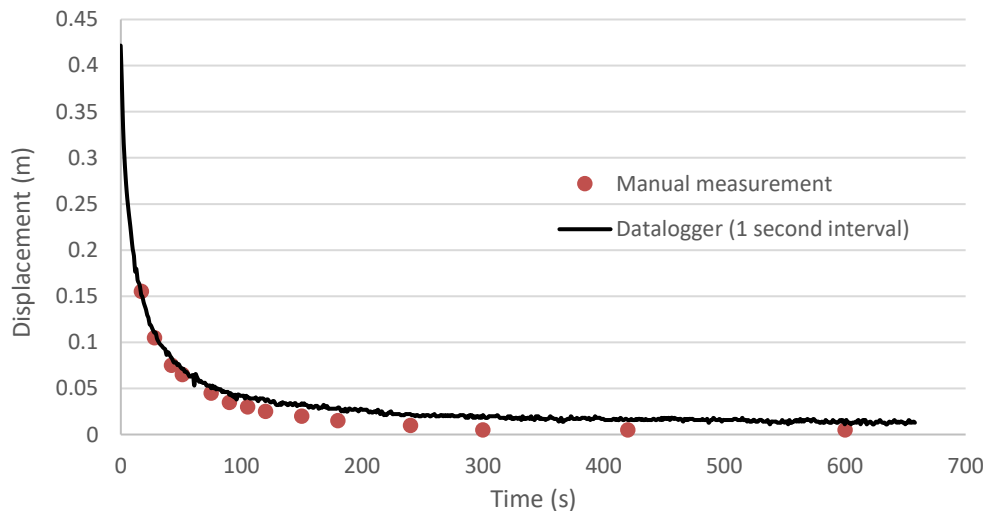
Date: March 2024

Project: 102669.001

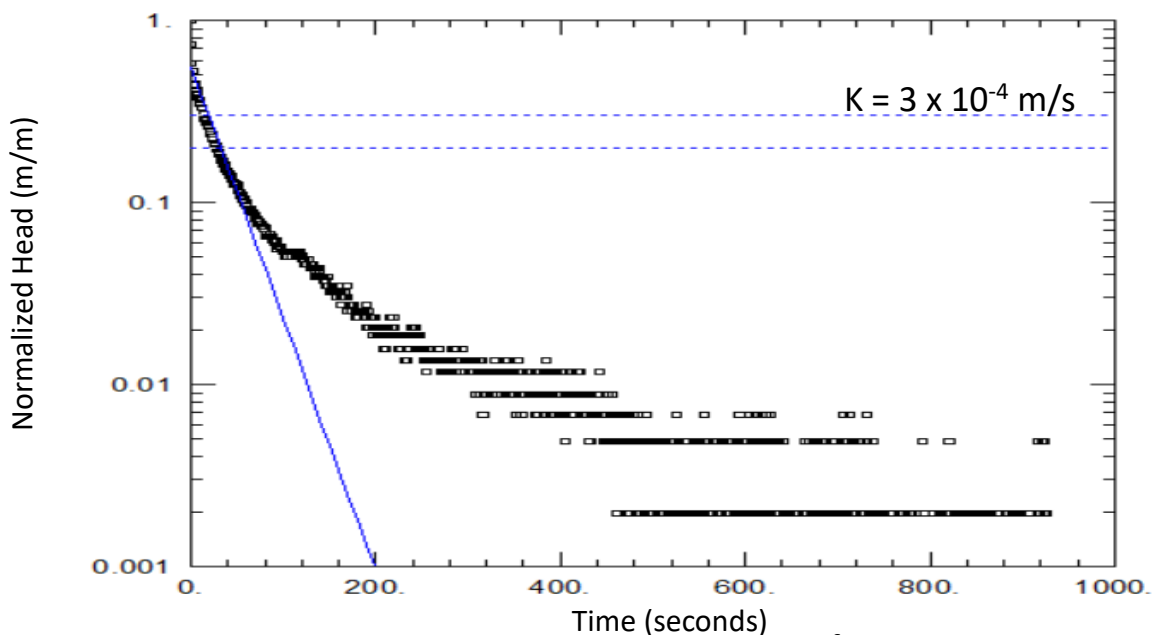
## Slug Test Data

**Figure F4**

### Borehole 23-03B Falling Head (FH)



### Borehole 23-03B FH: Bouwer-Rice Analysis



#### Well Data:

Displacement observed (slug size): 0.42 metres (0.60 m)

Well Depth: 7.01 metres

Screen Length: 3.05 metres

Well Radius: 0.0254 metres

#### Aquifer Data

Saturated Thickness: 0.86 metres

Anisotropy Ratio ( $K_z/K_r$ ): 0.2

Aquifer Model: Unconfined, B-R

Static Water Level: 1.15 metres bgs



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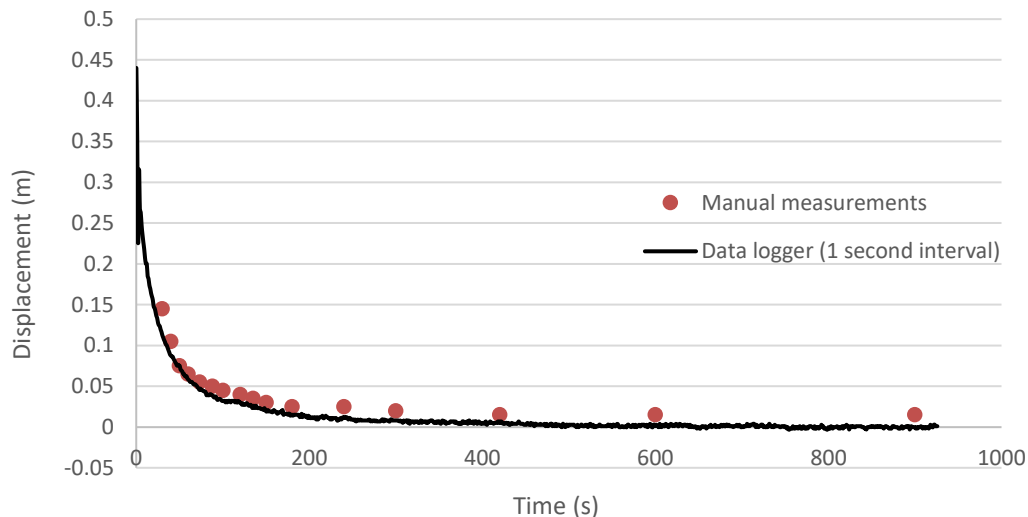
Date: March 2024

Project: 102669.001

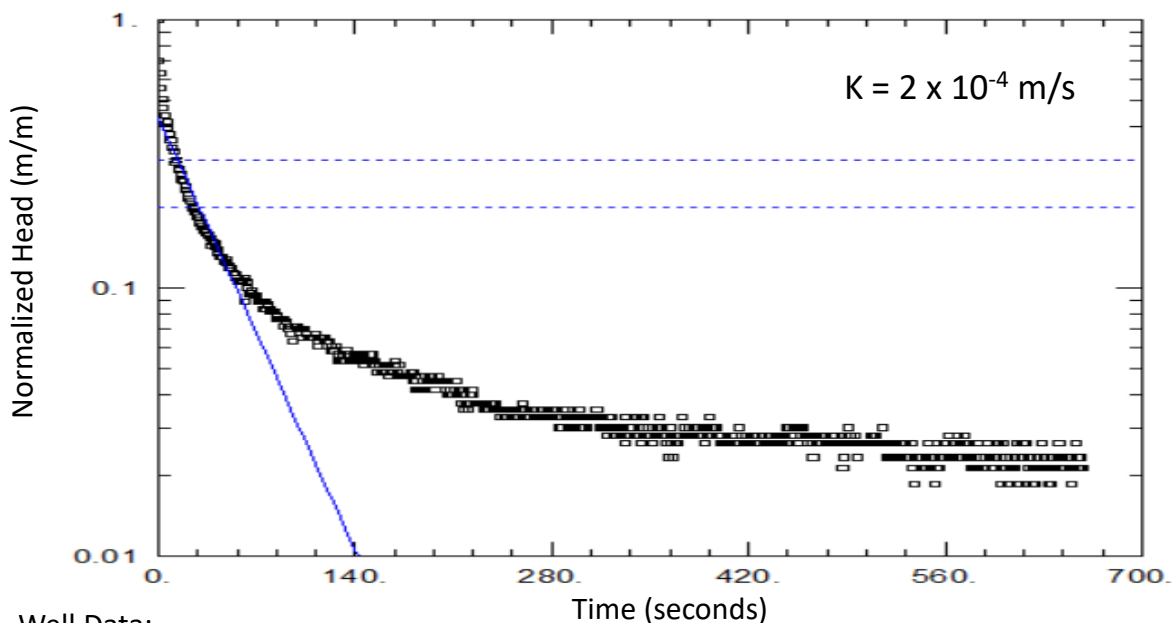
# Slug Test Data

**Figure F5**

Borehole 23-03B Rising Head (RH)



Borehole 23-03B RH: Bouwer-Rice Analysis



## Well Data:

Displacement observed (slug size): 0.44 metres (0.60 m)

Well Depth: 7.01 metres

Screen Length: 3.05 metres

Well Radius: 0.0254 metres

## Aquifer Data

Saturated Thickness: 0.86 metres

Anisotropy Ratio ( $K_z/K_r$ ): 0.2

Aquifer Model: Unconfined, B-R

Static Water Level: 1.15 metres bgs



**GEMTEC**

CONSULTING ENGINEERS  
AND SCIENTISTS

Date: March 2024

Project: 102669.001



## **APPENDIX G**

### Laboratory Certificate of Analysis

**CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS**  
**32 STEACIE DRIVE**  
**OTTAWA, ON K2K 2A9**  
**(613) 836-1422**

**ATTENTION TO: Mohit Bhargav**

**PROJECT: 102669.001**

**AGAT WORK ORDER: 23Z107710**

**TRACE ORGANICS REVIEWED BY: Radhika Chakraborty, Trace Organics Lab Manager**

**WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganic Team Lead**

**DATE REPORTED: Jan 03, 2024**

**PAGES (INCLUDING COVER): 17**

**VERSION\*: 1**

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

**\*Notes**

***Disclaimer:***

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*



## Certificate of Analysis

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

5835 COOPERS AVENUE  
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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

### O. Reg. 153(511) - PAHs (Water)

DATE RECEIVED: 2023-12-22

DATE REPORTED: 2024-01-03

		SAMPLE DESCRIPTION:		MW23-01	MW23-101	MW23-02	MW23-03
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2023-12-21	2023-12-21	2023-12-21	2023-12-21
Parameter	Unit	G / S	RDL	5569687	5569689	5569690	5569691
Naphthalene	µg/L	7	0.20	<0.20	<0.20	<0.20	<0.20
Acenaphthylene	µg/L	1	0.20	<0.20	<0.20	<0.20	<0.20
Acenaphthene	µg/L	4.1	0.20	<0.20	<0.20	<0.20	<0.20
Fluorene	µg/L	120	0.20	<0.20	<0.20	<0.20	<0.20
Phenanthrene	µg/L	0.1	0.10	<0.10	<0.10	<0.10	<0.10
Anthracene	µg/L	0.1	0.10	<0.10	<0.10	<0.10	<0.10
Fluoranthene	µg/L	0.4	0.20	<0.20	<0.20	<0.20	<0.20
Pyrene	µg/L	0.2	0.20	<0.20	<0.20	<0.20	<0.20
Benzo(a)anthracene	µg/L	0.2	0.20	<0.20	<0.20	<0.20	<0.20
Chrysene	µg/L	0.1	0.10	<0.10	<0.10	<0.10	<0.10
Benzo(b)fluoranthene	µg/L	0.1	0.10	<0.10	<0.10	<0.10	<0.10
Benzo(k)fluoranthene	µg/L	0.1	0.10	<0.10	<0.10	<0.10	<0.10
Benzo(a)pyrene	µg/L	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	µg/L	0.2	0.20	<0.20	<0.20	<0.20	<0.20
Dibenz(a,h)anthracene	µg/L	0.2	0.20	<0.20	<0.20	<0.20	<0.20
Benzo(g,h,i)perylene	µg/L	0.2	0.20	<0.20	<0.20	<0.20	<0.20
2-and 1-methyl Naphthalene	µg/L	2	0.20	<0.20	<0.20	<0.20	<0.20
Sediment				1	1	1	1
Surrogate	Unit	Acceptable Limits					
Naphthalene-d8	%	50-140					
Acridine-d9	%	50-140					
Terphenyl-d14	%	50-140					

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Ground Water - All Types of Property Uses  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**5569687-5569691** Sediment parameter is comment only based on visual inspection of the sample prior to extraction and is not an accredited test.

Legend: 1 = no sediment present; 2 = sediment present; 3 = sediment present in trace amount

Note: The result for Benzo(b)Fluoranthene is the total of the Benzo(b)&(j)Fluoranthene isomers because the isomers co-elute on the GC column.

2- and 1-Methyl Naphthalene is a calculated parameter. The calculated value is the sum of 2-Methyl Naphthalene and 1-Methyl Naphthalene. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.

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

**Certified By:**

R. Chakraborty



## Certificate of Analysis

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

5835 COOPERS AVENUE  
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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

### O. Reg. 153(511) - PHCs F1 - F4 (with PAHs and VOC) (Water)

DATE RECEIVED: 2023-12-22

DATE REPORTED: 2024-01-03

		SAMPLE DESCRIPTION:		MW23-01	MW23-101	MW23-02	MW23-03
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2023-12-21	2023-12-21	2023-12-21	2023-12-21
Parameter	Unit	G / S	RDL	5569687	5569689	5569690	5569691
F1 (C6 to C10)	µg/L	420	25	<25	<25	<25	<25
F1 (C6 to C10) minus BTEX	µg/L	420	25	<25	<25	<25	<25
F2 (C10 to C16)	µg/L	150	100	<100	<100	<100	<100
F2 (C10 to C16) minus Naphthalene	µg/L		100	<100	<100	<100	<100
F3 (C16 to C34)	µg/L	500	100	<100	<100	<100	<100
F3 (C16 to C34) minus PAHs	µg/L		100	<100	<100	<100	<100
F4 (C34 to C50)	µg/L	500	100	<100	<100	<100	<100
Gravimetric Heavy Hydrocarbons	µg/L		500	NA	NA	NA	NA
Sediment				1	1	1	1
Surrogate	Unit	Acceptable Limits					
Toluene-d8	%	50-140		98	96	104	101
Terphenyl	% Recovery	60-140		91	75	83	97

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Ground Water - All Types of Property Uses  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**5569687-5569691** The C6-C10 fraction is calculated using toluene response factor.  
C6-C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.  
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.  
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.  
The chromatogram has returned to baseline by the retention time of nC50.  
Total C6 - C50 results are corrected for BTEX and PAH contributions.  
C>10 - C16 (F2- Naphthalene) is a calculated parameter. The calculated value is F2 - Naphthalene.  
C>16 - C34 (F3-PAH) is a calculated parameter. The calculated value is F3-PAH (PAH: sum of Phenanthrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-c,d)pyrene and Pyrene).  
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.  
nC10, nC16 and nC34 response factors are within 10% of their average.  
C50 response factor is within 70% of nC10 + nC16 + nC34 average.  
Linearity is within 15%.  
Extraction and holding times were met for this sample.

Sediment parameter is comment only based on visual inspection of the sample prior to extraction and is not an accredited test.

Legend: 1 = no sediment present; 2 = sediment present; 3 = sediment present in trace amounts

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

**Certified By:**

R. Chakraborty





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AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

### O. Reg. 153(511) - PHCs F1/BTEX (Water)

DATE RECEIVED: 2023-12-22

DATE REPORTED: 2024-01-03

		SAMPLE DESCRIPTION:		Trip Blank
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2023-12-19
Parameter	Unit	G / S	RDL	5569693
Benzene	µg/L	0.5	0.20	<0.20
Toluene	µg/L	0.8	0.20	<0.20
Ethylbenzene	µg/L	0.5	0.10	<0.10
m & p-Xylene	µg/L		0.20	<0.20
o-Xylene	µg/L		0.10	<0.10
Xylenes (Total)	µg/L	72	0.20	<0.20
F1 (C6 to C10)	µg/L	420	25	<25
F1 (C6 to C10) minus BTEX	µg/L	420	25	<25
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	60-140		84.5

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Ground Water - All Types of Property Uses  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**5569693** The C6-C10 fraction is calculated using Toluene response factor.  
Total C6-C10 results are corrected for BTEX contributions.  
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.  
C6-C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.  
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.  
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.  
nC6 and nC10 response factors are within 30% of Toluene response factor.  
Extraction and holding times were met for this sample.  
NA = Not Applicable

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

**Certified By:**

R. Chakraborty



## Certificate of Analysis

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

### O. Reg. 153(511) - VOCs (with PHC) (Water)

DATE RECEIVED: 2023-12-22

DATE REPORTED: 2024-01-03

		SAMPLE DESCRIPTION:		MW23-01	MW23-101	MW23-02	MW23-03
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2023-12-21	2023-12-21	2023-12-21	2023-12-21
Parameter	Unit	G / S	RDL	5569687	5569689	5569690	5569691
Dichlorodifluoromethane	µg/L	590	0.40	<0.40	<0.40	<0.40	<0.40
Vinyl Chloride	µg/L	0.5	0.17	<0.17	<0.17	<0.17	<0.17
Bromomethane	µg/L	0.89	0.20	<0.20	<0.20	<0.20	<0.20
Trichlorofluoromethane	µg/L	150	0.40	<0.40	<0.40	<0.40	<0.40
Acetone	µg/L	2700	1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	µg/L	0.5	0.30	<0.30	<0.30	<0.30	<0.30
Methylene Chloride	µg/L	5	0.30	<0.30	<0.30	<0.30	<0.30
trans- 1,2-Dichloroethylene	µg/L	1.6	0.20	<0.20	<0.20	<0.20	<0.20
Methyl tert-butyl ether	µg/L	15	0.20	<0.20	<0.20	<0.20	<0.20
1,1-Dichloroethane	µg/L	0.5	0.30	<0.30	<0.30	<0.30	<0.30
Methyl Ethyl Ketone	µg/L	400	1.0	<1.0	<1.0	<1.0	<1.0
cis- 1,2-Dichloroethylene	µg/L	1.6	0.20	<0.20	<0.20	<0.20	<0.20
Chloroform	µg/L	2	0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichloroethane	µg/L	0.5	0.20	<0.20	<0.20	<0.20	<0.20
1,1,1-Trichloroethane	µg/L	0.5	0.30	<0.30	<0.30	<0.30	<0.30
Carbon Tetrachloride	µg/L	0.2	0.20	<0.20	<0.20	<0.20	<0.20
Benzene	µg/L	0.5	0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichloropropane	µg/L	0.5	0.20	<0.20	<0.20	<0.20	<0.20
Trichloroethylene	µg/L	0.5	0.20	<0.20	<0.20	<0.20	<0.20
Bromodichloromethane	µg/L	2	0.20	<0.20	<0.20	<0.20	<0.20
Methyl Isobutyl Ketone	µg/L	640	1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	µg/L	0.5	0.20	<0.20	<0.20	<0.20	<0.20
Toluene	µg/L	0.8	0.20	<0.20	<0.20	<0.20	<0.20
Dibromochloromethane	µg/L	2	0.10	<0.10	<0.10	<0.10	<0.10
Ethylene Dibromide	µg/L	0.2	0.10	<0.10	<0.10	<0.10	<0.10
Tetrachloroethylene	µg/L	0.5	0.20	<0.20	<0.20	<0.20	<0.20
1,1,1,2-Tetrachloroethane	µg/L	1.1	0.10	<0.10	<0.10	<0.10	<0.10
Chlorobenzene	µg/L	0.5	0.10	<0.10	<0.10	<0.10	<0.10
Ethylbenzene	µg/L	0.5	0.10	<0.10	<0.10	<0.10	<0.10
m & p-Xylene	µg/L		0.20	<0.20	<0.20	<0.20	<0.20

Certified By:

R. Chakraborty



## Certificate of Analysis

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

### O. Reg. 153(511) - VOCs (with PHC) (Water)

DATE RECEIVED: 2023-12-22

DATE REPORTED: 2024-01-03

		SAMPLE DESCRIPTION:		MW23-01	MW23-101	MW23-02	MW23-03
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2023-12-21	2023-12-21	2023-12-21	2023-12-21
Parameter	Unit	G / S	RDL	5569687	5569689	5569690	5569691
Bromoform	µg/L	5	0.10	<0.10	<0.10	<0.10	<0.10
Styrene	µg/L	0.5	0.10	<0.10	<0.10	<0.10	<0.10
1,1,2,2-Tetrachloroethane	µg/L	0.5	0.10	<0.10	<0.10	<0.10	<0.10
o-Xylene	µg/L		0.10	<0.10	<0.10	<0.10	<0.10
1,3-Dichlorobenzene	µg/L	0.5	0.10	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	µg/L	0.5	0.10	<0.10	<0.10	<0.10	<0.10
1,2-Dichlorobenzene	µg/L	0.5	0.10	<0.10	<0.10	<0.10	<0.10
1,3-Dichloropropene	µg/L	0.5	0.30	<0.30	<0.30	<0.30	<0.30
Xylenes (Total)	µg/L	72	0.20	<0.20	<0.20	<0.20	<0.20
n-Hexane	µg/L	5	0.20	<0.20	<0.20	<0.20	<0.20
Surrogate	Unit	Acceptable Limits					
Toluene-d8	% Recovery	50-140		98	96	104	101
4-Bromofluorobenzene	% Recovery	50-140		83	82	87	84

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Ground Water - All Types of Property Uses  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**5569687-5569691** Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.

1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.

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

**Certified By:**

R. Chakraborty



## Certificate of Analysis

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

5835 COOPERS AVENUE  
MISSISSAUGA, ONTARIO  
CANADA L4Z 1Y2  
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<http://www.agatlabs.com>

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

### O. Reg. 153(511) - Metals & Inorganics (Water)

DATE RECEIVED: 2023-12-22

DATE REPORTED: 2024-01-03

Parameter	Unit	SAMPLE DESCRIPTION:		MW23-01	MW23-101	RDL	MW23-02	MW23-03
		SAMPLE TYPE:		Water	Water		Water	Water
		DATE SAMPLED:		2023-12-21	2023-12-21		2023-12-21	2023-12-21
		G / S	RDL	5569687	5569689		5569690	5569691
Dissolved Antimony	µg/L	1.5	1.0	<1.0	<1.0	1.0	<1.0	<1.0
Dissolved Arsenic	µg/L	13	1.0	<1.0	<1.0	1.0	<1.0	<1.0
Dissolved Barium	µg/L	610	2.0	116	118	2.0	227	572
Dissolved Beryllium	µg/L	0.5	0.50	<0.50	<0.50	0.50	<0.50	<0.50
Dissolved Boron	µg/L	1700	10.0	26.5	26.1	10.0	37.4	32.8
Dissolved Cadmium	µg/L	0.5	0.20	<0.20	<0.20	0.20	<0.20	<0.20
Dissolved Chromium	µg/L	11	2.0	<2.0	<2.0	2.0	<2.0	<2.0
Dissolved Cobalt	µg/L	3.8	0.50	<0.50	<0.50	0.50	2.04	1.05
Dissolved Copper	µg/L	5	1.0	2.0	1.5	1.0	1.8	<1.0
Dissolved Lead	µg/L	1.9	0.50	<0.50	<0.50	0.50	<0.50	<0.50
Dissolved Molybdenum	µg/L	23	0.50	<0.50	<0.50	0.50	50.5	10.2
Dissolved Nickel	µg/L	14	1.0	1.5	<1.0	1.0	8.4	2.2
Dissolved Selenium	µg/L	5	1.0	<1.0	<1.0	1.0	<1.0	<1.0
Dissolved Silver	µg/L	0.3	0.20	<0.20	<0.20	0.20	<0.20	<0.20
Dissolved Thallium	µg/L	0.5	0.30	<0.30	<0.30	0.30	<0.30	<0.30
Dissolved Uranium	µg/L	8.9	0.50	0.75	0.73	0.50	1.70	0.83
Dissolved Vanadium	µg/L	3.9	0.40	<0.40	<0.40	0.40	0.48	0.53
Dissolved Zinc	µg/L	160	5.0	<5.0	<5.0	5.0	<5.0	<5.0
Mercury	µg/L	0.1	0.02	<0.02	<0.02	0.02	<0.02	<0.02
Chromium VI	µg/L	25	2.000	<2.000	<2.000	2.000	<2.000	<2.000
Cyanide, WAD	µg/L	5	2	<2	<2	2	<2	<2
Dissolved Sodium	µg/L	490000	50	106000	107000	100	483000	462000
Chloride	µg/L	790000	100	194000	197000	100	772000	706000
Electrical Conductivity	µS/cm	NA	2	1220	1150	2	2910	2880
pH	pH Units		NA	7.25	7.32	NA	7.52	7.47

**Certified By:**



*Mohit Bhargav*



**AGAT** Laboratories

## Certificate of Analysis

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

5835 COOPERS AVENUE  
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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

### O. Reg. 153(511) - Metals & Inorganics (Water)

DATE RECEIVED: 2023-12-22

DATE REPORTED: 2024-01-03

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Ground Water - All Types of Property Uses  
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**5569687-5569689** Metals analysis completed on a filtered sample.  
pH is a recommended field analysis taken within 15 minutes of sample collection. Due to the potential for rapid change in sample equilibrium chemistry laboratory results may differ from field measured results

**5569690-5569691** Metals analysis completed on a filtered sample.  
pH is a recommended field analysis taken within 15 minutes of sample collection. Due to the potential for rapid change in sample equilibrium chemistry laboratory results may differ from field measured results

Dilution required, RDL has been increased accordingly.

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

**Certified By:**



*Nivine Basly*



**AGAT** Laboratories

## Exceedance Summary

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

5835 COOPERS AVENUE  
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CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

ATTENTION TO: Mohit Bhargav

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
5569690	MW23-02	ON T1 GW	O. Reg. 153(511) - Metals & Inorganics (Water)	Dissolved Molybdenum	µg/L	23	50.5



## Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

PROJECT: 102669.001

SAMPLING SITE: O'Keefe Court

AGAT WORK ORDER: 23Z107710

ATTENTION TO: Mohit Bhargav

SAMPLED BY: MB

### Trace Organics Analysis

RPT Date: Jan 03, 2024			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE			MATRIX SPIKE			
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

#### O. Reg. 153(511) - PHCs F1 - F4 (with PAHs and VOC) (Water)

F1 (C6 to C10)	5566715	<25	<25	NA	< 25	101%	60%	140%	89%	60%	140%	89%	60%	140%
F2 (C10 to C16)	5566528	< 100	< 100	NA	< 100	119%	60%	140%	74%	60%	140%	75%	60%	140%
F3 (C16 to C34)	5566528	< 100	< 100	NA	< 100	119%	60%	140%	72%	60%	140%	74%	60%	140%
F4 (C34 to C50)	5566528	< 100	< 100	NA	< 100	69%	60%	140%	72%	60%	140%	88%	60%	140%

#### O. Reg. 153(511) - PAHs (Water)

Naphthalene	5570423	<0.20	<0.20	NA	< 0.20	115%	50%	140%	105%	50%	140%	105%	50%	140%
Acenaphthylene	5570423	<0.20	<0.20	NA	< 0.20	79%	50%	140%	72%	50%	140%	97%	50%	140%
Acenaphthene	5570423	<0.20	<0.20	NA	< 0.20	110%	50%	140%	105%	50%	140%	105%	50%	140%
Fluorene	5570423	<0.20	<0.20	NA	< 0.20	94%	50%	140%	110%	50%	140%	80%	50%	140%
Phenanthrene	5570423	<0.10	<0.10	NA	< 0.10	111%	50%	140%	111%	50%	140%	88%	50%	140%
Anthracene	5570423	<0.10	<0.10	NA	< 0.10	90%	50%	140%	117%	50%	140%	88%	50%	140%
Fluoranthene	5570423	<0.20	<0.20	NA	< 0.20	89%	50%	140%	105%	50%	140%	80%	50%	140%
Pyrene	5570423	<0.20	<0.20	NA	< 0.20	96%	50%	140%	105%	50%	140%	85%	50%	140%
Benzo(a)anthracene	5570423	<0.20	<0.20	NA	< 0.20	74%	50%	140%	101%	50%	140%	101%	50%	140%
Chrysene	5570423	<0.10	<0.10	NA	< 0.10	102%	50%	140%	114%	50%	140%	89%	50%	140%
Benzo(b)fluoranthene	5570423	<0.10	<0.10	NA	< 0.10	89%	50%	140%	115%	50%	140%	82%	50%	140%
Benzo(k)fluoranthene	5570423	<0.10	<0.10	NA	< 0.10	107%	50%	140%	117%	50%	140%	101%	50%	140%
Benzo(a)pyrene	5570423	<0.01	<0.01	NA	< 0.01	71%	50%	140%	112%	50%	140%	75%	50%	140%
Indeno(1,2,3-cd)pyrene	5570423	<0.20	<0.20	NA	< 0.20	73%	50%	140%	103%	50%	140%	79%	50%	140%
Dibenz(a,h)anthracene	5570423	<0.20	<0.20	NA	< 0.20	109%	50%	140%	112%	50%	140%	84%	50%	140%
Benzo(g,h,i)perylene	5570423	<0.20	<0.20	NA	< 0.20	68%	50%	140%	114%	50%	140%	83%	50%	140%

#### O. Reg. 153(511) - VOCs (with PHC) (Water)

Dichlorodifluoromethane	5566715	<0.40	<0.40	NA	< 0.40	94%	50%	140%	66%	50%	140%	77%	50%	140%
Vinyl Chloride	5566715	<0.17	<0.17	NA	< 0.17	112%	50%	140%	118%	50%	140%	97%	50%	140%
Bromomethane	5566715	<0.20	<0.20	NA	< 0.20	89%	50%	140%	87%	50%	140%	110%	50%	140%
Trichlorofluoromethane	5566715	<0.40	<0.40	NA	< 0.40	108%	50%	140%	113%	50%	140%	67%	50%	140%
Acetone	5566715	<1.0	<1.0	NA	< 1.0	110%	50%	140%	116%	50%	140%	88%	50%	140%
1,1-Dichloroethylene	5566715	<0.30	<0.30	NA	< 0.30	109%	50%	140%	92%	60%	130%	106%	50%	140%
Methylene Chloride	5566715	<0.30	<0.30	NA	< 0.30	98%	50%	140%	89%	60%	130%	105%	50%	140%
trans- 1,2-Dichloroethylene	5566715	<0.20	<0.20	NA	< 0.20	100%	50%	140%	73%	60%	130%	84%	50%	140%
Methyl tert-butyl ether	5566715	<0.20	<0.20	NA	< 0.20	87%	50%	140%	114%	60%	130%	100%	50%	140%
1,1-Dichloroethane	5566715	<0.30	<0.30	NA	< 0.30	105%	50%	140%	105%	60%	130%	81%	50%	140%
Methyl Ethyl Ketone	5566715	<1.0	<1.0	NA	< 1.0	84%	50%	140%	86%	50%	140%	97%	50%	140%
cis- 1,2-Dichloroethylene	5566715	<0.20	<0.20	NA	< 0.20	98%	50%	140%	90%	60%	130%	97%	50%	140%
Chloroform	5566715	<0.20	<0.20	NA	< 0.20	117%	50%	140%	95%	60%	130%	101%	50%	140%
1,2-Dichloroethane	5566715	<0.20	<0.20	NA	< 0.20	76%	50%	140%	111%	60%	130%	102%	50%	140%
1,1,1-Trichloroethane	5566715	<0.30	<0.30	NA	< 0.30	94%	50%	140%	116%	60%	130%	82%	50%	140%
Carbon Tetrachloride	5566715	<0.20	<0.20	NA	< 0.20	81%	50%	140%	66%	60%	130%	58%	50%	140%

## Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

### Trace Organics Analysis (Continued)

RPT Date: Jan 03, 2024			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Benzene	5566715		<0.20	<0.20	NA	< 0.20	115%	50%	140%	109%	60%	130%	87%	50%	140%
1,2-Dichloropropane	5566715		<0.20	<0.20	NA	< 0.20	107%	50%	140%	118%	60%	130%	112%	50%	140%
Trichloroethylene	5566715		<0.20	<0.20	NA	< 0.20	94%	50%	140%	74%	60%	130%	74%	50%	140%
Bromodichloromethane	5566715		<0.20	<0.20	NA	< 0.20	97%	50%	140%	83%	60%	130%	80%	50%	140%
Methyl Isobutyl Ketone	5566715		<1.0	<1.0	NA	< 1.0	105%	50%	140%	94%	50%	140%	89%	50%	140%
1,1,2-Trichloroethane	5566715		<0.20	<0.20	NA	< 0.20	114%	50%	140%	108%	60%	130%	105%	50%	140%
Toluene	5566715		<0.20	<0.20	NA	< 0.20	115%	50%	140%	98%	60%	130%	82%	50%	140%
Dibromochloromethane	5566715		<0.10	<0.10	NA	< 0.10	73%	50%	140%	83%	60%	130%	75%	50%	140%
Ethylene Dibromide	5566715		<0.10	<0.10	NA	< 0.10	96%	50%	140%	84%	60%	130%	86%	50%	140%
Tetrachloroethylene	5566715		<0.20	<0.20	NA	< 0.20	88%	50%	140%	70%	60%	130%	60%	50%	140%
1,1,1,2-Tetrachloroethane	5566715		<0.10	<0.10	NA	< 0.10	74%	50%	140%	74%	60%	130%	70%	50%	140%
Chlorobenzene	5566715		<0.10	<0.10	NA	< 0.10	102%	50%	140%	90%	60%	130%	89%	50%	140%
Ethylbenzene	5566715		<0.10	<0.10	NA	< 0.10	110%	50%	140%	84%	60%	130%	77%	50%	140%
m & p-Xylene	5566715		<0.20	<0.20	NA	< 0.20	112%	50%	140%	87%	60%	130%	77%	50%	140%
Bromoform	5566715		<0.10	<0.10	NA	< 0.10	72%	50%	140%	60%	60%	130%	54%	50%	140%
Styrene	5566715		<0.10	<0.10	NA	< 0.10	90%	50%	140%	72%	60%	130%	82%	50%	140%
1,1,2,2-Tetrachloroethane	5566715		<0.10	<0.10	NA	< 0.10	114%	50%	140%	106%	60%	130%	95%	50%	140%
o-Xylene	5566715		<0.10	<0.10	NA	< 0.10	113%	50%	140%	92%	60%	130%	84%	50%	140%
1,3-Dichlorobenzene	5566715		<0.10	<0.10	NA	< 0.10	103%	50%	140%	85%	60%	130%	84%	50%	140%
1,4-Dichlorobenzene	5566715		<0.10	<0.10	NA	< 0.10	101%	50%	140%	83%	60%	130%	82%	50%	140%
1,2-Dichlorobenzene	5566715		<0.10	<0.10	NA	< 0.10	99%	50%	140%	84%	60%	130%	84%	50%	140%
n-Hexane	5566715		<0.20	<0.20	NA	< 0.20	93%	50%	140%	72%	60%	130%	78%	50%	140%
O. Reg. 153(511) - PHCs F1/BTEX (Water)															
Benzene	5570424		<0.20	<0.20	NA	< 0.20	85%	60%	140%	72%	60%	140%	110%	60%	140%
Toluene	5570424		<0.20	<0.20	NA	< 0.20	85%	60%	140%	73%	60%	140%	74%	60%	140%
Ethylbenzene	5570424		<0.10	<0.10	NA	< 0.10	85%	60%	140%	72%	60%	140%	95%	60%	140%
m & p-Xylene	5570424		<0.20	<0.20	NA	< 0.20	88%	60%	140%	74%	60%	140%	74%	60%	140%
o-Xylene	5570424		<0.10	<0.10	NA	< 0.10	87%	60%	140%	74%	60%	140%	89%	60%	140%
F1 (C6 to C10)	5570424		<25	<25	NA	< 25	103%	60%	140%	93%	60%	140%	91%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

R. Chakraborty



## Quality Assurance

CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS

AGAT WORK ORDER: 23Z107710

PROJECT: 102669.001

ATTENTION TO: Mohit Bhargav

SAMPLING SITE: O'Keefe Court

SAMPLED BY: MB

Water Analysis															
RPT Date: Jan 03, 2024			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Water)															
Dissolved Antimony	5566528		<1.0	<1.0	NA	< 1.0	98%	70%	130%	102%	80%	120%	102%	70%	130%
Dissolved Arsenic	5566528		<1.0	<1.0	NA	< 1.0	99%	70%	130%	106%	80%	120%	110%	70%	130%
Dissolved Barium	5566528		276	278	0.7%	< 2.0	93%	70%	130%	98%	80%	120%	104%	70%	130%
Dissolved Beryllium	5566528		<0.50	<0.50	NA	< 0.50	97%	70%	130%	103%	80%	120%	113%	70%	130%
Dissolved Boron	5566528		53.3	51.8	2.9%	< 10.0	99%	70%	130%	100%	80%	120%	108%	70%	130%
Dissolved Cadmium	5566528		<0.20	<0.20	NA	< 0.20	98%	70%	130%	101%	80%	120%	94%	70%	130%
Dissolved Chromium	5566528		<2.0	<2.0	NA	< 2.0	99%	70%	130%	99%	80%	120%	116%	70%	130%
Dissolved Cobalt	5566528		0.89	0.72	NA	< 0.50	97%	70%	130%	106%	80%	120%	115%	70%	130%
Dissolved Copper	5566528		3.6	1.2	NA	< 1.0	100%	70%	130%	100%	80%	120%	105%	70%	130%
Dissolved Lead	5566528		<0.50	<0.50	NA	< 0.50	104%	70%	130%	98%	80%	120%	90%	70%	130%
Dissolved Molybdenum	5566528		2.41	2.17	NA	< 0.50	108%	70%	130%	111%	80%	120%	130%	70%	130%
Dissolved Nickel	5566528		7.8	7.5	3.9%	< 1.0	99%	70%	130%	107%	80%	120%	110%	70%	130%
Dissolved Selenium	5566528		1.1	1.4	NA	< 1.0	102%	70%	130%	111%	80%	120%	111%	70%	130%
Dissolved Silver	5566528		<0.20	<0.20	NA	< 0.20	105%	70%	130%	109%	80%	120%	102%	70%	130%
Dissolved Thallium	5566528		<0.30	<0.30	NA	< 0.30	101%	70%	130%	99%	80%	120%	94%	70%	130%
Dissolved Uranium	5566528		0.78	0.78	NA	< 0.50	99%	70%	130%	105%	80%	120%	107%	70%	130%
Dissolved Vanadium	5566528		<0.40	0.40	NA	< 0.40	94%	70%	130%	110%	80%	120%	121%	70%	130%
Dissolved Zinc	5566528		<5.0	<5.0	NA	< 5.0	96%	70%	130%	114%	80%	120%	96%	70%	130%
Mercury	5570859		<0.02	<0.02	NA	< 0.02	102%	70%	130%	101%	80%	120%	93%	70%	130%
Chromium VI	5561620		<2.000	<2.000	NA	< 2	99%	70%	130%	97%	80%	120%	95%	70%	130%
Cyanide, WAD	5570859		<2	<2	NA	< 2	105%	70%	130%	98%	80%	120%	90%	70%	130%
Dissolved Sodium	5566528		1330000	1330000	0.0%	< 50	106%	70%	130%	102%	80%	120%	NA	70%	130%
Chloride	5569687	5569687	194000	192000	1.0%	< 100	94%	70%	130%	101%	80%	120%	NA	70%	130%
Electrical Conductivity	5569969		281	280	0.4%	< 2	103%	90%	110%						
pH	5569969		7.19	7.43	3.3%	NA	98%	90%	110%						

Comments: NA signifies Not Applicable.

Duplicate NA: results are under 5X the RDL and will not be calculated.

Matrix spike NA: Spike level &lt; native concentration. Matrix spike acceptance limits do not apply and are not calculated.

### Certified By:


*Nivine Basily*

## Method Summary

**CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS**
**AGAT WORK ORDER: 23Z107710**
**PROJECT: 102669.001**
**ATTENTION TO: Mohit Bhargav**
**SAMPLING SITE: O'Keefe Court**
**SAMPLED BY: MB**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
<b>Trace Organics Analysis</b>			
Naphthalene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Acenaphthylene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Acenaphthene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Fluorene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Phenanthrene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Anthracene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Fluoranthene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Pyrene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(a)anthracene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Chrysene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(b)fluoranthene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(k)fluoranthene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(a)pyrene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Indeno(1,2,3-cd)pyrene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Dibenz(a,h)anthracene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(g,h,i)perylene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
2-and 1-methyl Naphthalene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Naphthalene-d8	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Acridine-d9	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Terphenyl-d14	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Sediment			N/A
F1 (C6 to C10)	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5010	modified from MOE PHC-E3421	P&T GC/FID
Toluene-d8	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5010	modified from MOE PHC-E3421	GC/FID
F2 (C10 to C16) minus Naphthalene	VOL-91-5010	modified from MOE PHC-E3421	GC/FID
F3 (C16 to C34)	VOL-91-5010	modified from MOE PHC-E3421	GC/FID
F3 (C16 to C34) minus PAHs	VOL-91-5010	modified from MOE PHC-E3421	GC/FID
F4 (C34 to C50)	VOL-91-5010	modified from MOE PHC-E3421	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	modified from MOE PHC-E3421	BALANCE
Terphenyl	VOL-91-5010	modified from MOE PHC-E3421	GC/FID
Benzene	VOL-91-5010	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS

## Method Summary

**CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS**
**AGAT WORK ORDER: 23Z107710**
**PROJECT: 102669.001**
**ATTENTION TO: Mohit Bhargav**
**SAMPLING SITE: O'Keefe Court**
**SAMPLED BY: MB**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Toluene	VOL-91-5010	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5010	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5010	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5010	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5010	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F1 (C6 to C10)	VOL-91-5010	modified from MOE E3421	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5010	modified from MOE E3421	(P&T)GC/FID
Toluene-d8	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/MS
Dichlorodifluoromethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Acetone	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
trans- 1,2-Dichloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Methyl tert-butyl ether	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
cis- 1,2-Dichloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Chloroform	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS

## Method Summary

**CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS**
**AGAT WORK ORDER: 23Z107710**
**PROJECT: 102669.001**
**ATTENTION TO: Mohit Bhargav**
**SAMPLING SITE: O'Keefe Court**
**SAMPLED BY: MB**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
1,1,2-Trichloroethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Bromoform	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Styrene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,3-Dichloropropene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS

## Method Summary

**CLIENT NAME: GEMTEC CONSULTING ENGINEERS AND SCIENTISTS**
**AGAT WORK ORDER: 23Z107710**
**PROJECT: 102669.001**
**ATTENTION TO: Mohit Bhargav**
**SAMPLING SITE: O'Keefe Court**
**SAMPLED BY: MB**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
<b>Water Analysis</b>			
Dissolved Antimony	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Arsenic	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Barium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Beryllium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Boron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cadmium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Chromium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cobalt	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Copper	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Lead	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Molybdenum	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Nickel	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Selenium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Silver	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Thallium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Uranium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Vanadium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Zinc	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Chromium VI	INOR-93-6073	modified from SM 3500-CR B	LACHAT FIA
Cyanide, WAD	INOR-93-6052	modified from ON MOECC E3015, SM 4500-CN- I, G-387	SEGMENTED FLOW ANALYSIS
Dissolved Sodium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE





## Chain of Custody Record

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

### Report Information:

Company: GEMTEC  
Contact: MOHIT BHARGAVA  
Address: 32 STEADIE DRIVE  
OTTAWA ONTARIO  
K2K2A9 Fax: \_\_\_\_\_  
Reports to be sent to: mojit.bhargava@gemtec.ca  
1. Email: dan.elliott@gemtec.ca  
2. Email: \_\_\_\_\_

### Project Information:

Project: 102669.001  
Site Location: O'Keefe Court  
Sampled By: MB  
AGAT Quote #: \_\_\_\_\_ PO: \_\_\_\_\_  
Please note: If quotation number is not provided, client will be billed full price for analysis.

### Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: \_\_\_\_\_  
Contact: \_\_\_\_\_  
Address: \_\_\_\_\_  
Email: \_\_\_\_\_

### Regulatory Requirements:

(Please check all applicable boxes)

☒ Regulation 153/04 ☐ Regulation 406 ☐ Sewer Use  
☐ Sanitary ☐ Storm  
Table 1 Indicate One Table 1 Indicate One  
☐ Ind/Com ☐ Res/Park ☐ Agriculture  
☐ CCME  
Soil Texture (Check One) ☐ Coarse ☐ Fine  
Region \_\_\_\_\_  
Prov. Water Quality Objectives (PWQO) ☐ Other \_\_\_\_\_  
Indicate One

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

☐ Yes ☐ No

### Report Guideline on Certificate of Analysis

☐ Yes ☐ No

### Sample Matrix Legend

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

### Laboratory Use Only

Work Order #: 232107710  
Cooler Quantity: one - ice packs  
Arrival Temperatures: 12.3 12.1 12.0  
3.1 13.5 13.9  
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A  
Notes: bagged in

### Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

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

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y / N	Field Filtered - Metals, Hg, CrVI, DOC	Metals & Inorganics	Metals - <input type="checkbox"/> CrVI, <input type="checkbox"/> Hg, <input type="checkbox"/> HWSB	BTEX, F1-F4 PHCs	VOC	PAHs	PCBs	PCBs: Aroclors <input type="checkbox"/>	Landfill Disposal Characterization TCLP: <input type="checkbox"/> M&I <input type="checkbox"/> VOCs <input type="checkbox"/> ABNs <input type="checkbox"/> Biop <input type="checkbox"/> PCBs	Regulation 406 SPLP Rainwater Leach	Regulation 406 SPLP: <input type="checkbox"/> Metals <input type="checkbox"/> VOCs <input type="checkbox"/> SVOCs	Regulation 406 Characterization Package	pH, ICPS Metals, BTEX, F1-F4	Corrosivity: <input type="checkbox"/> Moisture <input type="checkbox"/> Sulphide	Potentially Hazardous or High Concentration (Y/N)
1. <u>MW23-01</u>	<u>21 Dec 23</u>	<u>PM</u>	<u>AM</u>	<u>13</u>	<u>GW</u>																
2. <u>MW23-101</u>	<u>↓</u>	<u>↓</u>	<u>AM</u>	<u>↓</u>	<u>↓</u>																
3. <u>MW23-02</u>	<u>↓</u>	<u>↓</u>	<u>AM</u>	<u>↓</u>	<u>↓</u>																
4. <u>MW23-03</u>	<u>↓</u>	<u>↓</u>	<u>AM</u>	<u>↓</u>	<u>↓</u>																
5. <u>Toip Blank</u>	<u>19 Dec 23</u>	<u>AM</u>	<u>PM</u>	<u>3</u>																	
6.		<u>AM</u>	<u>PM</u>																		
7.		<u>AM</u>	<u>PM</u>																		
8.		<u>AM</u>	<u>PM</u>																		
9.		<u>AM</u>	<u>PM</u>																		
10.		<u>AM</u>	<u>PM</u>																		
11.		<u>AM</u>	<u>PM</u>																		

Samples Relinquished By (Print Name and Sign):

Mohit Bhargava

Samples Relinquished By (Print Name and Sign):

Chaito Dey

Samples Relinquished By (Print Name and Sign):

Date: 22 Dec 23

Time: 3pm

Samples Received By (Print Name and Sign):

C. G. G. G. G.

Samples Received By (Print Name and Sign):

De 28

Samples Received By (Print Name and Sign):

Date: 12/22/23

Time: 15h15

Date: 28

Time: 8:35

Page 1 of 1

No: T-147995

## Certificate of Analysis

**GEMTEC Consulting Engineers and Scientists Limited**

32 Steacie Drive  
Kanata, ON K2K 2A9  
Attn: Andrius Paznekas

Client PO:  
Project: 102669.001  
Custody: 137761

Report Date: 6-Feb-2024  
Order Date: 2-Feb-2024

**Order #: 2405495**

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2405495-01	MW23-01D
2405495-02	MW23-01S
2405495-03	MW23-02
2405495-04	MW23-03

Approved By:



Mark Foto, M.Sc.

Lab Supervisor

Certificate of Analysis

Report Date: 06-Feb-2024

**Client:** GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2024

**Client PO:**

**Project Description:** 102669.001

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-MS	EPA 200.8 - ICP-MS	5-Feb-24	6-Feb-24
Total Suspended Solids	SM 2540D - Gravimetric	3-Feb-24	3-Feb-24



Certificate of Analysis

Report Date: 06-Feb-2024

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2024

Client PO:

Project Description: 102669.001

Client ID:	MW23-01D	MW23-01S	MW23-02	MW23-03		
Sample Date:	01-Feb-24 09:00	01-Feb-24 09:00	01-Feb-24 09:00	01-Feb-24 09:00	-	-
Sample ID:	2405495-01	2405495-02	2405495-03	2405495-04		
Matrix:	Ground Water	Ground Water	Ground Water	Ground Water		
MDL/Units						

**General Inorganics**

Total Suspended Solids	2 mg/L	123	12400	18	402	-	-
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**Metals**

Arsenic	10 ug/L	<10	<10	<10	<10	-	-
Cadmium	1 ug/L	<1	<1	<1	<1	-	-
Chromium	50 ug/L	<50	<50	<50	<50	-	-
Copper	5 ug/L	<5	<5	<5	<5	-	-
Lead	1 ug/L	<1	<1	<1	<1	-	-
Manganese	50 ug/L	<50	1740	925	115	-	-
Nickel	5 ug/L	<5	<5	<5	<5	-	-
Selenium	5 ug/L	<5	<5	<5	<5	-	-
Silver	1 ug/L	<1	<1	<1	<1	-	-
Zinc	20 ug/L	<20	<20	<20	<20	-	-

Certificate of Analysis

Report Date: 06-Feb-2024

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2024

Client PO:

Project Description: 102669.001

## Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>								
Total Suspended Solids	ND	2	mg/L					
<b>Metals</b>								
Arsenic	ND	10	ug/L					
Cadmium	ND	1	ug/L					
Chromium	ND	50	ug/L					
Copper	ND	5	ug/L					
Lead	ND	1	ug/L					
Manganese	ND	50	ug/L					
Nickel	ND	5	ug/L					
Selenium	ND	5	ug/L					
Silver	ND	1	ug/L					
Zinc	ND	20	ug/L					

Certificate of Analysis

Report Date: 06-Feb-2024

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2024

Client PO:

Project Description: 102669.001

### Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>									
Total Suspended Solids	103	2	mg/L	104			1.0	10	
<b>Metals</b>									
Arsenic	ND	10	ug/L	ND			NC	20	
Cadmium	ND	1	ug/L	ND			NC	20	
Chromium	ND	50	ug/L	ND			NC	20	
Copper	5.5	5	ug/L	5.2			6.4	20	
Lead	ND	1	ug/L	ND			NC	20	
Manganese	701	50	ug/L	665			5.2	20	
Nickel	119	5	ug/L	111			6.6	20	
Selenium	ND	5	ug/L	ND			NC	20	
Silver	ND	1	ug/L	ND			NC	20	
Zinc	138	20	ug/L	135			2.6	20	

Certificate of Analysis

Report Date: 06-Feb-2024

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2024

Client PO:

Project Description: 102669.001

## Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>									
Total Suspended Solids	19.0	2	mg/L	ND	88.4	75-125			
<b>Metals</b>									
Arsenic	48.1	10	ug/L	ND	95.9	80-120			
Cadmium	43.7	1	ug/L	ND	87.3	80-120			
Chromium	50.2	50	ug/L	ND	99.9	80-120			
Copper	45.4	5	ug/L	ND	89.7	80-120			
Lead	40.9	1	ug/L	ND	81.6	80-120			
Manganese	111	50	ug/L	66.5	88.8	80-120			
Nickel	57.3	5	ug/L	11.1	92.4	80-120			
Selenium	38.9	5	ug/L	ND	77.7	80-120			QM-07
Silver	42.3	1	ug/L	ND	84.6	80-120			
Zinc	52.1	20	ug/L	ND	77.3	80-120			QM-07

Certificate of Analysis

Report Date: 06-Feb-2024

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2024

Client PO:

Project Description: 102669.001

**Qualifier Notes:****QC Qualifiers:**

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

**Sample Data Revisions:**

None

**Work Order Revisions / Comments:**

None

**Other Report Notes:**

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Parcel ID: 2405495



d.  
3  
om

Parcel Order Number  
(Lab Use Only)

2405495

Chain Of Custody

(Lab Use Only)

Nº 137761

Client Name: <u>Gemtec</u>	Project Ref: <u>102669.001</u>	Page <u>  </u> of <u>  </u>
Contact Name: <u>A Parnelcar</u>	Quote #:	Turnaround Time <input type="checkbox"/> 1 day <input type="checkbox"/> 3 day <input type="checkbox"/> 2 day <input checked="" type="checkbox"/> Regular
Address:	PO #:	
Telephone: <u>613-295-8425</u>	E-mail: <u>andrus.parnelcar@gemtec.ca</u>	
		Date Required: <u>                    </u>

<input type="checkbox"/> REG 153/04 <input type="checkbox"/> REG 406/19 <input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> Table <u>      </u> For RSC: <input type="checkbox"/> Yes <input type="checkbox"/> No		Other Regulation <input type="checkbox"/> REG 558 <input type="checkbox"/> PWQO <input type="checkbox"/> CCME <input type="checkbox"/> MISA <input type="checkbox"/> SU - Sani <input checked="" type="checkbox"/> SU - Storm Mun: <u>OTTAWA</u> <input type="checkbox"/> Other:	Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)	Required Analysis PHCs F1-F4+BTEX VOCs PAHs Metals by ICP (Disolved) Hg CrVI B (HWS) TSS																
Sample ID/Location Name			Matrix	Air Volume	# of Containers	Sample Taken														
						Date	Time													
1	MW23-01D		GW	-	2	Feb 1/24	-													
2	MW23-01S		GW	-	2															
3	MW23-02		GW	-	2															
4	MW23-03		GW	-	2															
5																				
6																				
7																				
8																				
9																				
10																				

Comments: <u>Filtered metals analysis</u>			Method of Delivery: <u>Parcel Parnelcar courier</u>		
Relinquished By (Sign): <u>Ester Wilson</u>	Received By Driver/Depot:	Received at Lab: <u>SS</u>	Verified By: <u>SO</u>		
Relinquished By (Print): <u>Ester Wilson</u>	Date/Time:	Date/Time: <u>Feb 2 24 1301</u>	Date/Time: <u>Feb 2, 2024 1:10pm</u>		
Date/Time: <u>Feb. 2, 2024</u>	Temperature: <u>      </u> °C	Temperature: <u>7.8</u> °C	pH Verified: <u>  </u> By: <u>SO</u>		



## **APPENDIX H**

### Preliminary Infiltration Assessment

**Table G1: Estimated Infiltration Rates (Refer to Figure 1 for test locations).**

Test ID / Test Pit	Depth m bgs	Infiltration Rates <sup>1,2</sup> - Soil Classification (mm/hr)	
		Soil Texture <sup>4</sup>	Minimum Infiltration Rate Based on Soil Texture <sup>5</sup>
TP23-01	2.2-2.8	Clay Loam	2.3
TP23-02	2.5-3.0	Loamy Sand	61.0
TP23-03	2.1-3.0	Loam	13.2
TP23-04	1.1-1.4	Silt Loam	6.8
TP23-06	2.1-2.4	Sandy Clay Loam	4.3
TP23-09	0.5-0.9	Sandy Loam	25.8
TP23-11	0.6-1.0	Sandy Loam	25.8
TP23-11	2.5-3.1	Loamy Sand	61.0

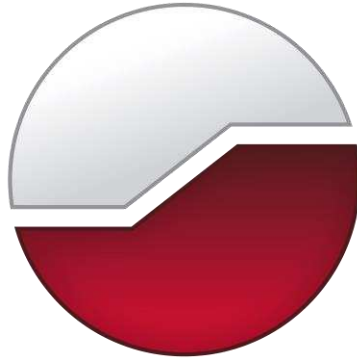
**Notes:**

1. Table 1. Approximate relationship between infiltration rate and hydraulic conductivity. Source: Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolation Times and Soil Descriptions. Toronto, Ontario.
2. The estimated infiltration rates do not include a safety factor. The design infiltration rate must include a safety correction factor depending on the ratio of mean measured infiltration rate of the bottom elevation of the exfiltration system. Refer to Table C2: Safety correction factors for calculating design infiltration rates in "Wisconsin Department of Natural Resources. 2004. Conservation Practice Standards. Site Evaluation for Stormwater Infiltration (1002). Madison, WI."



3. Hazen method predicted hydraulic conductivity of sands, converted to infiltration rate based on relationship found in OMMAH. Hazen method:  $k = cd_{10}^2$ , where  $c = 1$  and  $d_{10}$  = effective diameter at which 10 % of the grains are finer.
4. Soil texture based on the USDA Soils Textural Triangle (Appendix D.13. Method for Designing Infiltration Structures, Figure D.13.1, Maryland Department of the Environment (MDE). 2000 – Revised May 2009. 2000 Maryland Stormwater Design Manual. Prepared by Center for Watershed Protection (CWP). Baltimore, MD).
5. Infiltration rate estimated based on soil texture and corresponding infiltration rates as classified in Table D.13.1. Hydrogeologic Soil Properties Classified by Soil Texture' (Appendix D.13. Method for Designing Infiltration Structures, Maryland Department of the Environment (MDE). 2000 – Revised May 2009. 2000 Maryland Stormwater Design Manual. Prepared by Center for Watershed Protection (CWP). Baltimore, MD).

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

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