REPORT

Preliminary Geotechnical Review
Ottawa Hospital

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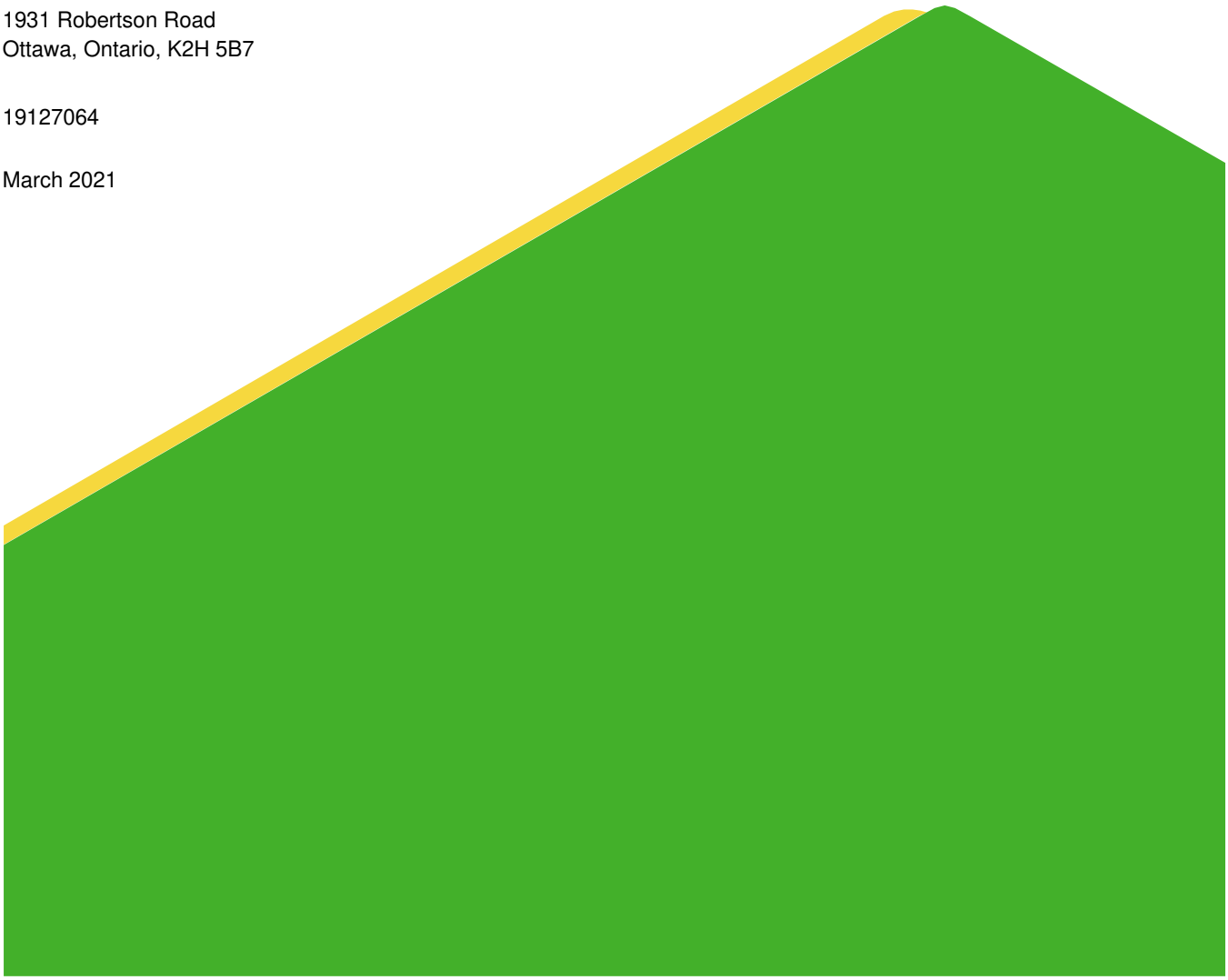

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1.0 INTRODUCTION

This report presents the results of a desktop study and preliminary geotechnical review completed as part of planning studies related to the proposed development of a new campus of The Ottawa Hospital (TOH) on an approximately 50-acre site located in the northeast corner of the Canadian Experimental Farm in the City of Ottawa. The site is located south of Carling Avenue, and west of Preston Street.

The desktop study included a review of available sub-surface information as well as information from previous investigations provided to us. Based on an interpretation of the factual information reviewed, a general description of the subsurface and groundwater conditions is presented. The purpose of the investigation is to provide a summary of the anticipated sub-surface conditions at the site in support of an eventual Master Plan and Functional Program to develop the site.

The reader is referred to the “Important Information and Limitations of This Report” which follows the text but forms an integral part of this document.

2.0 DESCRIPTION OF PROJECT AND SITE

The approximately 50-acre site is bordered on the north by Carling Avenue, to the east by Preston Street and to the southeast by Prince of Wales Drive. To the south and west, the parcel is bordered by remaining portions of the Central Experimental Farm. The eastern portion of the site is divided by the Ottawa Light Rail Transit (OLRT) right-of-way, resulting in a larger 45-acre parcel on the west side of the OLRT and a smaller 5-acre parcel on the east side.

The larger portion of the site west of the OLRT right-of-way consists primarily of park lands with landscaped areas, wooded areas, pedestrian paths, low-volume roads and parking lots. The northwest area of the site was the location of the Sir John Carling Building which was demolished in 2013 – 2014. The former West Annex of the building remains on site, as do the parking lot and access roads. The smaller portion of the site, east of the OLRT is covered primarily with a large parking lot, surrounded by landscaped areas.

The site topography grades towards the north, with approximately 20 m of elevation difference between the upland southern portion of the site and the lower portions of the site in the northeast.

The approximate location of the site is shown on Figure 1. It should be noted that the 100 m buffer shown on Figure 1 was used in the search for existing geotechnical investigations within 100 m of the proposed site.

3.0 DESKTOP STUDY

The investigation completed as part of this assignment included a desktop study which involved a review of existing available subsurface information, including:

- Published surficial and bedrock geology maps.
- Historical water well records in the general area.
- Records of historical investigations completed by Golder in the general area contained within our archives.
- Records of previous environmental investigations provided to us.

3.1 Published Bedrock and Surficial Geology Maps

Published bedrock geology maps indicate the site is underlain by limestone and shale (see Figure 3). The majority of the site (from approximately the OLRT right-of-way westwards) is indicated to be underlain by limestone and minor shale of the Bobcaygeon formation. The eastern portion of the site is indicated to be underlain by limestone of the Lindsay formation. Both formations are typically sound rock and are generally favourable for construction of foundations, open-cut excavations, etc.

Surficial geology maps indicate the site is underlain by a number of major soil types. The southwestern portion of the site is indicated to be overlain by marine deposits (silt and clay), while the northern and eastern portions are indicated to be underlain by shallow bedrock and glacial till.

Drift thickness (depth to bedrock) indicated in available mapping varies considerably across the site. The deepest soil deposits are indicated to be in the southwestern portion of the site (along the southern and western site boundaries). Bedrock is indicated to be relatively shallow in a central portion of the west side of the site, becoming deeper again to the northeast. On the east side of the OLRT right of way the small parcel of land is indicated as having relatively shallow bedrock.

It should be noted that all published geology maps are prepared on a very large scale and the boundaries of various soil deposits and rock formations are interpreted from a variety of regional sources and are very approximate. These maps provide a useful overview of anticipated conditions, but do not accurately predict detailed conditions. Interpretation of these maps should be undertaken with caution and in conjunction with other sub-surface information.

3.2 Water Well Records

Historical water well records were reviewed in the Ministry of the Environment, Conservation and Parks database. These records provided minimal information related to the sub-surface conditions at the site.

3.3 Previous Investigations Completed by Golder

Golder has completed a number of investigations at the site and in the general area in the past. These investigations can be broadly grouped as follows:

- Investigations along Carling Avenue for various infrastructure and development projects.
- Investigations along the southeastern side of the site in the areas of the Dow's Lake Pavilion and the HMCS Carleton facility.
- An investigation at the southern extent of the site, northwest of the traffic circle on Prince of Wales Drive.
- A previous investigation near the northwest corner of the site, west of the former Sir John Carling Building.
- A previous investigation in the north-central portion of the site (south of Carling and west of the OLRT right-of-way).

Some of these investigations are discussed below. Selected records from historical investigations completed for various Federal government projects are included in Appendix A.

3.3.1 North of Site

Golder has carried out previous investigations along the north perimeter of the site. These investigations were primarily carried out along and to the north of Carling Avenue for a variety of geotechnical and environmental projects, as well as for development projects along Carling Avenue and Preston Street.

The results of these investigations which include eight geotechnical reports are contained in the following reports:

- Golder Report to Minto Construction Ltd., titled "*Preliminary Soil Investigation, Proposed Residential Development, Protestant Children's Village, Ottawa, ON*", dated October 1982 (Report No. 821-2254).
- Golder Report to Minto Construction Ltd., titled "*Preliminary Soil Investigation, Proposed Swimming Pool, Protestant Children's Village, Ottawa, ON*", dated August 1984 (Report No. 841-2104).
- Golder Report to McCormick Corp., titled "*Geotechnical Investigation, Carling Avenue Rehabilitation, Kirkwood avenue to Bronson Avenue, Ottawa, ON*", dated April 2007 (Report No. 06-1120-367).
- Golder Report to Gormark Holdings Ltd., titled "*Phase 2 Environmental Site Assessment, 901 Carling Avenue, Ottawa, ON*", dated May 1996 (Report No. 961-2728).
- McRostie and Associates Report to Canadian Bank of Commerce, titled "*Foundation Investigation at Carling Avenue and Preston Street, Ottawa, ON*", dated July 1958 (Report No. SF-0359).
- Golder Report to Gormark Holdings Ltd., titled "*Geotechnical Consideration for Watermain, Sewer and Road Reconstruction, Preston Street, Albert Street to Carling Avenue, Ottawa, ON*", dated July 2007 (Report No. 06-11-289 (1000)).
- Golder Report to Claridge Homes Inc., titled "*Application for a Category 3 Permit to Take Water, 505 Preston Street, Ottawa, ON*", dated August 2014 (Report No. 12-1121-0045 (3000)).

Based on these various historical investigations, overburden in these areas typically consisted of fill and glacial till, overlying bedrock at depths estimated to range from less than 1 m to approximately 5 m. Groundwater levels (where measured) were found to be relatively shallow, ranging from approximately 1.5 m to 3 m below the ground surface.

3.3.2 Southeast of Site

Golder completed previous investigations south of the eastern portion of the site, in the area of the Dow's Lake Pavilion and the HMCS Carleton Facility. The results of these investigations are contained in the following reports:

- Golder Report to Novatech Engineering Consultants and Department of National Defence, titled "*Subsurface Investigation at CFRB Dow's Lake, Ottawa, ON*", dated June 1996 (Report No. SF-4385).
- Golder Report to Corush and Larocque Ltd., titled "*Subsurface Investigation, Proposed Landscape, Roadway and Dock, Dow's Lake, Ottawa, ON*", dated May 1983 (Report No. 831-2097).
- Golder Report to National Capital Commission, titled "*Subsurface Investigation, Proposed Dow's Lake Boathouse, Dow's Lake, Ottawa, ON*", dated March 1982 (Report No. 821-2042).
- McRostie and Associates Report to National Capital Commission, titled "*Subsurface Investigation, Rideau Canal Western Pathway, Hartwell Locks to Dow's Lake, Ottawa, ON*", dated October 2002 (Report No. SF-4729).

- McRostie and Associates Report to National Capital Commission, titled "*Subsurface Investigation, Rideau Canal Pathway, Bronson Bridge Overpass, Ottawa, ON*", dated January 2002 (Report No. SF-4764).
- Golder Report to National Capital Commission, titled "*Subsurface Investigation, Queen Elizabeth Driveway, Pretoria Bridge to Preston Street, Ottawa, ON*", dated October 1979 (Report No. 791-2217).
- Golder Report to National Capital Commission, titled "*Subsurface Investigation, Proposed Dock and Boardwalk, Dow's Lake, Ottawa, ON*", dated January 1982 (Report No. 821-2000).
- Golder Report Adjeleian, Allen, Rubeli Ltd., titled "*Geotechnical Investigation, Proposed Elevator, Dow's Lake Pavilion, Ottawa, ON*", dated January 2007 (Report No. 06-1120-362).

The majority of boreholes advanced in this area encountered fill and glacial till overlying shallow bedrock. The depth to bedrock in these boreholes was typically less than 2 m.

3.3.3 South of Site

Golder carried out a small investigation at the southern extent of the site (near the traffic circle on Prince of Wales). The results of that investigation were provided in the following report:

- Golder Report to Schoeler & Heaton Architects Inc., titled "*Soil Investigation, Proposed New Connector Road and Related Landscaping, Central Experimental Farm, Ottawa, Ontario*", dated August 2000 (Report No. 0012137).

The boreholes drilled for this investigation were drilled to a maximum of 3 m and encountered fill material underlain by glacial till and silty clay. Bedrock was not encountered in these holes, and groundwater levels were not measured.

3.3.4 Northeast Corner Inside Site

McRostie and Associates (later acquired by Golder) carried out a geotechnical investigation for a possible new location of the former Sir John Carling Building in the northwest corner of the larger portion of the site along the west side of the OLRT right-of-way. The results of that investigation were provided in the following report:

- McRostie and Associates Report to Public Work and Government Service Canada, titled "*Subsurface Investigation, Carling Avenue, Central Experimental Farm, New Sir John Carling Building, Ottawa, Ontario*", dated November 2000 (Report No. SF-4654).

Boreholes in this area encountered fill overlying glacial till, with limestone bedrock at depths ranging from 1.8 m to 4.7 m. Groundwater was typically encountered near the overburden/bedrock interface.

3.3.5 Northwest side of Site

Golder carried out a previous investigation for a sewer pipe installation, including advancing six boreholes to depths varying from 6.0 to 10.5 m below the existing ground surface. These boreholes are located at the northwest corner of the site (between the site boundary and the Dominion Observatory).

The results of that investigation were provided in the following report:

- Golder Report to McNeely Engineering Ltd., titled "*Auger Probe Survey, Proposed Sewer, Ottawa Observatory, Ottawa, Ontario*", dated February 1988 (Report No. 8812044).

The subsurface conditions encountered at the borehole locations included a thin layer of fill underlain by a thick deposit of silty sand till which extended to borehole termination depths. Silty clay was encountered at one borehole location. No refusal to augering was encountered in any of the boreholes.

3.4 Previous Environmental Investigations

The results of two previous environmental investigations were provided for use in this study. The approximate locations of these environmental boreholes are shown on Figure 1. Copies of borehole records are included in Appendix B.

3.4.1 Phase II Investigation at Sir John Carling Building

The first of these was an investigation of the site of the former Sir John Carling Building. The study included a total of seven boreholes and monitoring wells advanced to depths of up to 9 m in approximately the location of the previous building. The results of the investigation are included in the following report:

- Stantec Consulting Ltd. "Phase II Environmental Site Assessment, Former Sir John Carling Building, 930 Carling Ave., Ottawa, ON" dated March 2016.

The boreholes encountered relatively deep fill (it is understood the previous building had a basement which was filled in) and sandy soils overlying silty clay. Three of the boreholes met refusal on what was inferred to be bedrock at depths of 6.7 m to 7.3 m. The remaining four holes did not meet refusal to their maximum depth of 9.1 m.

Groundwater levels in the investigation area ranged from 0.7 m to 5.2 m below existing grade. It is noted in the report, however, that these may not be stabilized levels at all locations.

3.4.2 Phase II Investigation for New Ottawa Hospital Campus

The second environmental report included the results of a preliminary environmental investigation at various locations within the site area. The investigation included a total of 10 boreholes/monitoring wells spread over the site. The results of the investigation are included in the following report:

- Stantec Consulting Ltd. "*Phase II Environmental Site Assessment, New Ottawa Hospital Civic Campus, Ottawa, ON*" dated September 2017.

Overburden at the various boreholes included fill and sand/silt overlying bedrock at depths ranging from 0.9 m to 5.5 m based on coring and auger refusal. Groundwater measured during the investigation ranged from 1.2 m to 4.6 m below the ground surface.

4.0 SUBSURFACE CONDITIONS

4.1 General

The following sections provide an overview of the sub-surface conditions encountered in previous investigations. This overview is based only on existing documents and has not been confirmed through site-specific investigations. Additional fieldwork will be required as the design progresses to confirm (or modify) the assumptions and discussion provided below.

4.2 Topsoil & Organic Deposits

Topsoil is present extensively across the site which is comprised primarily of parks, treed areas and natural spaces.

Deeper deposits of organic soils were not noted in previous investigations and would not be expected in most areas. There may, however, be localized areas of deeper organic soils which have not been encountered in previous boreholes.

4.3 Fill

Fill material has been extensively encountered throughout the site. This fill includes thin layers of soil below pavement structures, thicker deposits which were likely used to alter the grade of the site and backfill of various excavations.

The thickest fill deposits were encountered in the 2016 environmental investigation of the former location of the Sir John Carling Building where the former basement was filled in following demolition of the building. In most other areas the fill deposits are shallower (typically 1 m to 3 m).

4.4 Silty Sand

Many of the boreholes record a layer of sandy material (most commonly described as silty sand, but areas of silt, sandy silt, and sand are also present). This soil is particularly prevalent in the environmental boreholes drilled in 2016 and 2017 within the site.

It should be noted that the description of sandy silt is very similar to glacial till in the area and in some cases the presence of cobbles and boulders is noted. Cobbles and boulders are common in glacial till, and it is possible that some of the areas described as silty sand are in fact glacial till.

4.5 Silty Clay

Deposits of silty clay are expected to exist within the project site. Published surficial geology maps suggest these deposits may be present from the central portion of the larger site towards the southwest.

Historical investigations encountered silty clay in the central portion of the site. The 2016 investigation of the former location of the Sir John Carling Building encountered silty clay near the base of many of the boreholes but did not advance far enough to determine how thick the deposit is. The location of the silty clay is somewhat consistent with the information presented on surficial geology maps (i.e., silty clay may be underlying the area of the former building). The southwest portion of the site is not well covered with historical boreholes and the exact extent and depth of silty clay present at the site is not known.

4.6 Glacial Till

Glacial till exists extensively throughout the site, and typically consists of a mixture of gravel, cobbles and boulders in a silty sand or sandy silt matrix. Glacial till (or soil with a similar description to till) was encountered extensively north of the site as well as the east portion of the site. Till was not encountered in the central portion of the site (though it is likely present below the silty clay), in the area of the former Sir John Carling Building. The boreholes advanced in the western and southern portions of the site in the previous environmental investigations identified silty sand at most locations. In some areas, however, the soil is described as containing cobbles and boulders, which is typical of glacial till. It is possible that some of the soil encountered in the boreholes could be till.

4.7 Bedrock

The site is underlain by bedrock of the Lindsay and Bobcaygeon formations. These formations include limestone with shale layers. The bedrock in the area typically has an upper disturbed zone which is of lower quality. This zone typically extends 1 m to 2 m, though this can vary. Below this zone the rock is typically relatively sound and competent. The limestone bedrock in the area is typically strong to very strong though weaker zones can be present.

Bedrock or drilling refusal was encountered extensively in previous investigations.

- Boreholes along Carling Avenue generally met bedrock (or refusal) at depths of 1 m to 5 m, generally deeper to the west (though many were drilled on roads and developed lots, and these values may not represent the overall bedrock surface).
- Previous developments around the intersection of Carling and Preston also encountered shallow bedrock.
- In area to the south of the site near the Dow's Lake Pavilion and the HMCS Carleton facility boreholes typically encountered bedrock at depths of less than 2 m.
- An environmental investigation was completed in the east parcel (east of the OLRT right-of-way). The results of the investigation are not available, but the Stantec environmental investigation report states that bedrock was encountered in this area at depths of 1 m to 3 m.
- The OLRT right-of-way includes a trench which is below-grade and houses the railway tracks. This trench is primarily in rock, confirming shallow bedrock in the eastern portion of the site.
- On the west side of the OLRT right-of-way an investigation was completed for a proposed new building. Boreholes in this area encountered bedrock at 2 m to 5 m below the existing ground.
- Further west, in the central portion of the site where the Sir John Carling Building was located, the environmental investigation encountered refusal in 3 boreholes at depths of 6.7 m to 7.3 m. None of these holes were cored, however, and refusal could have been caused by boulders in till. The majority of the boreholes were advanced to 9.1 m without refusal.
- On the west side of the site, boreholes were drilled in the northwest corner to a depth of up to 10.5 m without encountering refusal. Four boreholes were drilled at the far western extent of the site during the environmental investigations in 2017. Two of these holes met refusal at 4.6 m and 5.5 m. The remaining two were extended to 7.6 m without any refusal. Rock was not cored, and it is uncertain if the refusal was a result of rock or boulders in till.
- At the south end of the site two boreholes were drilled to a depth of 7.3 to 7.6 m without encountering refusal.

Generally, bedrock would be expected to be shallow over all of the site on the east side of the OLRT right-of-way. Immediately west of the OLRT the rock is also expected to be relatively shallow (rock is exposed along the right-of-way and is present at relatively shallow depth just to the west of the right-of-way). Further towards the centre of the site, near the former Sir John Carling Building bedrock could be 9 m or more below the ground surface. Similarly, towards the western extent of the site, the depth to rock is uncertain but is as much as 10.5 m (or more) in some locations. At the south end of the site, bedrock is greater than 7.6 m deep based on previous boreholes.

A fault line connected to the Gloucester Fault crosses throughout the northeast portion of the site in a northwest-southeast direction. These historical faults are not active faults but are more commonly what are known as healed faults; they are planes of movement where large sections of rock have experienced relative movement in the past but have usually in-filled with intact rock material. Where major excavations are found to intersect these faults additional investigation and characterization of this zone can be completed during the design stage.

4.8 Groundwater

Groundwater levels have been measured in a number of historical boreholes and have generally been found to be relatively shallow. The most recent environmental investigation encountered groundwater levels ranging from 1.2 m to 4.6 m below the existing ground surface in the various boreholes.

The groundwater level would also be expected to be shallow near existing water bodies. Groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring.

5.0 DISCUSSION

This section of the report provides preliminary engineering discussion related to geotechnical aspects of the project based on our interpretation of the available information obtained during our limited geotechnical investigation. The discussion and recommendations presented herein are intended to provide preliminary information to assess the feasibility of constructing various buildings and infrastructure across the site.

The scope of work competed as part of this assignment is significantly less than would be done for a typical design stage project. This report should therefore not be used or relied upon for detailed design decisions. These decisions will need to be supported with additional investigations and analyses as the project progresses.

Contractors must make their own interpretation based on the factual data provided in the report, in combination with additional geotechnical investigation to satisfy the project objectives and design needs. Contractors bidding on or undertaking various works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the factual information for construction, and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, safety, and equipment capabilities.

5.1 General

The overall site is expected to be underlain by a variety of overburden soils, including topsoil, fill, silt and sand, silty clay and glacial till.

This overburden is underlain by bedrock which is expected to be relatively sound and competent. The depth to bedrock varies across the site. In the east portion of the site around the OLRT right-of-way it is relatively shallow. Further towards the west and south, the bedrock is deeper. The exact depth to bedrock is less well understood but it is likely that in some areas it is 10 m or more.

Groundwater is relatively shallow at the site, ranging from approximately 1 m to 5 m below grade in the various boreholes.

It is anticipated that the new hospital development would likely include a variety of large buildings, with underground parking or basements, as well as associated roads and infrastructure. Discussion of some of the main geotechnical considerations which affect these types of development is presented below.

5.2 Site Grading

The subsurface conditions at the site are expected to consist of a variable thickness of overburden fill, silt and sand, silty clay and glacial till overlying bedrock at depths of 1 m to greater than 10 m. The majority of these soils are not likely to be unusually prone to excessive settlement caused by grading (with the exception of silty clay which may be present at depth in the central portion of the site). In most of the site no practical restrictions are likely to apply to normal site grading for roads, parking areas, green space, etc.

In the central portion of the site, in the area around the former Sir John Carling Building, there may be areas where silty clay soils are present. If these deposits include softer, unweathered silty clay then assessment of allowable grade raises may be required. These grade raise restrictions, however, are not likely to be severe enough to prevent typical development but would need to be confirmed and considered during detailed design.

5.3 Seismic Design Considerations

The eastern portion of the site, generally speaking on both sides of the OLRT right-of-way is underlain by relatively shallow rock. Where foundations are placed on, or within 3 m of, bedrock a favourable seismic site class could likely be used (Site Class A or B). Given the shallow bedrock it is likely that this would apply to large portions of the eastern part of the site (particularly if new structures have basements and below-grade parking which bring the foundations down to bedrock). Assigning a site class more favourable than C does, however, require site-specific measurement of shear wave velocities during the design phase.

Where building basements do not reach bedrock, a Site Class C may apply. There may be some areas where the presence of deep overburden, (in particular the silty clay) would require that they be assigned a Site Class D or E (depending on the thickness and strength of the clay deposit). These areas would need to be confirmed with additional investigations.

In the eastern portion of the site, where bedrock is shallow, seismic liquefaction is not considered to be a significant risk. It is possible that there are some areas in the western portion where seismic liquefaction may be an issue (where sandy soils are present and groundwater levels are relatively high). This must be confirmed during detailed design investigations since the methods of drilling used in the previous investigations typically did not obtain the data required to make this assessment at this time.

5.4 Foundations

Large portions of the site are expected to have relatively shallow bedrock (less than 5 m). In these areas, structures with conventional basements or underground parking can likely be founded on rock. Foundations on rock will be capable of supporting large loads and are generally suitable for any type of structure.

In areas where the soil is deeper than the lowest level of basements (for example in the central and western portions of the site) it is likely that lighter structures can still be founded on conventional spread footings. Large, heavy structures such as large hospital buildings for example may require deep foundations, or large raft foundations where overburden is deep.

There is limited data available at this time to confirm the extent of these deeper overburden areas, but they may exist around the former Sir John Carling Building and further to the west and south. Additional investigation would be required to confirm the detailed foundation requirements in these areas.

Conventional slab on grade construction is likely to be feasible at the site.

5.5 Groundwater

Groundwater was found to be relatively shallow in the various investigations (ranging from less than 1 m to 5 m below grade).

- Based on the anticipated high groundwater levels, deep basement levels may be below the water table (depending on final grading and elevations at specific locations) and may require drainage (weeping tiles, sub-floor drains, sumps, etc.).

If large, deep excavations are required there may be a need for a Permit to Take Water or registration under the Environmental Activity and Sector Registry. Obtaining these permits is relatively routine, but they must be accompanied by appropriate hydrogeological studies (which would be completed as part of the design-stage excavations).

If the deep excavations are also located in areas of thicker overburden an active dewatering system may also be required, particularly in the central, western and southern portions of the site where there is a significant thickness of silty, sandy overburden soils which extends below the water table.

5.6 Excavations

Excavations will likely be through a combination of soil and bedrock, depending on the depth of excavation and the specific location within the site.

No unusual problems would be anticipated with excavations in overburden soil (recognizing the potential need for dewatering if very deep excavations are required).

Shallow or localized excavations in bedrock can typically be accomplished using mechanical methods (such as hoe ramming in conjunction with line drilling). Deeper, larger excavations into bedrock are generally more economically made by blasting. Given the undeveloped nature of the site, unusual problems with blasting restrictions would not be expected.

Above the water table, side slopes should be stable in the short term at 1 horizontal to 1 vertical (Type 3 soil in accordance with the Occupational Health and Safety Act of Ontario (OHSA)). Below the water table (or the depth of dewatering), side slopes of 3 horizontal to 1 vertical (Type 4 soil in accordance with the OHSA) will be required to prevent sloughing of the sandier soils. It should be noted that more sloughing can be anticipated for portions of the excavations carried out through wet silt, silty sand and gravel deposits which in turn will require further side slope flattening or shoring, depends on the depth and size of excavations.

Near-vertical excavation side slopes in the bedrock, if encountered, should be feasible. Rock excavations in the area are typically made without shoring, using a combination of temporary support including rock bolts, wire mesh and shotcrete.

It should be possible to handle the groundwater inflow in small and/or shallow excavations above the water table, by pumping from properly filtered sumps in the excavations. Deeper excavations in thicker overburden may require active dewatering, particularly where it is coarser in nature (silts and sands as well as glacial tills) or highly susceptible to disturbance.

5.7 Slope Stability

The area slopes generally from south to north. Slope stability is not likely to be a significant factor over most of the site, and the soils described in the various borehole logs are not unusually prone to large scale slope failures. Localized areas may require a slope stability assessment and determination of suitable grading plans, but these would not be expected to be a significant impediment to development.

Sloping areas should be reviewed and assessed based on future development plans.

5.8 Roads and Pavements

The overburden soils and bedrock would not be expected to present any unusual issues related to the construction or performance of normal asphaltic concrete pavements at the site. This assumes pavements would not be constructed in areas of unusually high groundwater (higher than identified in previous investigations, or areas where significant cuts were required brining the pavement closer to groundwater). These areas could require special investigation, design and treatment prior to constructing new pavements.

6.0 ADDITIONAL STUDIES

The information and discussion provided in this report is of a preliminary nature and intended to inform development planning, not detailed design. As development plans progress additional geotechnical investigations will be required as part of the normal design process.

As plans for the site progress, Golder would be pleased to provide additional guidance and input as required based on proposed structure types, locations, etc.

7.0 CLOSURE

We trust that this report meets your current needs. If you have any questions, or if we may be of further assistance, please do not hesitate to contact the undersigned.

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BB/CH/hwd
https://golderassociates.sharepoint.com/sites/112513/project files/6 deliverables/geotech report/19127064-001-parsons general hospital geotechnical review mar 2021_rev01.docx

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

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

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

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

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

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder 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 Golder's report.

During construction, Golder 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 Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder 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, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder 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 Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

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

INSET MAP

KEY MAP

SCALE 1:125,000

LEGEND

- HISTORICAL TESTHOLE LOCATION
- PREVIOUS ENVIRONMENTAL BOREHOLE COMPLETED BY STANTEC, 2016 & 2017
- STUDY AREA
- 100 METRE BUFFER
- O-TRAIN STATION
- O-TRAIN TRACK
- ROADWAY
- WATERBODY

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2018
2. SERVICE LAYER CREDITS: © OPENSTREETMAP (AND) CONTRIBUTORS, CC-BY-SA
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

0 40 80 160
1:4,000 METRES

CLIENT
PARSONS

PROJECT
THE OTTAWA HOSPITAL NEW CIVIC CAMPUS

TITLE
EXISTING BOREHOLES

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-07
DESIGNED	----
PREPARED	BR
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
19127064	0004	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 0 25mm

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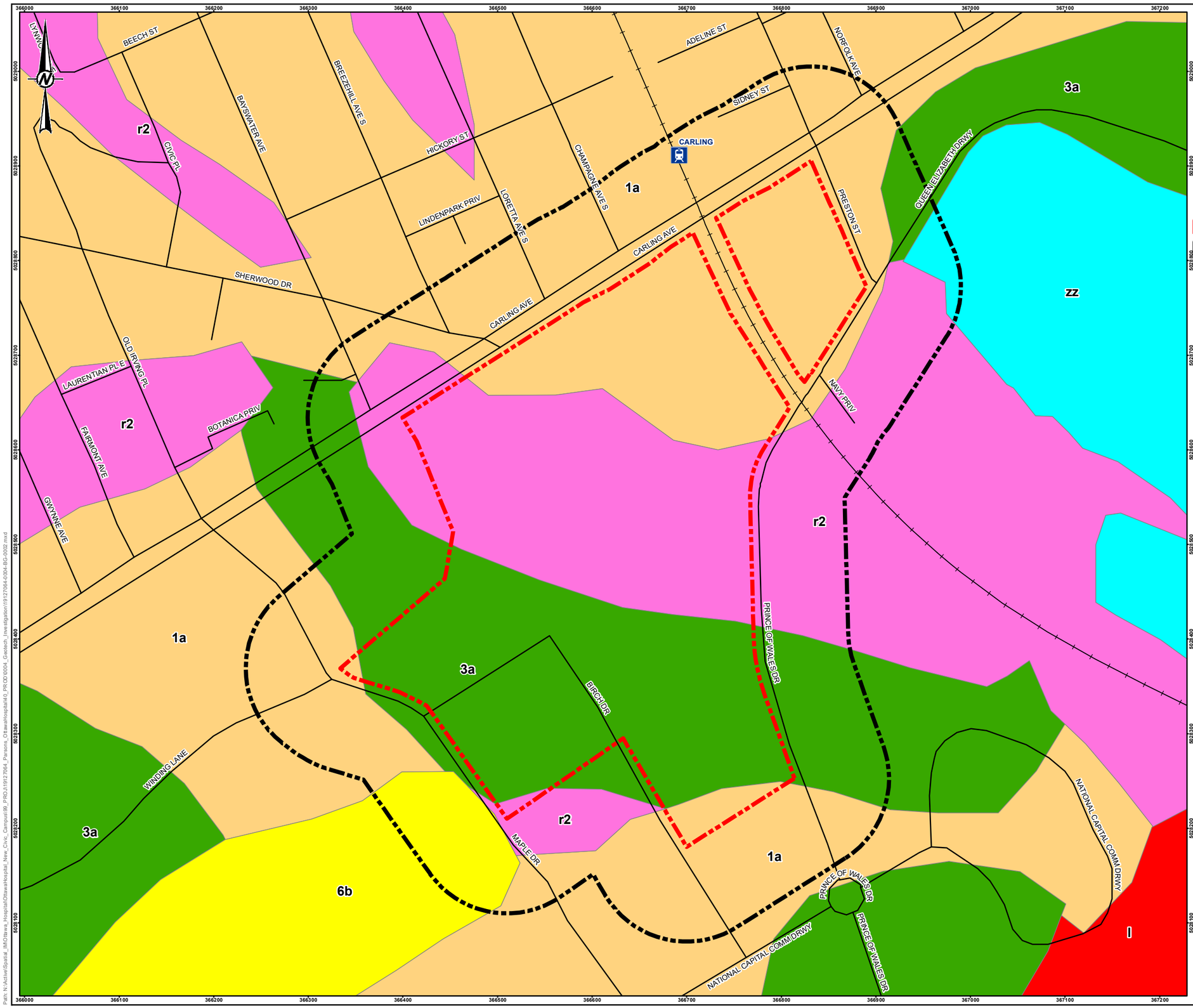


LEGEND

- O-TRAIN STATION
- O-TRAIN TRACK
- ROADWAY

GSC SURFICIAL GEOLOGY

- 6b: ALLUVIAL DEPOSITS: MEDIUM GRAINED STRATIFIED SAND WITH SOME SILT
- 3a. OFFSHORE MARINE DEPOSITS: CLAY, SILT UNDERLYING EROSIONAL TERRACES
- 1a. TILL, PLAIN WITH LOCAL RELIEF <5 m
- L. LANDSLIDE AREA
- r2. BEDROCK: LIMESTONE, DOLOMITE, SANDSTONE & LOCAL SHALE
- zz. WATERBODY
- STUDY AREA
- 100 METRE BUFFER

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. BÉLANGER, J. R. 2008 URBAN GEOLOGY OF THE NATIONAL CAPITAL AREA, GEOLOGICAL SURVEY OF CANADA, OPEN FILE 5311, 1 DVD.
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2018
3. SERVICE LAYER CREDITS:
4. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

0 40 80 160
1:4,000 METRES

CLIENT
PARSONS

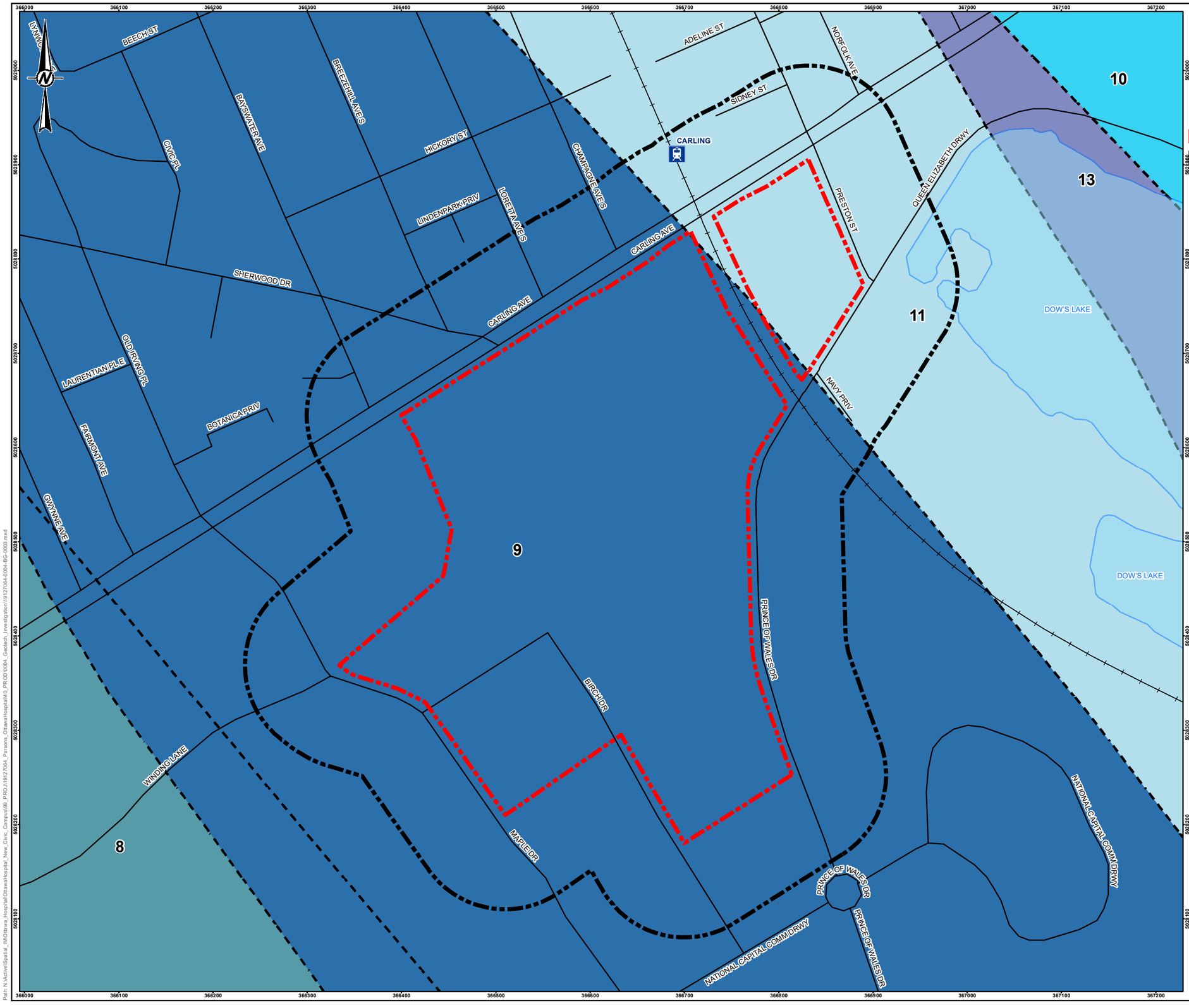
PROJECT
THE OTTAWA HOSPITAL NEW CIVIC CAMPUS

TITLE
SURFICIAL GEOLOGY

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-07
DESIGNED	----
PREPARED	BR
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
19127064	0004	A	2



LEGEND

- O-TRAIN STATION
- O-TRAIN TRACK
- ROADWAY
- FAULT
- WATERBODY
- STUDY AREA
- 100 METRE BUFFER
- 13: BILLINGS FORMATION - SHALE, MINOR LIMESTONE
- 11: LINDSAY FORMATION - LIMESTONE; NODULAR TO BLACK LAMINATED
- 10: VERULAM FORMATION - LIMESTONE AND SHALE
- 9: BOBCAYGEON FORMATION - LIMESTONE, WITH MINOR SHALES IN UPPER PART
- 8: GULL RIVER FORMATION - LIMESTONE, WITH DOLOSTONE BEDS TOWARDS BASE

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. ARMSTRONG, D.K. AND DODGE, J.E.P. 2007. PALEOZOIC GEOLOGY OF SOUTHERN ONTARIO; ONTARIO GEOLOGICAL SURVEY, MISCELLANEOUS RELEASE--DATA 219
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2018
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83,
COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

0 40 80 160
1:4,000 METRES

CLIENT
PARSONS

PROJECT
THE OTTAWA HOSPITAL NEW CIVIC CAMPUS

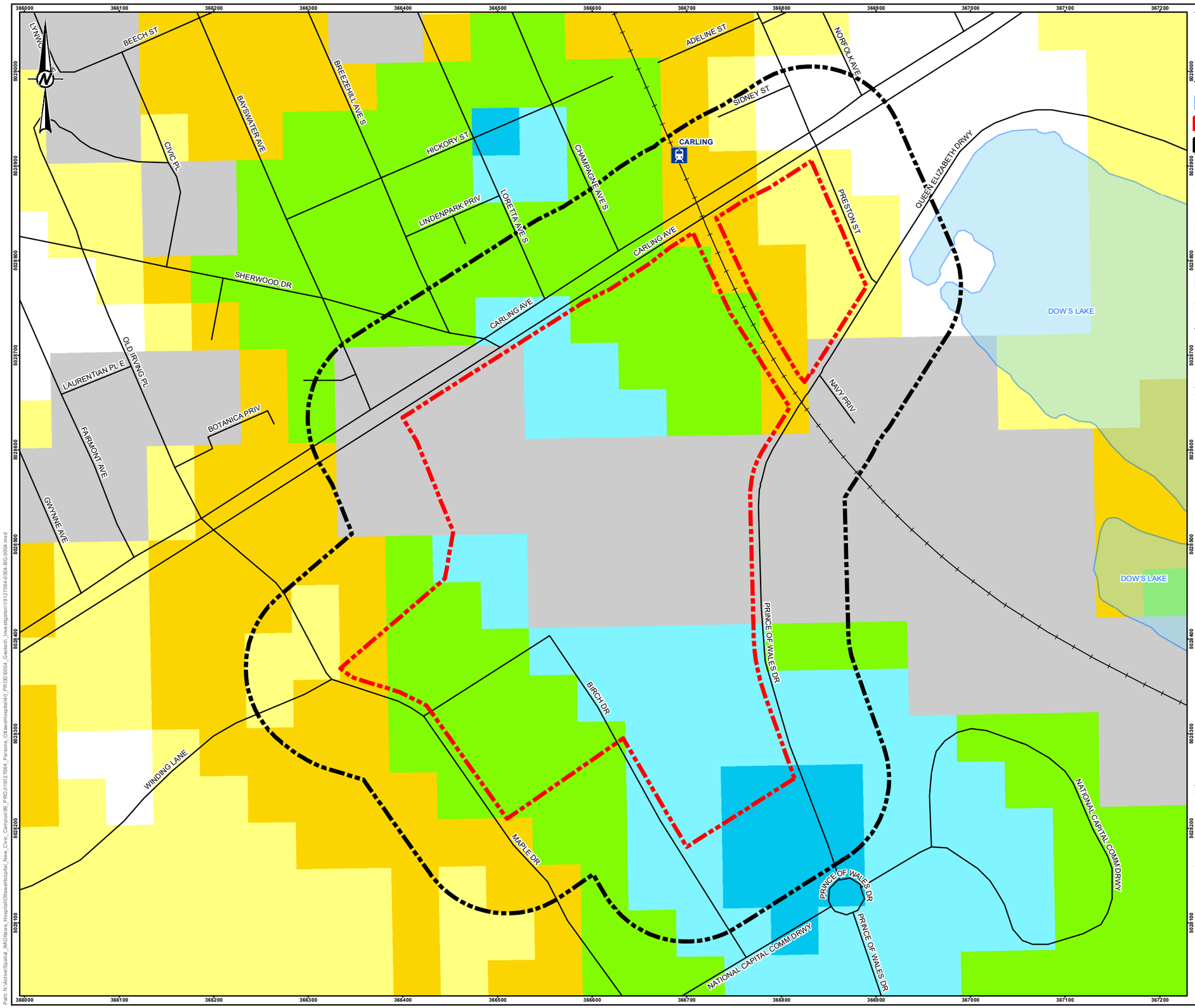
TITLE
BEDROCK GEOLOGY

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-07
DESIGNED	----
PREPARED	BR
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
19127064	0004	A	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
0 25mm



LEGEND

- O-TRAIN STATION
- O-TRAIN TRACK
- ROADWAY
- WATERBODY
- STUDY AREA
- 100 METRE BUFFER

GSC TREND IN DEPTH TO BEDROCK (METRES)

- 0 to 1
- 1 to 2
- 2 to 3
- 3 to 5
- 5 to 10
- 10 to 15
- 15 to 25

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. 2010 BÉLANGER, J. R., URBAN GEOLOGY OF THE NATIONAL CAPITAL AREA, GEOLOGICAL SURVEY OF CANADA, OPEN FILE D3256, 2001
2. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2018
3. SERVICE LAYER CREDITS:
4. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: MTM ZONE 9, VERTICAL DATUM: CGVD28

0 40 80 160

1:4,000 METRES

CLIENT
PARSONS

PROJECT
THE OTTAWA HOSPITAL NEW CIVIC CAMPUS

TITLE
DRIFT THICKNESS

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-07
DESIGNED	----
PREPARED	BR
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
19127064	0004	A	4

APPENDIX A

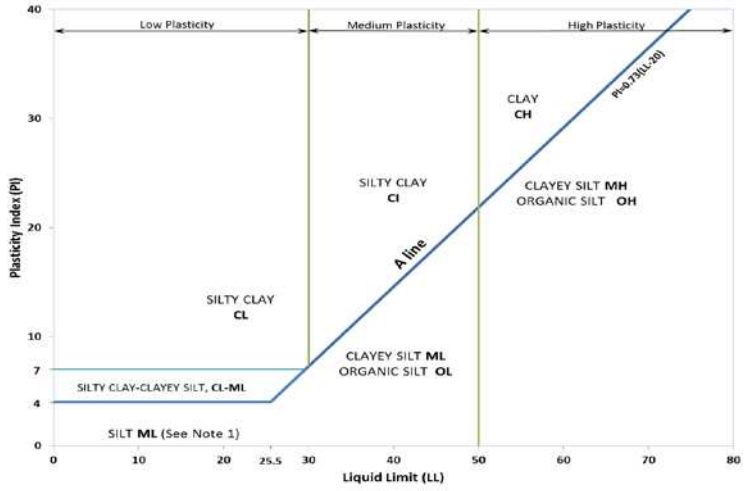
Records of Previous Investigations

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
				Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% **(see Note 2)**	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat							75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation
w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c′	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERINGS STATE

Fresh: no visible sign of rock material weathering.

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)
The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)
The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)
The percentage of solid drill core, greater than 100 mm length, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid segments.

DISCONTINUITY DATA

Fracture Index
A count of the number of naturally occuring discontinuities (physical separations) in the rock core. Mechanically induced breaks caused by drilling are not included.

Dip with Respect to Core Axis
The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90^{o} angle is horizontal.

Description and Notes
An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

JN	Joint	PL	Planar
FLT	Fault	CU	Curved
SH	Shear	UN	Undulating
VN	Vein	IR	Irregular
FR	Fracture	K	Slickensided
SY	Stylolite	PO	Polished
BD	Bedding	SM	Smooth
FO	Foliation	SR	Slightly Rough
CO	Contact	RO	Rough
AXJ	Axial Joint	VR	Very Rough
KV	Karstic Void		
MB	Mechanical Break		

TABLE 1

RECORD OF AUGERHOLES

Augerhole Number	Depth (metres)	Description
AH 00-1	0.0 – 0.09	Asphaltic Concrete
	0.09 – 0.36	Grey crushed stone (base)
	0.36 – 1.90	Brown fine sand (subbase)
	1.90 – 2.10	Brown sand and gravel (subbase)
	2.10 – 3.05	Grey brown Silty Clay
	3.05	End of augerhole
AH00-2	0.0 – 0.07	Asphaltic Concrete
	0.07 – 0.40	Grey crushed stone (base)
	0.40 – 0.97	Brown fine sand (subbase)
	0.97 – 1.83	Dark brown Glacial Till, wet
	1.83	End of augerhole
		Auger refusal
AH00-3	0.0 – 0.30	Topsoil
	0.30 – 0.65	Brown silty sand, trace topsoil (FILL)
	0.65 – 0.95	Dark brown silty Topsoil
	0.95 – 1.63	Brown Glacial Till, wet
	1.63	End of augerhole
		Auger refusal
AH00-4	0.0 – 0.20	Topsoil
	0.20 – 0.75	Brown silty sand (FILL)
	0.75 – 0.95	Topsoil
	0.95 – 1.15	Grey brown Silty Clay
	1.15 – 1.80	Brown Glacial Till
	1.80	End of augerhole
AH00-5	0.0 – 0.10	Asphaltic Concrete
	0.10 – 0.18	Grey crushed stone (base)
	0.18 – 0.45	Brown sand and gravel (subbase)
	0.45 – 0.96	Brown fine sand (subbase)
	0.96 – 1.14	Brown sand and gravel (subbase)
	1.14 – 1.20	Dark brown sandy Topsoil
	1.20 – 1.50	Brown fine Sand
	1.50 – 2.54	Brown Glacial Till
	2.54	End of augerhole
		Auger refusal
		Free water at 1.9 metres depth

Form G.A.-D-1.

Project No. 821-2000

RECORD OF BOREHOLES 1, 2 & 3

LOCATION See Figure 2 BORING DATE JAN. 6, 1982 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 63.5 Kg., DROP 0.76m PENETRATION TEST HAMMER WEIGHT DROP

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
POWER AUGER, 0.20m DIAM. (HOLLOW STEM)		**BH. 1**					63
	62.51	GROUND SURFACE					
	0.00 / 61.44	VERY LOOSE DARK GREY ORGANIC SANDY SILT, TRACE GRAVEL, WOOD AND BRICK (ALLUVIUM)		1	50 mm D.O.	1	62
				2	"	1	
	1.07	END OF HOLE AUGER REFUSAL, PROBABLY BEDROCK				>100	61
		BH. 2					63
	62.53	ICE SURFACE					
	0.00	ICE					
	0.15 / 61.92	WATER					62
	0.61 / 61.04	VERY LOOSE DARK GREY ALLUVIUM		1	50 mm D.O.	1	
	1.49 / 60.52	VERY DENSE SILTY GLACIAL TILL		2	"	>100	61
	2.01	END OF HOLE AUGER REFUSAL PROBABLY BEDROCK					60
		BH. 3					63
	62.51	ICE SURFACE					
	0.00	ICE					
	0.18 / 61.90	WATER					62
ROTARY DRILLING, BW CASING	0.61 / 60.59	VERY LOOSE GREY SANDY SILT, SOME ORGANIC MATTER, TRACE GRAVEL AND COBBLES (ALLUVIUM)		1	50 mm D.O.	1	
				2	"	1	61
	1.92 / 60.28	DARK GREY ORGANIC SILT AND PEAT		3	"	2	
	2.23	DENSE SILTY GLACIAL TILL					
45mm T.W. R.C.	2.38 / 58.88	SOUND GREY LIMESTONE BEDROCK, OCCASIONAL BLACK SHALEY INTERBEDS		4	45 mm T.W. R.C.	>100 —	60
	3.63	END OF HOLE					59

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	COEFFICIENT OF PERMEABILITY, k, CM./SEC. (1x10 1x10 1x10 1x10)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
SHEAR STRENGTH Cu. NAT. V. - + Q. - ● REM. V. - ⊕ U. - O	WATER CONTENT, PERCENT W_P W W_L		

100 78 R.Q.D. (%) CORE RECOVERY (%)

0 15 5 10 Percent axial strain at failure

VERTICAL SCALE 1:50

Golder Associates

DRAWN DN

CHECKED

Form G.A.-D-1.

Project No. 821-2000

RECORD OF BOREHOLES 4 & 5

LOCATION See Figure 2 BORING DATE JAN. 7, 1982 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 63.5 Kg., DROP 0.76m PENETRATION TEST HAMMER WEIGHT DROP

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/	ELEVATION SCALE
		BH. 4					63
	62.54	ICE SURFACE					
ROTARY DRILLING	0.00	ICE					
BW CASING	62.30						
	0.24	WATER					62
	61.26						
	1.28	DARK GREY ALLUVIUM					
	61.02						
	1.52	VERY LOOSE TO VERY DENSE GLACIAL TILL		1	50 mm D.O.	2 / >50	61
	60.41						
45 mm T.W. R.C.	2.13	FRACTURED LIMESTONE BEDROCK		2	45 mm T.W. R.C.	—	60
	59.95						
	2.59						
	59.64						
	2.90	END OF HOLE					
		FAIRLY SOUND GREY LIMESTONE BEDROCK					59

83 33 R.Q.D. (%)
CORE RECOVERY (%)

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/	ELEVATION SCALE
		BH. 5					63
	62.51	ICE SURFACE					
ROTARY DRILLING	0.00	ICE					
BW CASING	0.18	WATER					
	0.40	DARK GREY ALLUVIUM		1	50 mm D.O.		62
	0.61	DARK GREY SILTY GLACIAL TILL					
45mm T.W. RC	0.73	SOUND GREY LIMESTONE BEDROCK, OCCASIONAL SHALEY INTERBEDS		2	45 mm T.W. R.C.		61
	60.80						
	1.71	END OF HOLE					60

100 45 R.Q.D. (%)
CORE RECOVERY (%)

0 / 15 5 / 10 Percent axial strain at failure

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu. NAT. V. - + Q. - ● REM.V. - ⊕ U. - O

COEFFICIENT OF PERMEABILITY, k, CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT W_P W W_L

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

VERTICAL SCALE 1:50

Golder Associates

DRAWN DN

CHECKED

RECORD OF BOREHOLE 1

LOCATION See Figure 2 BORING DATE MAR. 11, 1982 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 63.5 Kg., DROP 760 mm PENETRATION TEST HAMMER WEIGHT DROP

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
	62.49	ICE SURFACE					
	0.00	ICE					62
	61.88						
	0.61	WATER					61
B CASING	60.84						
	1.65	VERY LOOSE BROWN SANDY SILT, SOME ORGANIC MATTER POCKETS (ALLUVIUM)		1	50 mm DO	4	
	60.11						60
	2.38	FRACTURED GREY LIMESTONE		2	38 mm R.C.	—	
	59.87	BEDROCK					
ROTARY DRILLING	2.62			3	"	—	
		FAIRLY SOUND TO SOUND GREY LIMESTONE BEDROCK, SOME DARK GREY SHALEY LIMESTONE BANDS OCCASIONAL NEAR HORIZONTAL JOINTS					59
				4	"	—	
							58
				5	"	—	
	57.31						
	5.18	END OF HOLE					57

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu. NAT. V. - + Q. - ● REM. V. - ⊕ U. - O

COEFFICIENT OF PERMEABILITY, k, CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT W_P W W_L

CORE RECOVERY (%): 50, 100, 90, 89

R.Q.D. (%): 0, 78, 35, 63

15 0 5 10 Percent axial strain at failure

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

VERTICAL SCALE 1:25

Golder Associates

DRAWN DM

CHECKED

RECORD OF BOREHOLE 2

LOCATION See Figure 2 BORING DATE MAR 11, 1982 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 63.5 Kg., DROP 760 mm PENETRATION TEST HAMMER WEIGHT DROP

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
	62.62	ICE SURFACE					
ROTARY DRILLING; B CASING; 38mm DIAM. T.W. CORE	0.00	ICE					
	62.19						
	0.43	DARK BROWN SILTY SAND, SOME GRAVEL, OCCASIONAL COBBLES (ALLUVIUM)					62
	61.86						
	0.76	VERY DENSE GREY BROWN SILTY SAND, SOME GRAVEL, TRACE CLAY (GLACIAL TILL)		1	50 mm D.O.	>100	
	61.28						
	1.34	FRACTURED GREY LIMESTONE BEDROCK, OCCASIONAL SILT FILLED SEAMS		2	38 mm R.C.	—	61
				3	"	—	
	60.24						
	2.38	FAIRLY SOUND GREY LIMESTONE BEDROCK, SOME DARK GREY SHALEY LIMESTONE BANDS		4	"	—	60
	59.33						
	3.29	END OF HOLE					59

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu. NAT. V. - + Q. - ● REM. V. - ⊕ U. - O

COEFFICIENT OF PERMEABILITY, k, CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT Wp W WL

CORE RECOVERY (%): 67, 52, 97

R.Q.D. (%): 0, 67

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

15 0 5 10 Percent axial strain at failure

VERTICAL SCALE 1:25

Golder Associates

DRAWN DN

CHECKED

RECORD OF BOREHOLE 3

LOCATION See Figure 2 BORING DATE MAR. 12, 1982 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 63.5 Kg., DROP 760mm PENETRATION TEST HAMMER WEIGHT DROP

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION SCALE
	62.48	ICE SURFACE					
ROTARY DRILLING, B CASING, 38mm DIAM. TW. CORE	0.00	ICE					62
	61.81						
	0.67	DARK BROWN SILTY SAND AND GRAVEL, OCCASIONAL ASPHALT ETC.		1	50 mm D.O.	>100	
	61.47	(ALLUVIUM)					
	1.01	**BADLY TO MODERATELY FRACTURED** GREY LIMESTONE **BEDROCK**, OCCASIONAL SILT FILLED SEAMS		2	38 mm R.C.		61
				3	"		
				4	"		
				5	"		
	60.53			6	"		
	1.95	**FAIRLY SOUND** GREY LIMESTONE **BEDROCK**, SOME DARK GREY SHALEY LIMESTONE BANDS, OCCASIONAL NEAR HORIZONTAL JOINTS		7	"		60
				8	"		
	59.43						
	3.05	END OF HOLE					59

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu. NAT. V. - + Q. - ● REM. V. - ⊕ U. - O

COEFFICIENT OF PERMEABILITY, k_v, CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT W_P W W_L

CORE RECOVERY (%): 62, 53, 100, 56, 100, 94

R.Q.D. (%): 0, 66

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

15 — 0 — 5 — 10 Percent axial strain at failure

VERTICAL SCALE 1:25

Golder Associates

DRAWN DN

CHECKED

RECORD OF BOREHOLE 4

LOCATION See Figure 2 BORING DATE MAR 12, 1982 DATUM GEODETIC

SAMPLER HAMMER WEIGHT 63.5 Kg., DROP 760 mm PENETRATION TEST HAMMER WEIGHT DROP

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION SCALE
	62.81	GROUND SURFACE					63
B CASING	0.00 / 61.69	BROWN SAND AND GRAVEL, OCCASIONAL WOOD AND ORGANIC MATTER (FILL)		1	C.S.	–	
	0.85 / 61.62	LOOSE DARK BROWN SANDY SILT, SOME CLAY AND ORGANIC MATTER (ALLUVIUM)		2	50 mm D.O.	5	62
ROTARY DRILLING 38 mm DIAM. T.W. CORE	1.19	**FAIRLY SOUND** GREY LIMESTONE **BEDROCK**, SOME DARK GREY SHALEY LIMESTONE BANDS, OCCASIONAL NEAR HORIZONTAL JOINTS		3	38 mm R.C.	>100 / 1	61
				4	=	–	60
				5	=	–	59
	58.88 / 3.93	END OF HOLE					58

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu. NAT. V. - + Q. - ● REM. V. - ⊕ U. - O

COEFFICIENT OF PERMEABILITY, k, CM./SEC. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT W_P W W_L

CORE RECOVERY (%): 89

R.Q.D. (%): 67, 66

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

15 — 0 / 10 — 5 Percent axial strain at failure

VERTICAL SCALE 1:25

Golder Associates

DRAWN DN

CHECKED

RECORD OF BOREHOLE 1

LOCATION See Figure 2 BORING DATE OCT. 1 & 4, 1982 DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	ELEVATION SCALE
80.82 / 0.00	GROUND SURFACE					81
0.24	TOPSOIL					
79.91 / 0.91	LOOSE BROWN SANDY SILT		1	50 mm DO.	29	80
	DENSE TO VERY LOOSE BROWN TO GREY SILTY SAND TO SANDY SILT, SOME GRAVEL, TRACE TO SOME CLAY, OCCASIONAL COBBLES AND BOULDERS (GLACIAL TILL)		2	"	46	79
			3	"	15	78
			4	"	13	
			5	"	13	77
			6	"	5	76
			7	"	4	75
			8	"	5	
						74
			9	"	5	73
72.01 / 8.81	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK					72
						71

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT Wp W WL 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUND SURFACE

SURFACE SEAL

PLASTIC TUBING

NATIVE BACKFILL

STANDPIPE

MH

MH

W.L. IN STANDPIPE AT ELEV. 76.42 OCT. 13, 1982

15 0 5 10 Percent axial strain at failure

VERTICAL SCALE 1:50

Golder Associates

DRAWN DN

CHECKED

RECORD OF BOREHOLE 2

LOCATION See Figure 2 BORING DATE OCT 4, 1982 DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
80.01	GROUND SURFACE					
0.05	TOPSOIL					80
0.21	VERY LOOSE LIGHT BROWN CINDERS AND ASHES (FILL)		1	SS	2	79
79.70						
1.31 / 78.42	TOPSOIL					
1.58 / 78.23	COMPACT BROWN SANDY SILT		2	SS	11	78
1.98	DENSE TO LOOSE BROWN TO GREY SANDY SILT TO SILTY SAND, SOME GRAVEL, TRACE TO SOME CLAY; OCCASIONAL COBBLES AND BOULDERS (GLACIAL TILL)		3 4 5 6 7 8	SS SS SS SS SS SS	43 6 5 10 8 24	77 76 75 74 73
71.02						
8.99 / 70.56	VERY LOOSE GREY FINE SAND, TRACE SILT		9 10	SS SS	15 WH / 30	72 71
9.45 / 69.34	COMPACT GREY GLACIAL TILL					70
10.67	END OF HOLE AUGER REFUSAL, POSSIBLY BEDROCK					69

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT Wp W WL

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUND SURFACE

SURFACE SEAL

PLASTIC TUBING

NATIVE BACKFILL

STANDPIPE

CAVED IN MATERIAL

W.L. IN STANDPIPE AT ELEV. 74.51 OCT 12, 1982

0 / 15 5 / 10 Percent axial strain at failure

VERTICAL SCALE 1:50

Golder Associates

DRAWN DN

CHECKED

RECORD OF BOREHOLES 3 & 4

LOCATION See Figure 2 BORING DATE OCT. 4, 1982 DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

SOIL PROFILE			SAMPLES			ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (NAT. V.- + Q.-● REM. V.- ⊕ U.-○)	HYDRAULIC CONDUCTIVITY, k, cm/sec. (1x10 1x10 1x10 1x10) / WATER CONTENT, PERCENT (Wp W WL)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS/0.3m					
	BH. 3					70				
69.35 / 0.00	GROUND SURFACE									GROUND SURFACE
0.15	BROWN CLAYEY SILT (FILL)					69				SURFACE SEAL
	VERY LOOSE BROWN CINDERS AND ASHES, TRACE GLASS (FILL)		1	50 mm D.O.	1	68				PLASTIC TUBING
			2	"	4					
			3	"	2	67				NATIVE BACKFILL
			4	"	1	66				STANDPIPE
65.81 / 3.54	PROBABLY WEATHERED BEDROCK				>100					
65.57 / 3.78	END OF HOLE AUGER REFUSAL PROBABLY BEDROCK					65				W.L. IN STANDPIPE AT ELEV. 66.15 OCT. 13, 1982
	BH. 4									
70.22 / 0.00	GROUND SURFACE					70				GROUND SURFACE
	VERY LOOSE TO LOOSE BROWN CINDERS AND ASHES, TRACE GLASS AND BRICK (FILL)		1	50 mm D.O.	6	69				SURFACE SEAL
			2	"	2					PLASTIC TUBING
			3	"	3	68				NATIVE BACKFILL
67.48 / 2.74	LOOSE TO VERY LOOSE BROWN TO GREY SANDY SILT AND SILTY SAND, SOME GRAVEL, TRACE CLAY, OCCASIONAL COBBLES AND BOULDERS (GLACIAL TILL)		4	"	9	67				
			5	"	1	66				STANDPIPE
			6	"	3					
65.16 / 5.06	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK				>100	65				W.L. IN STANDPIPE AT ELEV. 67.62 OCT. 13, 1982

0 / 15 — 5 / 10 Percent axial strain at failure

VERTICAL SCALE 1:50

Golder Associates

DRAWN DN

CHECKED

RECORD OF BOREHOLE 5

LOCATION See Figure 2 | BORING DATE OCT. 5, 1982 | DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm | PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m
76.51 / 0.00	GROUND SURFACE TOPSOIL				
75.93 / 0.58	BROWN SANDY SILT				
	DENSE TO VERY LOOSE BROWN TO GREY SANDY SILT TO SILTY SAND, SOME GRAVEL, TRACE TO SOME CLAY, OCCASIONAL COBBLES AND BOULDERS (GLACIAL TILL)		1 2 3 4 5 6 7 8 9 10 11	50 for 20 = = = = = = = = = =	31 44 19 8 4 2 7 4 6 6 26
64.93 / 11.58	GREY FINE SAND				
64.01 / 12.50	GREY GLACIAL TILL				
63.25 / 13.26	END OF HOLE AUGER REFUSAL POSSIBLE BEDROCK				

ELEVATION SCALE: 77, 76, 75, 74, 73, 72, 71, 70, 69, 68, 67, 66, 65, 64, 63

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W W_L — 10 20 30 40

MH

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUND SURFACE
SURFACE SEAL
PLASTIC TUBING
BENTONITE SEAL
PIEZOMETER 'B'
3.8
PIEZOMETER 'A'
NATIVE BACKFILL
STANDPIPE

W.L.'S IN STANDPIPE AT ELEV. 72.11
PIEZOMETER 'A' AT ELEV. 73.11
PIEZOMETER 'B' DRY
OCT. 19, 1982

15 — 0 — 5 — 10 Percent axial strain at failure

VERTICAL SCALE 1:50

Golder Associates

DRAWN DN

CHECKED

RECORD OF BOREHOLE 6

LOCATION See Figure 2 BORING DATE OCT. 5 & 6, 1982 DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

SOIL PROFILE ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS/0.3m	ELEVATION SCALE
82.26	GROUND SURFACE					83
0.00	TOPSOIL					
0.21	BROWN SANDY SILT					82
81.65						
0.61	DENSE TO VERY LOOSE BROWN TO GREY SANDY SILT TO SILTY SAND, SOME GRAVEL, TRACE TO SOME BOULDERS (GLACIAL TILL)		1	SS	47	81
			2	"	39	
			3	"	22	80
			4	"	15	79
			5	"	25	78
			6	"	8	
			7	"	4	77
			8	"	7	76
						75
			9	"	7	
						74
			10		12	73
						72
			11		36	
						71
						70
79.79						69
2.47	END OF HOLE AUGER REFUSAL, POSSIBLY BEDROCK					

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT Wp W W_L

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUND SURFACE

SURFACE SEAL

PLASTIC TUBING

NATIVE BACKFILL

STANDPIPE

W.L. IN STANDPIPE AT ELEV. 77.69 OCT. 6, 1982

0 15 5 10 Percent axial strain at failure

VERTICAL SCALE 1:50

Golder Associates

DRAWN VN

CHECKED

RECORD OF BOREHOLE 7

LOCATION See Figure 2 BORING DATE OCT. 6, 1982 DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (NAT. V.- + Q.-● REM. V.- ⊕ U.-○)	HYDRAULIC CONDUCTIVITY, k, cm/sec. (1x10 1x10 1x10 1x10) / WATER CONTENT, PERCENT (Wp W WL)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
600 mm DIAM (HOLLOW STEM)	82.12	GROUND SURFACE									GROUND SURFACE
	0.00	TOPSOIL									SURFACE SEAL
	0.24	LOOSE TO COMPACT BROWN TO GREY SANDY SILT AND SILTY SAND, SOME GRAVEL, TRACE TO SOME CLAY, OCCASIONAL COBBLES AND BOULDERS (GLACIAL TILL)		1	50 mm D.D.	13					PLASTIC TUBING
	82			2	"	12					
	81			3	"	17					NATIVE BACKFILL
	80			4	"	9					
	78.33			5	"	54					STANDPIPE
				6	"	>100					
	4.79	END OF HOLE AUGER REFUSAL, POSSIBLY BEDROCK									STANDPIPE DRY OCT. 13, 1982

NOTE: ADDITIONAL AUGERHOLE DRILLED 1m SOUTH OF BH. 7, AUGER REFUSAL ENCOUNTERED AT 4.72 m. DEPTH

15 — 0 / 10 — 5 Percent axial strain at failure

VERTICAL SCALE 1:50

Golder Associates

DRAWN DN

CHECKED

RECORD OF AUGERHOLE 1

LOCATION See Figure 2 | BORING DATE APRIL 25, 1983 | DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm | PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
	66.61	GROUND SURFACE					66.5
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	0.00	ASPHALT					
	0.04 / 66.48	BROWN SAND SOME GRAVEL (FILL)					
	0.13 / 66.36	THIN ROCK SLABS AND BROWN SILT (FILL)					
	0.25 / 66.28	CONCRETE					
	0.33	DARK BROWN CLAYEY SILT, SOME GRAVEL, THIN LIMESTONE SLABS AND ORGANIC MATTER (FILL)		1	AS		66.0
	65.49						65.5
	1.12	END OF HOLE REFUSAL TO AUGER POSSIBLY BEDROCK					65.0

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W W_L

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

AUGERHOLE D
ON COMPLETI
OF DRILLING

0 / 15 5 / 10 Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C.

CHECKED bcm

RECORD OF AUGERHOLE 2

LOCATION See Figure 2 | BORING DATE APRIL 21, 1983 | DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm | PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m
	66.35	GROUND SURFACE				
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	0.00 / 66.11	GREY CRUSHED STONE (FILL)				
	0.24 / 65.89	COMACT BROWN SILTY SAND AND GRAVEL (FILL)		1	AS	
	0.46 / 64.83	GREY BROWN SILTY CLAY, SOME SAND AND GRAVEL SOME BLACK ORGANIC MATTER (POSSIBLE FILL)		2	AS	
	1.52	END OF HOLE AUGER REFUSAL POSSIBLE BEDROCK				

ELEVATION SCALE: 66.5, 66, 65.5, 65, 64.5

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 | 1x10 | 1x10 | 1x10

WATER CONTENT, PERCENT — Wp, W, WL

ADDITIONAL LAB. TESTING: M

PIEZOMETER OR STANDPIPE INSTALLATION: AUGERHOLE D ON COMPLETI OF DRILLING

15 — 0 — 5 — 10 Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C.

CHECKED GKM

RECORD OF AUGERHOLE 3

LOCATION See Figure 2

BORING DATE APRIL 21, 1983

DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
POWER AUGER 200mm DIAM. (HOLLOW STEM)	66.12 / 0.00	GROUND SURFACE GREY CRUSHED STONE (FILL)					66
	0.05	DARK BROWN SANDY SILT, SOME GRAVEL, TRACE CLAY, PIECES WOOD, BRICK, SOME ORGANIC MATTER (FILL)		1	AS		65.5
	64.19 / 1.93	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK					65 64.5 64

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W WL

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

AUGERHOLE DRY ON COMPLETION O DRILLING

0 / 15 5 / 10 Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C.

CHECKED ERM

RECORD OF AUGERHOLE 4

LOCATION See Figure 2

BORING DATE APRIL 21, 1983

DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	SOIL PROFILE: ELEV'N./DEPTH	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	66.11	GROUND SURFACE				
	0.00 / 65.91	COMPACT BROWN SAND, SOME GRAVEL (FILL)				
	0.20 / 64.59	DARK BROWN SANDY SILT, SOME GRAVEL OCCASIONAL THIN SHALE SLABS, TRACE CLAY, SOME ORGANIC MATTER (POSSIBLE FILL)		1	AS	
	1.52	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK				

ELEVATION SCALE: 66, 65.5, 65, 64.5

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W W_L

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

AUGERHOLE DRY ON COMPLETION OF DRILLING

15 — 0 / 10 — 5 Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C.

CHECKED GBM

RECORD OF AUGERHOLE 5

LOCATION See Figure 2

BORING DATE APRIL 21, 1983

DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m
	65.88	GROUND SURFACE				
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	0.00 / 65.80	ASPHALT				
	0.08 / 65.65	BROWN SAND AND GRAVEL, TRACE SILT (FILL)		1	AS	
	0.23	BLACK AMORPHOUS TO FIBROUS PEAT, SOME GRAVEL AND THIN BLACK SHALE SLABS		2	AS	
	63.97					
	1.91	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK				

ELEVATION SCALE: 66, 65.5, 65, 64.5, 64, 63.5

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 | 1x10 | 1x10 | 1x10

WATER CONTENT, PERCENT — Wp, W, WL — 20 | 40 | 60 | 80

M

<167 ⊙

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

W.L. IN OPEN HOLE AT ELEV. 64.66 UPON COMPLETION OF DRILLING

0 / 15 5 / 10 Percent axial strain at failure

VERTICAL SCALE

RECORD OF BOREHOLE 6

LOCATION See Figure 2 | BORING DATE APRIL, 21, 1983 | DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm | PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
	66.07	GROUND SURFACE					66
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	0.00	ASPHALT					
	0.05 / 65.87	BROWN SILTY SAND (FILL)					
	0.20	ASPHALT					
	0.23 / 65.47	COMPACT BROWN SILTY SAND, SOME GRAVEL (FILL)		1	AS		65.5
	0.60 / 64.42	COMPACT SILTY SAND AND GRAVEL, SOME CLAY, PIECES OF BRICK (PROBABLY FILL)		2	50 0.3m 0.0	20	65
				3	=	50/0.1m	64.5
	1.65	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK					64

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

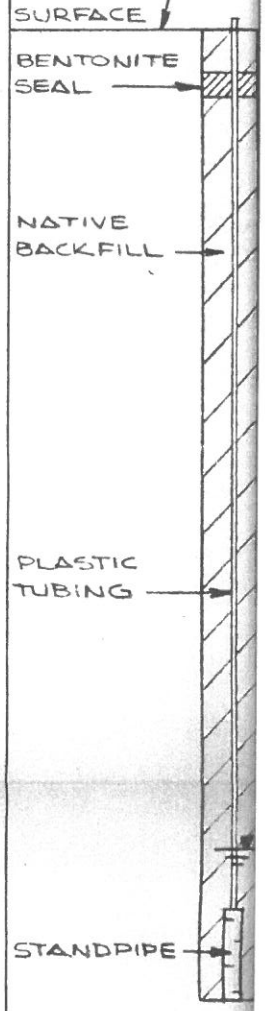
SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W WL

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



W.L. IN STANDPIPE AT ELEV. 64.67 MAY 6, 1983

15 ← 0 / 10 → 5 Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C.

CHECKED G.M.

RECORD OF BOREHOLE 7

LOCATION See Figure 2

BORING DATE APRIL 21, 1983

DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	SOIL PROFILE: ELEV'N./DEPTH	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (NAT. V.- + Q.-● REM. V.- ⊕ U.-O)	HYDRAULIC CONDUCTIVITY, k, cm/sec. (1x10 1x10 1x10 1x10) / WATER CONTENT, PERCENT (Wp W WL)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
	66.11	GROUND SURFACE									
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	0.00	ASPHALT									
	0.04 / 65.84	BROWN SAND AND GRAVEL (FILL)									
	0.27 / 65.04	DARK BROWN SILT AND GRAVEL (FILL)		1	SS	50/0.33 0.0 14					
	1.07 / 64.74	DARK BROWN SILTY TOPSOIL									
	1.37 / 64.26	COMPACT GREY BROWN SILTY SAND, SOME GRAVEL, TRACE CLAY, TRACE ORGANIC MATTER (GLACIAL TILL)		2	SS	50/0.1m					
	1.85	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK									

66 / 65.5 / 65 / 64.5 / 64

0 / 5 / 10 / 15 Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C

CHECKED GM

RECORD OF AUGERHOLE 8

LOCATION See Figure 2 | BORING DATE APRIL 22, 1983 | DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm | PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
	66.39	GROUND SURFACE					66.5
POWER AUGER 200mm DIAM. (HOLLOW STEM)	0.00	BROWN SANDY TOPSOIL					
	0.05 / 65.98	BROWN SILTY SAND (FILL)					66
	0.41 / 65.38	COMPACT BROWN TO GREY SANDY SILT AND GRAVEL, TRACE CLAY, SOME THIN LIMESTONE SLABS (POSSIBLE GLACIAL TILL)		1	50 D.0 / 50 ·1M		65.5
	1.01	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK					65

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM.V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W WL

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

AUGERHOLE DR
ON COMPLETIO
OF DRILLING

15 ✦ 0 5 10 Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C.

CHECKED GRM

RECORD OF BOREHOLE 9

LOCATION See Figure 2 | BORING DATE APRIL 22, 1983 | DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm | PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
	64.69	GROUND SURFACE					65
POWER AUGER 200mm DIAM. (HOLLOW STEM)	0.00	GREY BROWN SILTY CLAY, SOME SAND, TRACE GRAVEL, SOME ORGANIC MATTER (FILL)		1	AS		64.5
	63.79						64
	0.90	LOOSE GREY BROWN CLAYEY SILT, SOME BLACK ORGANIC MATTER, PIECES WOOD (ALLUVIUM)		2	50 mm D.O.	3/0.15m	
	63.39	POSSIBLY WEATHERED BEDROCK				50/.03m	63.5
	1.30	END OF HOLE AUGER REFUSAL POSSIBLE BEDROCK					63

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 | 1x10 | 1x10 | 1x10

WATER CONTENT, PERCENT — Wp | W | W_L

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUND SURFACE

SURFACE SEAL

NATIVE BACKFILL

PLASTIC TUBING

STANDPIPE

W.L. IN STANDPIPE AT ELEV. 64.02 MAY 6, 1983

15 ✦ 0 5 10 Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C.

CHECKED G.K.M.

RECORD OF BOREHOLE 10, 11

LOCATION See Figure 2

BORING DATE APRIL 22, 1983

DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (NAT. V.- + Q.-● REM. V.- ⊕ U.-O)	HYDRAULIC CONDUCTIVITY, k, cm/sec. (1x10 1x10 1x10 1x10) / WATER CONTENT, PERCENT (Wp W WL)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
								B.H. 10			
	62.94	GROUND SURFACE					63				
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	0.00	INTERLAYERED THIN LIMESTONE SLABS, SILT AND SAND. (PROBABLY HIGHLY WEATHERED BEDROCK)									AUGERHOLE DRY ON COMPLETION OF DRILLING
	62.64										
	0.30	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK					62.5				
								B.H. 11			
	62.50	GROUND SURFACE					62.5				
POWER AUGER 200 mm DIAM. (HOLLOW STEM)		INTERLAYERE THIN LIMESTONE, SILT AND SAND (PROBABLY HIGHLY WEATHERED BEDROCK)									
	62.02										
	0.48	SLIGHTLY WEATHERED, GREY FOSSILIFOROUS LIMESTONE, THIN SILT FILLED SEAM AT 0.94 M DEPTH BEDROCK			BXL	—	62				
	61.50										
ROTARY DRILLING BXL CORE	1.00	FAIRLY SOUND GREY FOSSILIFOROUS LIMESTONE WITH SOME DARK GREY WISPY SHALE BANDING BEDROCK			BXL	—	61.5	CORE RECOVERY (%) 92	R.Q.D. (%) 47		
	60.31						61				
	2.19	END OF HOLE					60.5				

15 ← 0 / 10 → 5 Percent axial strain at failure

VERTICAL SCALE
1:125

Golder Associates

DRAWN JC

CHECKED GRM

RECORD OF BOREHOLES 12 & 13

LOCATION See Figure 2 | BORING DATE | DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm | PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE
	62.84	GROUND SURFACE					63
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	0.00	GREY SILTY SAND AND GRAVEL (FILL)		1	AS		62.5
	62.15						
	0.69	END OF HOLE AUGER REFUSAL POSSIBLE BEDROCK					62
		AUGERHOLE 13					
	64.71 63.25	GROUND SURFACE					
	0.00	GREY CRUSHED STONE					
POWER AUGER 200 mm DIAM. (HOLLOW STEM)	0.02	COMPACT DARK BROWN CLAYEY SILT, SOME GRAVEL AND ORGANIC MATTER, PIECES WOOD (POSSIBLE FILL)		1	50 D.O.	16	63
							62.5
							62
	63.21 61.75						61.5
	1.50	END OF HOLE AUGER REFUSAL POSSIBLY BEDROCK					

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W W_L

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

UPON COMPLETION OF DRILLING, WATER IN OPEN HOLE AT ELEV. 61.95

15 — 0 — 5 — 10 Percent axial strain at failure

VERTICAL SCALE 1:25

Golder Associates

DRAWN ___JC___

CHECKED ___GRM___

G.A. -1 (m

...iect ...83 97

RECORD OF BOREHOLE 14

LOCATION See Figure 2

BORING DATE

DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (NAT. V.- + Q.-● REM. V.- ⊕ U.-○)	HYDRAULIC CONDUCTIVITY, k, cm/sec. (1x10 1x10 1x10 1x10); WATER CONTENT, PERCENT (Wp W WL)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
	63.25 ~~64.77~~	GROUND SURFACE									
POWER AUGER (200mm DIAM. HOLLOW STEM)	0.00	DARK BROWN, LOOSE GRAVEL, SOME SILT AND SAND, TRACE ORGANIC MATTER					64.5				
	62.74 ~~64.20~~										
	0.51 ~~64.08~~	SLIGHTY WEATHERED GREY LIMESTONE BEDROCK									
	0.63						64				
ROTARY DRILLING BXL CORE		FAIRLY SOUND GREY FOSSILIFOROUS LIMESTONE WITH FREQUENT DARK GREY WISPY SHALE BANDING (BEDROCK)		BXL RC			63.5	CORE RECOVERY (%) 98; R.Q.D. (%) 86			
				BXL RC			63	CORE RECOVERY (%) 100; R.Q.D. (%) 68			
							62.5				
	60.48 ~~61.94~~						62				
	2.77	END OF HOLE									

15 ✦ 5 (0 / 10) Percent axial strain at failure

VERTICAL SCALE 1:125

Golder Associates

DRAWN J.C.

CHECKED GM

RECORD OF BOREHOLES 84-1 & 84-2

LOCATION See Figure 2

BORING DATE AUG. 8, 1984

DATUM GEODETIC

SAMPLER HAMMER, 63.5 kg.; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg.; DROP, 760 mm

BORING METHOD	ELEV'N. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m
		BH. 84-1				
	74·00	GROUND SURFACE				
PORTABLE DRILL, 75 mm CASING	0·00 / 73·73	**TOPSOIL**		1	50 mm D.O.	4
	0·27 / 73·02	LOOSE BROWN **SILTY SAND**, OCCASIONAL BOULDER		2	"	33
	0·98 / 71·26	DENSE GREY BROWN **SANDY SILT**, TRACE CLAY AND SOME GRAVEL, OCCASIONAL BOULDER **(GLACIAL TILL)**		3	"	41
				4	"	8/6"
				5	"	47
	2·74	END OF HOLE				
		BH. 84-2				
	74·06	GROUND SURFACE				
PORTABLE DRILL, 75 mm CASING	0·00 / 73·82	**TOPSOIL**		1	50 mm D.O.	11
	0·24 / 73·30	COMPACT GREY BROWN **SILTY** FINE **SAND**, WITH SOME GRAVEL AND OCCASIONAL BOULDER		2	"	>100
	0·76 / 70·92	DENSE TO COMPACT, GREY BROWN TO GREY, **SANDY SILT** WITH TRACE TO SOME CLAY AND GRAVEL, OCCASIONAL BOULDER **(GLACIAL TILL)**		3	"	44
				4	"	31
				5	"	29
				6	"	>100
	3·14	END OF HOLE				

ELEVATION SCALE: 74, 73, 72, 71, 70, 75, 74, 73, 72, 71, 70

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa — NAT. V.- + Q.-● REM. V.- ⊕ U.-○

HYDRAULIC CONDUCTIVITY, k, cm/sec. — 1x10 1x10 1x10 1x10

WATER CONTENT, PERCENT — Wp W WL — 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

0 / 15 5 / 10 Percent axial strain at failure

VERTICAL SCALE 1:50

Golder Associates

DRAWN J.C

CHECKED [illegible]

PROJECT: 06-1120-362

RECORD OF BOREHOLE: 06-1

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: November 14, 2006

DATUM: Local

SAMPLER HAMMER, 21kg; DROP, 760mm

PENETRATION TEST HAMMER, 21kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Rotary Drill / NQ Core	FLOOR SLAB CONCRETE INSULATION		0.09	1	N RC	DD				
		CONCRETE		0.22							
		VOID		0.41							
1											
2	Rotary Drill / NW Casing	WATER		1.90							
		Loose to very loose dark brown silty sand with shells and organic matter (ALLUVIUM)		2.26	2	50 DO	6				
3					3	50 DO	1				
		Dark brown silty clay with sand and gravel, some organic matter (ALLUVIUM)		3.50	4	50 DO	32				
	Rotary Drill / NQ Core	Fresh grey LIMESTONE BEDROCK with shale interbeds increasing with depth		3.68	5	NQ RC	DD	T.C.R. (%): 94 / S.C.R. (%): 88 / R.Q.D. (%): 47			
4											
5					6	NQ RC	DD	T.C.R. (%): 96 / S.C.R. (%): 90 / R.Q.D. (%): 60			
		End of Borehole Note: 'N' values corrected for 1/3 sampler weight hammer		5.50							
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: J.A.S.

CHECKED: G.S.W.

BOREHOLE 06-1120-362.GPJ HYDROGEO.GDT 1/4/07

RECORD OF AUGER PROBE AP - 1

SHEET 1 of 2

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 150mm Diam (Solid Stem)	Ground Surface									
		ASPHALT		0.00							
		Brown sand and gravel (FILL)		0.09							
		Brown fine to coarse sand, trace gravel (FILL)		0.31							
1											
				1.22							
2											
3											
4											
5		Proabably grey brown to grey silty sand, some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)									
6											
7											
8											
9											
10		Hole Continued		10.00							

0 / 16 / 10 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CLM

RECORD OF AUGER PROBE AP-1

SHEET 2 of 2

LOCATION See Figure 2 | BORING DATE Feb.5,1988 | DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm | PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- ○)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Power Auger Diam (Solid Stem) 150mm	Hole Continued									
		Proabably grey brown to grey silty sand, some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)		10.00							
		End of Hole		10.52							
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

15 (0 / 10) 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

RECORD OF AUGER PROBE AP - 2

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 150mm Diam (Solid Stem)	Ground Surface									
		ASPHALT									
		Grey silty sand, some gravel (FILL)		0.06							
		Brown silty sand (FILL)		0.49							
1		Probably grey brown to grey silty sand, some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)		0.82							
2											
3											
4											
5											
6											
		End of Hole		6.10							
7											
8											
9											
10											

0 / 15 / 10 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

RECORD OF AUGER PROBE AP-3

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (M)
0		Ground Surface		
		ASPHALT		0.00
		Brown silty sand, some gravel (FILL)		0.23
1				0.98
2	Power Auger 150mm Diam (Solid Stem)	Probably grey brown to grey silty clay becoming silty sand, some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)		
3				
4				
5				
6				
7				
8				
9		End of Hole		9.14
10				

SAMPLES: NUMBER | TYPE | BLOWS/0.3M

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa nat.V.- + Q.- ● rem.V.- ⊕ U.- O

HYDRAULIC CONDUCTIVITY, k, CM/SEC

WATER CONTENT, PERCENT Wp W Wl

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

0 / 15 / 10 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

RECORD OF AUGER PROBE AP-4

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, CM/SEC	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface						SHEAR STRENGTH Cu, kPa; nat.V.- + Q.- ●; rem.V.- ⊕ U.- O	WATER CONTENT, PERCENT Wp W Wl		
		ASPHALT		0.00							
		Dark grey silty sand, some gravel (FILL)		0.09							
				0.21							
1		Brown silty sand, trace gravel (Probably Fill)									
				1.28							
2	Power Auger 150mm Diam (Solid Stem)										
3		Probably grey brown to grey SILTY CLAY									
4											
5											
6											
		End of Hole		6.10							
7											
8											
9											
10											

0 / 16 / 10 5 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRMM

RECORD OF AUGER PROBE AP-5

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (M)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, CM/SEC	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface									
		ASPHALT		0.00							
		Grey silty sand and gravel (FILL)		0.09							
				0.37							
1		Very stiff grey brown SILTY CLAY, trace sand and gravel (Weathered Crust)			1	50 DO	16				
2					2	50 DO	10				
				2.16							
3					3	50 DO	25				
4	Power Auger										
5		Grey brown to grey silty sand some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)									
6											
7											
8											
		End of Hole		8.63							
9											
10											

SHEAR STRENGTH Cu, kPa — nat.V.- + Q.- ● rem.V.- ⊕ U.- O

WATER CONTENT, PERCENT — Wp, W, Wl — 20 40 60 80

15 — 5 PERCENT AXIAL STRAIN AT FAILURE — 0 10

DEPTH SCALE

1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

RECORD OF AUGER PROBE AP-6

SHEET 1 of 1

LOCATION See Figure 2

BORING DATE Feb.5,1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

PROJECT 881-2044

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (M)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC	WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface											
		Medium brown silty sand, trace organic matter (FILL)		0.00									
				0.24									
1		Medium brown silty sand, trace gravel (FILL)											
				1.25									
2													
3													
4	Power Auger 150mm Diam (Hollow Stem)	Probably grey brown to grey silty sand, some gravel, trace clay, occasional cobble and boulder (GLACIAL TILL)											
5													
6													
7													
8													
9													
		End of Hole		9.14									
10													

0 / 15 / 10 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

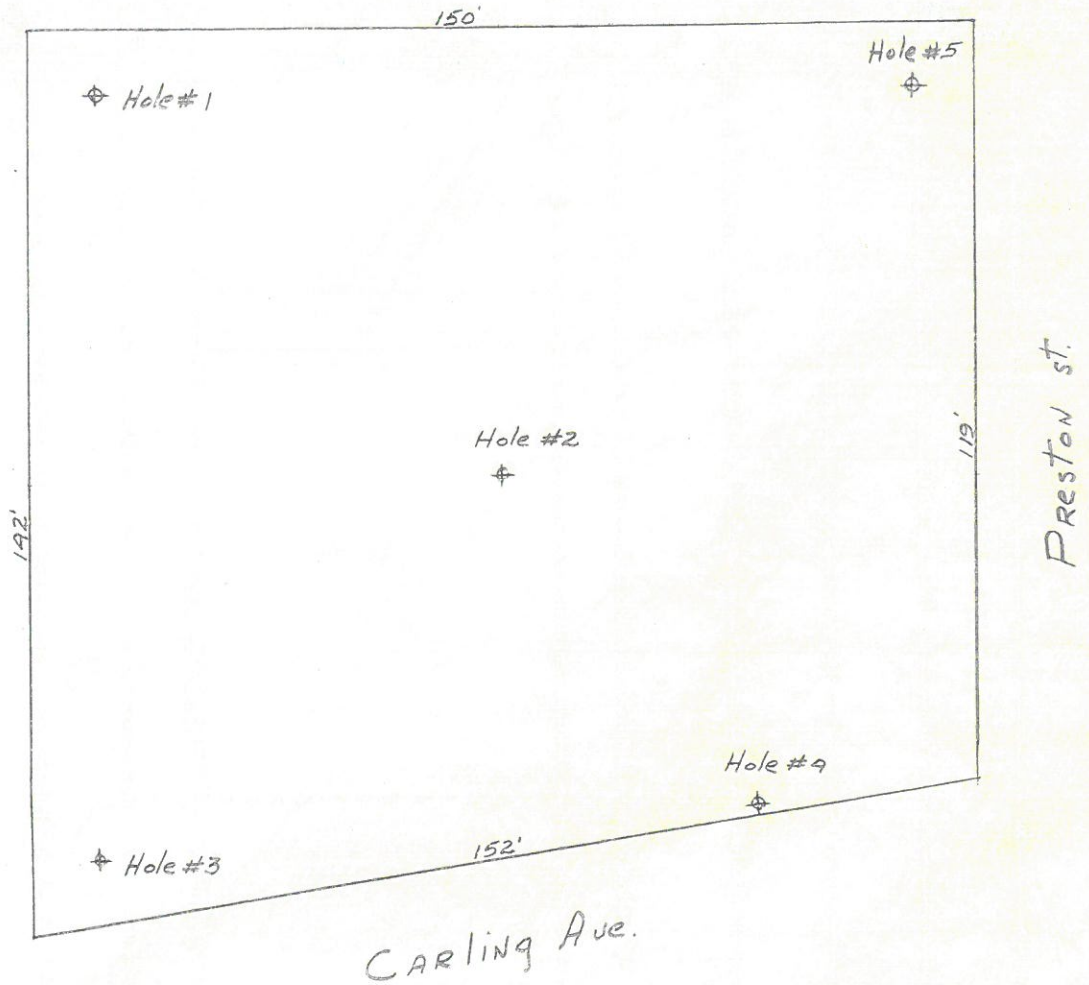
1 : 50

Golder Associates

LOGGED S.Leighton

CHECKED CRM

4



McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

BOREHOLE LOCATIONS

PRESTON & CARLING

SCALE 1" = 30' | PLATE 1

FORM S-10-2

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF LABORATORY TESTS

Preston & Carling

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 202.7'

REMARKS B.M. #19 Norfolk & Carling (el. 202.66') Geodetic Datum

DATE June 26/58

HOLE NO. 1

Unconfined Compressive Strength Kips/Ft.²	Small Scale Penetrometer Kips/Ft.²	Standard Penetration Blows/Ft.	Sample Number	Description of Soil	Depth in Feet	Elevation	Penetration Test: ....LB. HAMMER / ....INCH DROP; NO CASING ....INCH DIA. ROD; BLOWS PER FOOT
				GROUND SURFACE	0'	202.7'	
		33	1-1	Fill			
					4.7'	198.0'	
				Shaley Limestone CORE RECOVERY - 87%			
				Bottom of Hole	7.2'	195.5'	

% WATER CONTENT

PLATE 2

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF LABORATORY TESTS

Preston & Carling

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 203.1'

REMARKS See: plate #2

DATE June 26/58

HOLE NO. 2

Unconfined Compressive Strength Kips/Ft.²	Small Scale Penetrometer Kips/Ft.²	Standard Penetration Blows/Ft.	Sample Number	Description of Soil	Depth in Feet	Elevation	Penetration Test (.....LB. HAMMER, ...INCH DROP, NO CASING, ...INCH DIA. ROD, BLOWS PER FOOT)
				GROUND SURFACE			
				Fill	0'	203.1'	
					1.5'	201.6'	
				Shaley Limestone CORE RECOVERY - 100%			
					6.7'	196.4'	
				Shaley Limestone CORE RECOVERY - 100%			
					12.0'	191.1'	
				Bottom of Hole			

% WATER CONTENT

PLATE 3

L.-M. CO.—A26553

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF LABORATORY TESTS

Preston & Carling

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 205.5'

REMARKS See: plate #2

HOLE NO. 3

DATE June 26/58

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION	PENETRATION TEST: ..... LB. HAMMER, ... INCH DROP, NO CASING, ... INCH DIA. ROD, BLOWS PER FOOT
				GROUND SURFACE	0'	205.5'	
				Fill			
					1'	204.5'	
				Dense Till			
		23 for 6" 63	3-1				
					4'	201.5'	
				Shaley Limestone			
				CORE RECOVERY - 87%			
					6.5'	199.0'	
				Bottom of Hole			

% WATER CONTENT

PLATE 4

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF LABORATORY TESTS

Preston & Carling

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 205.5'

REMARKS See: plate #2

DATE June 28/58

HOLE No. 4

Unconfined Compressive Strength Kips/Ft.²	Small Scale Penetrometer Kips/Ft.²	Standard Penetration Blows/Ft.	Sample Number	Description of Soil	Depth in Feet	Elevation
				GROUND SURFACE	0'	205.5'
				Fill		
		49	A-1			
		8 for 6"			3.5'	202.0'
				Medium Dense Till		
					4.2'	201.3'
				Shaley Limestone		
				CORE RECOVERY - 92%		
					6.3'	199.2'
				Bottom of Hole		

PENETRATION TEST

.....LB. HAMMER
.....INCH DROP
NO CASING
.....INCH DIA. ROD
BLOWS PER FOOT

% WATER CONTENT

PLATE 5

L.-M. CO.—A26553

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF LABORATORY TESTS

Preston & Carling

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 203.5'

REMARKS See: plate #2

HOLE NO. 5

DATE June 28/58

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION	PENETRATION TEST (.....LB. HAMMER, ...INCH DROP, NO CASING, ...INCH DIA. ROD, BLOWS PER FOOT)
				GROUND SURFACE	0'	203.5'	
				Fill			
		9	5-1				
		4 for 6"			3.5	200.0'	
				Loose Till			
					4.5'	199.0'	
				Shaley Limestone			
				Core Recovery - 89%			
					6.7'	196.8'	
				Bottom of Hole			

% WATER CONTENT

PLATE 6

L.-M. CO.—A26553

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-1
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.41	DEPTH in metres	DESCRIPTION	REMARKS
		FILL crushed limestone gran. "A"	sides stable
66.11	0.30	FILL sand and gravel (pit run 4" minus)	
65.61	0.80	FILL topsoil and till with some clay, brick and traces of wood, metal and a few boulders up to 0.30m Ø and a few pieces of broken rock	
65.41	-- 1 --		
64.86	1.55	Bottom of pit Refusal on possible rock or boulders	no water seepage

Plate No.
2.

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-2
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.46	DEPTH in metres	DESCRIPTION	REMARKS
		FILL - crushed limestone	sides stable
66.26	0.20	FILL sand and gravel with some topsoil, broken rock and boulders up to 0.5m ø and traces of wood and brick	
65.46	-- 1 --		
65.16	1.3	Bottom of pit Refusal on possible rock or boulders	no water seepage

Plate No.
3

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-3
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.58	DEPTH in metres	DESCRIPTION	REMARKS
		FILL crushed limestone	sides stable
66.33	0.25		
		FILL sand and gravel (pit run)	
65.98	0.60		
		FILL	
65.58	-- 1 --	sand, gravel, broken rock with some clay and topsoil, and traces of brick and wood	
64.78	1.8		no water seepage
		Bottom of pit Refusal on possible rock or boulders	

Plate No.
4.

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-4
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.32	DEPTH in metres	DESCRIPTION	REMARKS
		FILL - sand and gravel	sides stable
66.17	0.15	FILL sand and gravel with some topsoil, boulders, broken rock and traces of brick, porcelain and paper	
65.32	-- 1 --		
64.82	1.5	Bottom of pit Refusal on possible rock or boulders	no water seepage

Plate No.
5.

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-5
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.47	DEPTH in metres	DESCRIPTION	REMARKS
		FILL - crushed limestone	sides stable
66.32	0.15		
		FILL sand and gravel (pit run)	
66.02	0.45		
		FILL topsoil, sand and gravel with pieces of broken rock up to 1mx0.8mx0.3m and some brick, wood, metal and organic material	
65.47	-- 1 --		
64.47	-- 2 --		
64.02	2.45	Bottom of pit Refusal on possible rock or boulders	no water seepage

Plate No.
6.

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-6
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 65.89	DEPTH in metres	DESCRIPTION	REMARKS
		ASPHALT	sides stable
65.86	0.03	FILL - sand and gravel (pit run)	
65.49	0.40	FILL sand, gravel, topsoil with some organic material, brick, ashes, tree roots, with traces of metal and wire and pieces of broken rock (0.5mx0.5mx0.8m)	
64.89	-- 1 --		
64.09	1.8	Bottom of pit Refusal on possible rock or boulders	slight water seepage at bottom of pit

Plate No.
7.

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-7
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.14	DEPTH in metres	DESCRIPTION	REMARKS
		ASPHALT	sides stable
66.11	0.03	FILL - sand and gravel (pit run)	
65.89	0.25	FILL sand, gravel, topsoil with some organic material, wood, broken rock and traces of metal and brick	
65.14	-- 1 --		
64.54	1.6	Bottom of pit Refusal on possible rock or boulders	slight water seepage at bottom of pit

Plate No.
8.

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-8
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.01	DEPTH in metres	DESCRIPTION	REMARKS
		ASPHALT	sides stable
65.96	0.05	FILL - sand and gravel (2" minus pit run)	
65.51	0.50	FILL sand and gravel with some organic material traces of wood, brick and metal	no water seepage
65.11	0.90	Bottom of pit Refusal on possible rock or boulders	

Plate No.
9

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-9
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 65.55	DEPTH in metres	DESCRIPTION	REMARKS
65.40	0.15	FILL - sand and gravel	sides stable
		FILL clay and till	
64.55	-- 1 --	FILL clay, organic material, brick, ashes, metal and wood decayed trees near bottom of pit	water seepage at elev 63.91m
63.55	-- 2 --		
63.10	2.45	Bottom of pit Refusal on possible rock or boulders	

Plate No.
10.

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-10
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.14	DEPTH in metres	DESCRIPTION	REMARKS
66.09	0.05	ASPHALT	sides stable
65.94	0.20	FILL - sand and gravel	
		FILL topsoil, sand and gravel with traces of wood, metal, brick and wire	
65.19	0.95	Bottom of pit Refusal on possible rock or boulders	no water seepage

Plate No. 11

McROSTIE GENEST ST-LOUIS & Associates Ltd. Consulting Engineers OTTAWA, CANADA	TEST PIT RECORD	Test Pit No. 96-11
	Date :	MAY 31, 1996

DOW'S LAKE
D.N.D.

ELEV. 66.35	DEPTH in metres	DESCRIPTION	REMARKS
		ASPHALT	sides stable
66.30	0.05	FILL - sand and gravel (2" minus pit run)	
66.10	0.25	Bottom of pit Refusal on possible rock or boulders	no water seepage

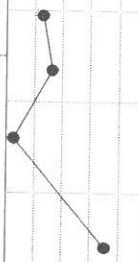
Plate No.
12.

CARLING AVE. NEW – SIR JOHN CARLING BLDG	BM(ELEV 67.61m)geodetic: Top of S.M.H.	BOREHOLE NO: 00–104
	38m+/– S.W. of B.H. 00–104 as per survey	PROJECT NO: E–7913
START DATE: 00/10/25	plan by Webster & Simmonds Surveying Ltd	ELEVATION: 67.51 m

SAMPLE TYPE ■ REMOULDED–AUGER ▨ SHELBY TUBE ⊠ SPLIT–SPOON ▤ NW–CASING ▯ NO RECOVERY ▮ NQ CORE

DEPTH(m)	COMMENTS..SPT (N)	SAMPLE TYPE	SAMPLE NO	% CORE RECOVERY	RQD %	SOIL / ROCK DESCRIPTION	ELEVATION(m)
0.0	6 11	▨	1			FILL – topsoil	67.0
		▨	1A			66.76	
1.0	60/15cm 75 24/15cm	▨	2			FILL clay with some sand, gravel, topsoil, pieces of concrete and asphalt	
	19 4/15cm 12/15cm	▨	3				66.0
2.0	WL Power auger refusal					Water level Oct.27/00 elev 65.38m	
						65.29	65.0
3.0				99	84	LIMESTONE	
4.0						63.76	64.0
				99	84	LIMESTONE	63.0
5.0							
						Bottom of hole 62.24	62.0
6.0							
							61.0
7.0							
							60.0
8.0							

VANE Cu (kPa) ■ 80 160 240 320
▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320
PLASTIC M.C. LIQUID
20 40 60 80



McROSTIE GENEST ST–LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 5.27 m
	REVIEWED BY: **E.S.**	COMPLETE: 00/10/25
	Fig. No: 2	Page 1 of 1

00/11/14 11:15AM (NQ–RQD)

CARLING AVE. NEW – SIR JOHN CARLING BLDG	BM(ELEV 67.61m)geodetic: Top of S.M.H.	BOREHOLE NO: 00–105
	38m+/– S.W. of B.H. 00–104 as per survey	PROJECT NO: E–7913
START DATE: 00/10/24	plan by Webster & Simmonds Surveying Ltd	ELEVATION: 66.13 m

SAMPLE TYPE ■ REMOULDED–AUGER ⧸ SHELBY TUBE ⊠ SPLIT–SPOON ▤ NW–CASING ▥ NO RECOVERY ▮ NQ CORE

DEPTH(m)	COMMENTS..SPT (N)	SAMPLE TYPE	SAMPLE NO	% CORE RECOVERY	RQD %	SOIL / ROCK DESCRIPTION	ELEVATION(m)
0.0						FILL – topsoil	66.0
	6 4/15cm 23/15cm		1			65.83	
1.0	30 25		2			FILL clay with some sand, gravel, topsoil, pieces of concrete and wood	65.0
	29		3				
	split barrel refusal All water lost					64.33	
2.0							64.0
				99	67	LIMESTONE	
	WL					Water level Oct.27/00 elev 63.24m	
3.0							63.0
						62.81	
4.0				100	95	LIMESTONE	62.0
5.0						Bottom of hole 61.27	61.0
6.0							60.0
7.0							59.0
8.0							

VANE Cu (kPa) ■ 80 160 240 320
▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320
PLASTIC M.C. LIQUID
20 40 60 80

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 4.86 m
REVIEWED BY: E.S.	COMPLETE: 00/10/24
Fig. No: 3	Page 1 of 1

00/11/14 12:07PM (NQ–RQD)

CARLING AVE. NEW – SIR JOHN CARLING BLDG	BM(ELEV 67.61m)geodetic: Top of S.M.H.	BOREHOLE NO: 00–106
	38m+/– S.W. of B.H. 00–104 as per survey	PROJECT NO: E–7913
START DATE: 00/10/25	plan by Webster & Simmonds Surveying Ltd	ELEVATION: 66.38 m

SAMPLE TYPE ■ REMOULDED–AUGER ⊘ SHELBY TUBE ⊠ SPLIT–SPOON ▤ NW–CASING ▯ NO RECOVERY ▮ NQ CORE

DEPTH(m)	COMMENTS..SPT (N)	SAMPLE TYPE	SAMPLE NO	% CORE RECOVERY	RQD %	SOIL / ROCK DESCRIPTION	ELEVATION(m)
0.0						FILL – topsoil	
	8 21	⊠	1			66.08	66.0
1.0	Power auger refusal						
						FILL clay with some sand, pieces of concrete, wood and broken rock	65.0
	10/15cm 16 2/15cm	⊠	3				
2.0							
	5 3	⊠	4				64.0
	WL					Water level Oct.27/00 elev 63.80m	
3.0	1/15cm 75/15cm	⊠	5				
	split barrel refusal all water lost					63.08	63.0
4.0				100	50	LIMESTONE	62.0
						61.68	
5.0							
				94	75	LIMESTONE	61.0
6.0							
						Bottom of hole 60.16	60.0
7.0							59.0
8.0							

VANE Cu (kPa) ■ 80 160 240 320
▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320
PLASTIC M.C. LIQUID
20 40 60 80

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 6.22 m
REVIEWED BY: E.S.	COMPLETE: 00/10/25
Fig. No: 4	Page 1 of 1

00/11/14 12:08PM (NQ–RQD)

CARLING AVE. NEW – SIR JOHN CARLING BLDG	BM(ELEV 67.61m)geodetic: Top of S.M.H.	BOREHOLE NO: 00–107
	38m+/– S.W. of B.H. 00–104 as per survey	PROJECT NO: E–7913
START DATE: 00/10/24	plan by Webster & Simmonds Surveying Ltd	ELEVATION: 66.57 m

SAMPLE TYPE ■ REMOULDED–AUGER ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ NW–CASING ▥ NO RECOVERY ◧ NQ CORE

DEPTH(m)	COMMENTS..SPT (N)	SAMPLE TYPE	SAMPLE NO	% CORE RECOVERY	RQD %	SOIL / ROCK DESCRIPTION	ELEVATION(m)
0.0						FILL – topsoil	
	8 18	⊠	1			66.27	66.0
		⊠	1A				
1.0	22 28	⊠	2			FILL clay with some topsoil, sand, gravel, and pieces of asphalt	
	8 5	⊠	3				65.0
2.0							
	5 10/10cm	⊠	4			medium dense sandy TILL 64.32	64.0
	split barrel refusal power auger refusal all water lost					63.82	
3.0				100	46	LIMESTONE	63.0
4.0	WL					Water level Oct.27/00 elev 62.51m	
						62.37	62.0
5.0				96	74	LIMESTONE	
						Bottom of hole 60.85	61.0
6.0							60.0
7.0							59.0
8.0							

VANE Cu (kPa) ■ 80 160 240 320
▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320
PLASTIC M.C. LIQUID
20 40 60 80

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 5.72 m
REVIEWED BY: E.S.	COMPLETE: 00/10/24
Fig. No: 5	Page 1 of 1

00/11/14 11:16AM (NQ–RQD)

CARLING AVE. NEW – SIR JOHN CARLING BLDG	BM(ELEV 67.61m)geodetic: Top of S.M.H.	BOREHOLE NO: 00–108
	38m+/– S.W. of B.H. 00–104 as per survey	PROJECT NO: E–7913
START DATE: 00/10/24	plan by Webster & Simmonds Surveying Ltd	ELEVATION: 66.75 m

SAMPLE TYPE ■ REMOULDED–AUGER ⧸ SHELBY TUBE ☒ SPLIT–SPOON ▤ NW–CASING ▥ NO RECOVERY ▮ NQ CORE

DEPTH(m)	COMMENTS..SPT (N)	SAMPLE TYPE	SAMPLE NO	% CORE RECOVERY	RQD %	SOIL / ROCK DESCRIPTION	ELEVATION(m)
0.0						FILL – topsoil	
	8 8	☒	1			66.45	
1.0	6 5/15cm 17/15cm	☒	2 2A			FILL clay with some sand, gravel, brick, cinders, and pieces of concrete and broken rock	66.0
	33 38	☒	3				
2.0	power auger refusal					64.61	65.0
						LIMESTONE	
3.0	WL			95	51	Water level Oct.27/00 elev 63.70m	64.0
						63.09	63.0
4.0				100	55	LIMESTONE	
5.0							62.0
						Bottom of hole 61.57	
6.0							61.0
							60.0
7.0							
8.0							59.0

VANE Cu (kPa) ■ 80 160 240 320
▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320
PLASTIC M.C. LIQUID
20 40 60 80

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 5.18 m
REVIEWED BY: E.S.	COMPLETE: 00/10/24
Fig. No: 6	Page 1 of 1

00/11/13 08:47PM (NQ–RQD)

CARLING AVE. NEW – SIR JOHN CARLING BLDG	BM(ELEV 67.61m)geodetic: Top of S.M.H.	BOREHOLE NO: 00–109
	38m+/– S.W. of B.H. 00–104 as per survey	PROJECT NO: E–7913
START DATE: 00/10/24	plan by Webster & Simmonds Surveying Ltd	ELEVATION: 66.85 m

SAMPLE TYPE: REMOULDED–AUGER, SHELBY TUBE, SPLIT–SPOON, NW–CASING, NO RECOVERY, NQ CORE

DEPTH(m)	COMMENTS..SPT (N)	SAMPLE TYPE	SAMPLE NO	% CORE RECOVERY	RQD %	SOIL / ROCK DESCRIPTION	ELEVATION(m)
0.0						FILL – topsoil	
	6 7		1			66.55	
1.0	8 4/15cm 23/15cm		2			FILL clay with some cinders, sand, gravel, and organic material	66.0
	24 17		3				65.0
2.0							
	5 12		4				
3.0							64.0
	4 4		5			63.85	
	WL					Water level Oct.27/00 elev 63.27m	63.0
4.0	10 24		6			medium dense sandy TILL	
	15/20cm split barrel refusal		7				
5.0						62.15	62.0
				100	51	LIMESTONE	
6.0							61.0
						60.63	
7.0				98	57	LIMESTONE	60.0
8.0						Bottom of hole 59.11	59.0

VANE Cu (kPa) 80 160 240 320
VANE Cu REMOULDED (kPa) 80 160 240 320
PLASTIC M.C. LIQUID
20 40 60 80

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LOGGED BY: JML	COMPLETION DEPTH: 7.74 m
REVIEWED BY:	COMPLETE: 00/10/24
Fig. No: 7	Page 1 of 1

00/11/14 12:08PM (NQ–RQD)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–1
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT-2	ELEVATION: 64.84 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	VANE Cu (kPa) / VANE Cu REMOULDED (kPa) / PLASTIC M.C. LIQUID	ELEVATION(m)
0.0	33 14	⊠	1	ASPHALT FILL 64.80 sand and gravel	■ 80 160 240 320 ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	
				FILL 64.54 clay with some topsoil		
	7 11	⊠	2	FILL 64.24 silt with some traces of topsoil and clay		64.0
1.0						
				Bottom of hole 63.64		63.0
2.0						
						62.0
3.0						
						61.0
4.0						

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LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 2	Page 1 of 1

02/01/24 08:50AM (STD-SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–2
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 65.05 m

SAMPLE TYPE ■ REMOULDED ▨ SHELBY TUBE ▩ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0	22 28			FILL – stone dust	65.0
				FILL 65.00	
			1	sand and gravel	
				64.75	
	14 15		2	FILL clay with some topsoil	
1.0					64.0
				Bottom of hole 63.85	
2.0					63.0
3.0					62.0
4.0					

■ VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID

20 40 60 80

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Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 3	Page 1 of 1

02/01/24 08:50AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–3
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 65.08 m

SAMPLE TYPE: REMOULDED | SHELBY TUBE | SPLIT–SPOON | PROBING | NO RECOVERY | CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	VANE Cu (kPa) 80 160 240 320 / VANE Cu REMOULDED (kPa) 80 160 240 320 / PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	8 15			FILL – stone dust		65.0
			1	FILL 65.03 sand and gravel		
				FILL 64.78 clay with some topsoil		
	13 12		2	64.48 sandy brownish gray CLAY		64.0
1.0						
2.0						63.0
3.0						62.0
4.0				Bottom of hole 63.88		

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Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 4	Page 1 of 1

02/01/24 08:51AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–4
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 64.71 m

SAMPLE TYPE ■ REMOULDED ⧸ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▯▯ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	40 8	⊠	1	FILL – stone dust FILL 64.66 sand and gravel		
	10 10	⊠	2	64.11 sandy brownish gray CLAY		64.0
1.0						
				Bottom of hole 63.51		63.0
2.0						62.0
3.0						61.0
4.0						

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LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 5	Page 1 of 1

02/01/24 08:51AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–5
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 64.66 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	23 9			FILL – stone dust		
			1	FILL 64.61 sand and gravel with some pieces of crushed limestone		
	12 13		2	64.06 sandy brownish gray CLAY		64.0
1.0						
				Bottom of hole 63.46		63.0
2.0						
						62.0
3.0						
						61.0
4.0						

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 6	Page 1 of 1

02/01/24 08:51AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–6
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 64.83 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0	8 6			FILL – stone dust	
				FILL 64.78	
			1	sand and gravel	
				64.53	
				FILL clay with some topsoil and traces of gravel	
	6 6		2		64.0
1.0					
				Bottom of hole 63.63	63.0
2.0					
					62.0
3.0					
					61.0
4.0					

■ VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST–LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
	REVIEWED BY: E.S	COMPLETE: 01/12/21
	Fig. No: 7	Page 1 of 1

02/01/24 08:51AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–7
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 66.29 m

SAMPLE TYPE ■ REMOULDED ⧸ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▯▯ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0	95 21			Fill – stone dust	
				FILL 66.24	
			1	sand and gravel	66.0
				FILL 65.99	
				sand with some pieces of broken rock and traces of topsoil	
	10 7			medium dense 65.69	
1.0			2	fine SAND with some medium sand	
				Bottom of hole 65.09	65.0
2.0					64.0
3.0					63.0
4.0					

■ VANE Cu (kPa) ■ 80 160 240 320
▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320
PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST–LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
	REVIEWED BY: E.S.	COMPLETE: 01/12/21
	Fig. No: 8	Page 1 of 1

02/01/24 08:51AM (STD–SHAL)

DOWS LAKE - N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01-8
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT-2	ELEVATION: 65.18 m

SAMPLE TYPE ■ REMOULDED ⁄ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0	23 17			FILL - stone dust	
			1	FILL 65.13 sand and gravel	65.0
				64.88 FILL sand and gravel with traces of clay and brick	
	21 25		2		
1.0					64.0
				Bottom of hole 63.98	
2.0					63.0
3.0					62.0
4.0					

■ VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST-LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 9	Page 1 of 1

02/01/24 08:51AM (STD-SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–9
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 64.96 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	11 24			FILL – stone dust		
				FILL 64.91		
			1	sand and gravel		
				FILL 64.66		
	split barrel refusal			sand & gravel with some clay, topsoil and pieces of broken rock		
				Bottom of hole 64.36		
1.0						64.0
2.0						63.0
3.0						62.0
4.0						61.0

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Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 0.6 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 10	Page 1 of 1

02/01/24 08:52AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01-9A
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT-2	ELEVATION: 64.87 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ◧ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	39 20			TOPSOIL		
				64.72		
			1	FILL sand and gravel with some topsoil		
				FILL 64.27		
	20 30		2	clay with some sand, gravel, and topsoil		64.0
1.0						
				Bottom of hole 63.67		63.0
2.0						
						62.0
3.0						
						61.0
4.0						

McROSTIE GENEST ST-LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 11	Page 1 of 1

02/02/06 03:31PM (STD-SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–10
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 65.04 m

SAMPLE TYPE ■ REMOULDED ▨ SHELBY TUBE ▩ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0	24 24	▨		FILL – stone dust	65.0
				FILL – sand and gravel 64.99	
			1	FILL 64.74 sand with some gravel and pieces of crushed limestone	
	12 13	▨		FILL 64.44 clay with some sand and gravel	
1.0			2		64.0
				Bottom of hole 63.84	
2.0					63.0
3.0					62.0
4.0					

VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 12	Page 1 of 1

02/01/24 08:52AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–11
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 65.4 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ◧ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0	28 27			FILL – stone dust	
				FILL 65.35	
			1	sand and gravel	
				FILL 65.10	65.0
				sand and gravel with traces of clay	
	14 9/15cm 14/9cm		2	FILL 64.80 clay with some topsoil, sand, and gravel	
1.0	split barrel refusal			Bottom of hole 64.26	64.0
2.0					63.0
3.0					62.0
4.0					

■ VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.14 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 13	Page 1 of 1

02/02/06 03:32PM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–12
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 64.68 m

SAMPLE TYPE ■ REMOULDED ⁄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0	13 20			FILL – stone dust	
				FILL 64.63	
			1	sand and gravel	
				FILL 64.38	
				sand with some pieces of crushed stone traces of topsoil	
	22 15			FILL 64.08	64.0
			2	pieces of limestone with traces of sand	
1.0					
				Bottom of hole 63.48	63.0
2.0					62.0
3.0					61.0
4.0					

■ VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST–LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
	REVIEWED BY: E.S.	COMPLETE: 01/12/21
	Fig. No: 14	Page 1 of 1

02/01/24 08:52AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–13
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT-2	ELEVATION: 64.5 m

SAMPLE TYPE ■ REMOULDED ⊘ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	12 7			FILL – stone dust		
				FILL 64.45		
			1	sand and gravel	●	
				FILL 64.20		
	8/9cm		2	sand and gravel with traces of topsoil and clay		64.0
	split barrel refusal			Bottom of hole 63.81		
1.0						63.0
2.0						62.0
3.0						61.0
4.0						

McROSTIE GENEST ST-LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 0.69 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 15	Page 1 of 1

02/01/24 08:52AM (STD-SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–14
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 66.32 m

SAMPLE TYPE ■ REMOULDED ⊘ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▯▯ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	20 17			FILL – stone dust		
			1	FILL 66.27 sand and gravel		
				FILL 66.02 sand with some clay, topsoil and traces of brick		66.0
	10/10cm split barrel refusal		2			
1.0				Bottom of hole 65.62		65.0
2.0						64.0
3.0						63.0
4.0						

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 0.7 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 16	Page 1 of 1

02/01/24 08:53AM (STD-SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–15
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 65.98 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0	5/15cm 14/15cm split barrel refusal	⊠	1	FILL – stone dust FILL 65.94 sand and gravel with some clay, topsoil and pieces of broken rock Bottom of hole 65.68	
1.0					65.0
2.0					64.0
3.0					63.0
4.0					62.0

■ VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST–LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 0.3 m
	REVIEWED BY: B.S.	COMPLETE: 01/12/21
	Fig. No: 17	Page 1 of 1

02/01/24 08:53AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–16
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 64.61 m

SAMPLE TYPE ■ REMOULDED ⧸ SHELBY TUBE ☒ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	9 7		1	FILL – sand and gravel		
				64.31		
	9 8		2	FILL sand and gravel with some clay, topsoil and pieces of broken rock		64.0
1.0						
				Bottom of hole 63.41		63.0
2.0						62.0
3.0						61.0
4.0						

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 18	Page 1 of 1

02/01/24 08:53AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–17
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E-8193
START DATE: 01/12/21	Monument No. DOT-2	ELEVATION: 64.52 m

SAMPLE TYPE ■ REMOULDED ⊘ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	9 13	⊠	1	FILL – sand and gravel		
				64.22 FILL sand and gravel with some topsoil and traces of clay		64.0
	4 5	⊠	2			
1.0						
				Bottom of hole 63.32		63.0
2.0						
						62.0
3.0						
						61.0
4.0						

McROSTIE GENEST ST-LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 19	Page 1 of 1

02/01/24 08:53AM (STD-SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–18
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 64.83 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	7/15cm 8/8cm split barrel refusal	⧄⊠	1	FILL sand and gravel with traces of clay	●	64.83
				Bottom of hole 64.60		64.0
1.0						63.0
2.0						62.0
3.0						61.0
4.0						

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 0.23 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 20	Page 1 of 1

02/01/24 08:53AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–19
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 66.03 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	5 6	⧄	1	FILL – sand and gravel		66.0
				65.73		
	6 14	⧄	2	FILL sand and gravel with some clay and topsoil		
1.0						65.0
				Bottom of hole 64.83		
2.0						64.0
3.0						63.0
4.0						

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.2 m
REVIEWED BY: **E.S.**	COMPLETE: 01/12/21
Fig. No: 21	Page 1 of 1

02/01/24 08:53AM (STD–SHAL)

DOWS LAKE – N.C.C. PATHWAY	B.M.(ELEV 68.01m)geodetic: Top of	BOREHOLE NO: 01–20
	Cathead on east side of Hartwell Lock 9	PROJECT NO: E–8193
START DATE: 01/12/21	Monument No. DOT–2	ELEVATION: 65.74 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ◧ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	VANE Cu (kPa) 80 160 240 320 / ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 / PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0	8 13			TOPSOIL		
			1	FILL 65.44 sand and gravel with some clay and traces of topsoil		
	3/15cm 8/13cm		2			65.0
	split barrel refusal			Bottom of hole 64.86		
1.0						
						64.0
2.0						
						63.0
3.0						
						62.0
4.0						

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 0.88 m
REVIEWED BY: E.S.	COMPLETE: 01/12/21
Fig. No: 22	Page 1 of 1

02/01/24 08:53AM (STD–SHAL)

N.C.C.PATHWAY – BRONSON TO PRESTON	B.M.(ELEV 67.25m)geod. Spindle top of	BOREHOLE NO: 02-1
	hyd., S. side of Queen Elizabeth Dr.	PROJECT NO: E-8305
START DATE: 02/09/19	just west of Preston St.	ELEVATION: 64.88 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ◧ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0				COBBLE STONE		
				FILL 64.78		
				stone dust		
	7		1	64.58 Water level Sept.21/02 elev 64.00m		
	16		2			64.5
1.0	WL 15			FILL clay and sand with some gravel, and traces of topsoil		
	10					
	6		3			
				Bottom of hole 63.08		63.0
2.0						
				Bore hole is 1.75m north of C/L of sidewalk		
						62.0
3.0						
						61.0
4.0						

McROSTIE GENEST ST-LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 1.8 m
	REVIEWED BY: E.S.	COMPLETE: 02/09/19
	Fig. No: 2	Page 1 of 1

02/10/08 07:48AM (STD-SHM)

N.C.C.PATHWAY – BRONSON TO PRESTON	B.M.(ELEV 67.25m)geod. Spindle top of	BOREHOLE NO: 02–2
	hyd., S. side of Queen Elizabeth Dr.	PROJECT NO: E–8305
START DATE: 02/09/19	just west of Preston St.	ELEVATION: 64.82 m

SAMPLE TYPE ■ REMOULDED ▨ SHELBY TUBE ▩ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0				COBBLE STONE	
				FILL 64.72 stone dust	
				64.52	
	17 24	▨	1	FILL crushed limestone	64.0
				63.92	
1.0	14 18	▨	2	FILL topsoil with some sand and pieces of crushed stone	
				Bottom of hole 63.32	63.0
2.0				Water level Sept. 21/02 lower than elev 63.32m	
				Borehole is 2.70m North of C/L of sidewalk	62.0
3.0					
					61.0
4.0					

■ VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST–LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.5 m
REVIEWED BY: E.S.	COMPLETE: 02/09/19
Fig. No: 3	Page 1 of 1

02/10/08 07:48AM (STD–SHM)

N.C.C.PATHWAY – BRONSON TO PRESTON	B.M.(ELEV 67.25m)geod. Spindle top of	BOREHOLE NO: 02–3
	hyd., S. side of Queen Elizabeth Dr.	PROJECT NO: E–8305
START DATE: 02/09/19	just west of Preston St.	ELEVATION: 64.45 m

SAMPLE TYPE ■ REMOULDED ▨ SHELBY TUBE ▩ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0				TOPSOIL		
				64.15		64.0
	28 27	▨	1	FILL sand and gravel with pieces of crushed stone	●	
1.0	35 30	▨	2		●	
				Bottom of hole 62.95		63.0
				Water level Sept. 21/02 lower than elev 63.02m		
2.0						62.0
				Borehole is 2.1m North of C/L of sidewalk		
3.0						61.0
4.0						

McROSTIE GENEST ST-LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.5 m
REVIEWED BY: B.S.	COMPLETE: 02/09/19
Fig. No: 4	Page 1 of 1

02/10/08 07:48AM (STD-SHM)

N.C.C.PATHWAY – BRONSON TO PRESTON	B.M.(ELEV 67.25m)geod. Spindle top of	BOREHOLE NO: 02–4 C/L
	hyd., S. side of Queen Elizabeth Dr.	PROJECT NO: E-8305
START DATE: 02/09/19	just west of Preston St.	ELEVATION: 64.4 m

SAMPLE TYPE ■ REMOULDED ▨ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0				ASPHALT		
				FILL 64.35		
				crushed stone, some sand, clay & gravel		
				64.10		64.0
	6					
	10		1	FILL		
				fine sand with some very fine sand		
1.0						
	6					
	8		2			
			2A	medium dense 63.05		63.0
				clayey SILT with some very fine sand		
				Bottom of hole 62.90		
2.0						
						62.0
3.0						
						61.0
4.0						

McROSTIE GENEST ST-LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.5 m
REVIEWED BY: E.S.	COMPLETE: 02/09/19
Fig. No: 5	Page 1 of 1

02/10/08 07:48AM (STD-SHM)

N.C.C.PATHWAY - BRONSON TO PRESTON	B.M.(ELEV 67.25m)geod. Spindle top of	BOREHOLE NO: 02-5
	hyd., S. side of Queen Elizabeth Dr.	PROJECT NO: E-8305
START DATE: 02/09/19	just west of Preston St.	ELEVATION: 64.82 m

SAMPLE TYPE ■ REMOULDED ⧄ SHELBY TUBE ⊠ SPLIT-SPOON ▤ PROBING ▯▯ NO RECOVERY ▮▯ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0				TOPSOIL		
	27 22	⊠	1	FILL 64.52 sand with some gravel and pieces of brick		
	WL			Water level Sept.21/02 elev 63.99m		64.0
1.0	26 19	⊠	2	medium dense 63.92 silty fine SAND with traces of roots and topsoil		
				Bottom of hole 63.32		63.0
2.0				Bore hole os 1.8m North of C/L of sidewalk		
						62.0
3.0						
						61.0
4.0						

McROSTIE GENEST ST-LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 1.5 m
	REVIEWED BY:	COMPLETE: 02/09/19
	Fig. No: 6	Page 1 of 1

02/10/08 11:08AM (STD-SHM)

N.C.C.PATHWAY – BRONSON TO PRESTON	B.M.(ELEV 67.25m)geod. Spindle top of	BOREHOLE NO: 02-6 C/L
	hyd., S. side of Queen Elizabeth Dr.	PROJECT NO: E-8305
START DATE: 02/09/19	just west of Preston St.	ELEVATION: 66.16 m

SAMPLE TYPE ■ REMOULDED ⧸ SHELBY TUBE ☒ SPLIT-SPOON ▤ PROBING ▯ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	ELEVATION(m)
0.0				ASPHALT	
				FILL – crushed limestone 66.09	
				FILL – sand and gravel 66.01	
				65.86	
	6 18		1	FILL fine sand with some very fine sand	66.0
1.0	10/15cm 30/15cm 101		2		65.0
			2A	FILL 64.96 pieces of broken rock	
				Bottom of hole 64.66	
2.0					64.0
3.0					63.0
4.0					

■ VANE Cu (kPa) ■ 80 160 240 320

▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320

PLASTIC M.C. LIQUID 20 40 60 80

McROSTIE GENEST ST-LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 1.5 m
	REVIEWED BY: E.S.	COMPLETE: 02/09/19
	Fig. No: 7	Page 1 of 1

02/10/08 08:05AM (STD-SHM)

N.C.C.PATHWAY – BRONSON TO PRESTON	B.M.(ELEV 67.25m)geod. Spindle top of	BOREHOLE NO: 02–7
	hyd., S. side of Queen Elizabeth Dr.	PROJECT NO: E–8305
START DATE: 02/09/19	just west of Preston St.	ELEVATION: 66.97 m

SAMPLE TYPE ■ REMOULDED ▨ SHELBY TUBE ▩ SPLIT–SPOON ▤ PROBING ▥ NO RECOVERY ▮ CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 / ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 / PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0				TOPSOIL		
				66.67		
	10 39	▨	1	FILL sand with some gravel and traces of topsoil	●	
1.0	33 44	▨	2		●	66.0
				Bottom of hole 65.47		
				Water level Sept.21/02 lower than elev 65.56m		
2.0						65.0
				Borehole is 4.35m South of C/L of sidewalk		
3.0						64.0
4.0						63.0

McROSTIE GENEST ST–LOUIS Ottawa, Canada	LOGGED BY: JML	COMPLETION DEPTH: 1.5 m
	REVIEWED BY: E.S.	COMPLETE: 02/09/19
	Fig. No: 8	Page 1 of 1

02/10/08 07:49AM (STD–SHM)

N.C.C.PATHWAY – BRONSON TO PRESTON	B.M.(ELEV 67.25m)geod. Spindle top of	BOREHOLE NO: 02-8 C/L
	hyd., S. side of Queen Elizabeth Dr.	PROJECT NO: E-8305
START DATE: 02/09/19	just west of Preston St.	ELEVATION: 66.17 m

SAMPLE TYPE: REMOULDED | SHELBY TUBE | SPLIT-SPOON | PROBING | NO RECOVERY | CORE

DEPTH(m)	SMALL PEN. SPT (kPa) (N)	SAMPLE TYPE	SAMPLE NO	SOIL DESCRIPTION	■ VANE Cu (kPa) ■ 80 160 240 320 / ▲ VANE Cu REMOULDED (kPa) ▲ 80 160 240 320 / PLASTIC M.C. LIQUID 20 40 60 80	ELEVATION(m)
0.0				ASPHALT		
				FILL – sand with some gravel 66.12		66.0
				65.87		
	12 39		1	FILL sand with some gravel and pieces of broken rock		
1.0	36 45		2			65.0
				Bottom of hole 64.67		
2.0						64.0
3.0						63.0
4.0						

McROSTIE GENEST ST-LOUIS
Ottawa, Canada

LOGGED BY: JML	COMPLETION DEPTH: 1.5 m
REVIEWED BY: E.S.	COMPLETE: 02/09/19
Fig. No: 9	Page 1 of 1

02/10/08 07:49AM (STD-SHM)

SECTION G

PAVT. & SUBGRADE CONDITIONS

ASPH. OVER CONC. & DISCONTINUOUS SA & GR. ROADWAY FILL OVER SI./SA. TO SA. SI., SOME CL. FILL MAT'L.

RECOMMENDATIONS

OVERLAY PROVIDE FOR 30 mm H.L.3 ASPH. OVERLAY

AH. 51

0 - 330 - ASPH.
330 - 455 - CONC.
455 - 990 - DK. BR. SI. SA., SOME GR., TR. METAL PIECES
990 - 1325 - BR. F.-M. SA., TR. SI.

AH. 52

0 - 150 - ASPH.
150 - 330 - CONC.
330 - 915 - GRY. BR. SA. SI. SOME CL. & GR.
915 - 1675 - BR. F. SA., TR. TO SOME SI.
W.T. @ 1420

SECTION G CONT'D.

1:1250

Golder Associates

SHEET 5 OF 5

APPENDIX B

Borehole Records from Recent Environmental Investigations

Monitoring Well: MW16-1

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	97.46 m RTD
Number:	122511246	**Top of casing elevation:**	97.37 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444332.2
Contractor:	Strata Drilling Group	**Northing:**	5026985.7

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	97.46							
			TOPSOIL moist to wet	0.00 97.38							Flushmount protective cover with concrete seal
			CRUSHED CONCRETE (FILL) grey, silt, trace clay, dry	0.08	1	DP	17" 28%	pH, Phenols	<5 <0.02		
5				95.94							
	2		SANDY SILT (FILL) brown, trace gravel, trace concrete dust, dry	1.52	2	DP	47" 78%		<5 1.0		Bentonite backfill 50 mm ID PVC pipe
10				94.41							
			SANDY SILT (FILL) grey, gravel, crushed concrete, brick fragments, dry	3.05	3	DP	31" 52%	Explosives	<5 1.0		
	4										
15			- becomes grey		4	DP	26" 43%	Metals & Inorganics, Phenols	<5 1.0		Groundwater Level: 5.29 m BGS 17-Mar-16
20	6		- becomes moist to wet		5	DP	30" 50%	PHC, VOC, PAH, Field Duplicate	10 <0.02		Silica sand backfill 50 mm ID slotted PVC pipe
			CLAY grey, moist, black staining at 7.5 m BGS	90.45 7.01							
25	8		- becomes wet		6	DP	30" 50%		<5 1.0		Slough
30			End of Borehole	88.32 9.14							

Screen Interval: 5.64 - 8.69 m BGS
Sand Pack Interval: 5.33 - 8.69 m BGS
Well Seal Interval: 0.23 - 5.33 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - MW16-1A SS5

Stantec

Drawn By/Checked By: M. Ford

Borehole: BH16-2

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	99.32 m RTD
Number:	122511246	**Top of casing elevation:**	n/a
Field investigator:	J. Urben / B. Chenier	**Easting:**	444365.8
Contractor:	Strata Drilling Group	**Northing:**	5026932.5

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	99.32							
			TOPSOIL	0.00							
			CLAYEY SILT brown with orange mottling, sand, gravel, dry	99.17 0.15	1	DP	21" 70%	Explosives, PAH, Metals	<5 ● ○ <0.02		
					2a	DP	19" 63%		<5 ● ○ <0.02		
5			SILTY SAND grey-brown, with gravel, moist	97.80 1.52							
	2				2b	DP	19" 32%		<5 ● ○ <0.02		
10			- becomes grey, dry								
	4				3	DP	24" 40%		<5 ● ○ <0.02		
15			- with silt, moist								Bentonite backfill
					4	DP	12" 20%	VOC, PHC	<5 ● ○ <0.02		
20	6			93.22							
			No soil samples recovered	6.10							
				91.70							
25			CLAY grey, gravel, trace silt, wet	7.62							
	8				6	DP	12" 20%		<5 ● ○ <0.02		
				90.18							
30			End of Borehole	9.14							

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-3

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	98.02 m RTD
Number:	122511246	**Top of casing elevation:**	97.96 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444386.4
Contractor:	Strata Drilling Group	**Northing:**	5026952

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram	Description
			Ground Surface	98.02							
			TOPSOIL	0.00 97.76							Flushmount protective cover with concrete seal
			CRUSHED CONCRETE (FILL) with sand, gravel, dry	0.26	1	DP	9" 15%	Phenols	<5 <0.02		
5			- brick fragments								Bentonite backfill 50 mm ID PVC pipe
	2				2	DP	14" 23%	PAH, Metals & Inorganics	<5 <0.02		
10				94.97							
			SAND (FILL) brown, gravel, dry	3.05	3	DP	10" 17%	Phenols, Explosives			Groundwater Level: 3.80 m BGS 17-Mar-16
	4			93.45							Silica sand backfill
15			GRAVEL (FILL) trace silt, moist	4.57	4	DP	11" 18%	VOC, pH, PHC			50 mm ID slotted PVC pipe
	6		- with silt, trace clay, wet	91.62							
20			CLAY grey, with gravel, wet	6.40	5	DP	31" 52%		<5 <0.02		
25			- trace sand								Silica sand backfill
	8				6	DP	38" 63%		<5 <0.02		
30				88.88							
			End of Borehole	9.14							

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 9.14 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Stantec

Drawn By/Checked By: M. Ford

Borehole: BH16-4

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	94.29 m RTD
Number:	122511246	**Top of casing elevation:**	n/a
Field investigator:	J. Urben / B. Chenier	**Easting:**	444468.1
Contractor:	Strata Drilling Group	**Northing:**	5026816

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV ● Comb 200 400 600 800	Diagram	Description
			Ground Surface	94.29							
			SILTY SAND grey, trace clay, gravel, moist	0.00	1	DP	24" 40%	PAH, Metals, Explosives, Field Duplicate	<5 ● ○ <0.02		
5				92.51							
	2		SAND coarse to medium grained, with gravel	1.78	2	DP	24" 40%	Glycol, pH	<5 ● ○ <0.02		
				91.24							
10			SILTY SAND grey, with clay, gravel, wet	3.05	3	DP	36" 60%	VOC, PHC	<5 ● ○ <0.02		Bentonite backfill
	4										
15					4	DP	29" 81%		<5 ● ○ <0.02		
					5	DP	29" 121%		<5 ● ○ <0.02		
20	6				6	DP	36" 100%		<5 ● ○ <0.02		
				87.28							
			Refusal on inferred bedrock End of Borehole	7.01							
25											
	8										
30											

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - BH16-4 SS7 (for Metals Only)

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-5

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	96.18 m RTD
Number:	122511246	**Top of casing elevation:**	96.10 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444404.1
Contractor:	Strata Drilling Group	**Northing:**	5026972.9

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram	Description
			Ground Surface	96.18							
			SAND (FILL) brown, clay, gravel, dry	0.00							Flushmount protective cover with concrete seal
					1	DP	11" 18%	VOC, PHC, PAH, Metals & Inorganics, Explosives	<5 ● ○ <0.02		Bentonite backfill
5			- becomes grey, moist								50 mm ID PVC pipe
	2				2	DP	36" 60%	Glycol, Field Duplicate	<5 ● ○ <0.02		Groundwater Level: 2.28 m BGS 17-Mar-16
				93.74							
			SILTY SAND grey, gravel	2.44							
10			- trace clay, moist to wet								
	4				3	DP	37" 62%		<5 ● ○ <0.02		Silica sand backfill
15											50 mm ID slotted PVC pipe
					4	DP	27" 45%		<5 ● ○ <0.02		
20	6										
					5	DP	19" 79%		<5 ● ○ <0.02		
				89.47							
			Refusal on inferred bedrock End of Borehole	6.71							
25											
	8										
30											

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 6.71 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - MW16-5 SS7

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-6

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	11-Mar-2016 / 14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	94.85 m RTD
Number:	122511246	**Top of casing elevation:**	94.82 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444454.1
Contractor:	Strata Drilling Group	**Northing:**	5026972.9

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram	Description
			Ground Surface	94.85							
			SILTY CLAY (FILL) grey, gravel, moist	0.00	1	DP	0" 0%	Phenols, Explosives, PAH, Metals & Inorganics			Flushmount protective cover with concrete seal
5											Groundwater Level: 0.73 m BGS 17-Mar-16
	2				2	DP	12" 50%		<5 ● ○ <0.02		Bentonite backfill
				92.72							50 mm ID PVC pipe
			SILTY SAND brown, trace clay, soft, moist	2.13	3	DP	18" 50%	VOC, pH	<5 ● ○ <0.02		
10			- gravel, wet		4	DP	24" 80%		<5 ● ○ <0.02		
	4				5	DP	24" 80%		<5 ● ○ <0.02		Silica sand backfill
			- seam of coarse brown sand								50 mm ID slotted PVC pipe
15			- becomes grey		6	DP	27" 45%		<5 ● ○ <0.02		
20	6				7	DP	24" 50%	PHC	220 ● ○ <0.02		Slough
				87.54							
			Refusal on inferred bedrock End of Borehole	7.32							
25											
	8										
30											

Screen Interval: 2.59 - 5.64 m BGS
Sand Pack Interval: 2.29 - 5.64 m BGS
Well Seal Interval: 0.23 - 2.29 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-7

Project:	Phase II Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	95.47 m RTD
Number:	122511246	**Top of casing elevation:**	95.36 m RTD
Field investigator:	J. Urben / B. Chenier	**Easting:**	444336.2
Contractor:	Strata Drilling Group	**Northing:**	5027014.9

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	95.47							
			TOPSOIL with grass, sand, dry	0.00 95.16							
			SILTY CLAY brown, soft, dry	0.30	1	DP	24" 100%		●<5 ○<0.02		Flushmount protective cover with concrete seal
					2	DP	24" 67%	Phenols, Metals, Explosives, PAH	●<5 ○<0.02		Bentonite backfill
5	2										50 mm ID PVC pipe
					3	DP	36" 60%		●<5 ○1.0		
				92.73							
			SILTY SAND brown, coarse grained sand, gravel - becomes wet	2.74	4	DP	24" 80%	PHC, VOC, Field Duplicate	●60 ○<0.02		
10	4		- grey	90.90	5	DP	30" 100%		●<5 ○<0.02		
15			SILTY SAND grey, trace clay, gravel, moist	4.57	6	DP	36" 60%		●<5 ○<0.02		Groundwater Level: 4.79 m BGS 17-Mar-16 Silica sand backfill 50 mm ID slotted PVC pipe
20	6				7	DP	30" 50%		●<5 ○<0.02		
25	8										Slough
					8	DP	28" 47%		●<5 ○<0.02		
30				86.33							
			End of Borehole	9.14							

Screen Interval: 3.66 - 6.71 m BGS
Sand Pack Interval: 3.35 - 6.71 m BGS
Well Seal Interval: 0.23 - 3.35 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - MW16-2A SS4

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW17-01

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	28-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	79.39 m RTD
Number:	122170088	**Top of casing elevation:**	79.31 m RTD
Field investigator:	A. Parrott	**Easting:**	444632.4025
Contractor:	Strata Drilling Group	**Northing:**	5027203.643

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	79.39							
			ASPHALT/ INTERLOCKING BRICK	0.00							
1			SAND AND GRAVEL brown, moist	79.23							
2	0.5			0.15	1	DP	50%	D-F, Metals, PAHs, PCBs, PHC F1-F4, Phenols, VOCs	<5 ● <0.02 ○		Flushmount protective cover with concrete seal
3			SILTY SAND brown, trace gravel, moist	78.93							Backfilled with bentonite
4	1.0			0.46							50 mm ID PVC pipe
5	1.5		BEDROCK No soil samples recovered	78.47							
6				0.91							Groundwater Level: 1.61 m BGS 3-Aug-17
7	2.0										
8	2.5										Backfilled with silica sand
9					2	RC	n/a				
10	3.0										
11											
12	3.5										
13											
14	4.0										
15	4.5			74.66							50 mm ID slotted PVC pipe
16			End of Borehole	4.72							
17	5.0										
18	5.5										
19											
20	6.0										
21	6.5										
22											
23	7.0										
24	7.5										
25											
26	8.0										
27											
28	8.5										
29	9.0										
30											
31	9.5										
32											
33	10.0										
34	10.5										

Screen Interval: 1.68 - 4.72 m BGS
Sand Pack Interval: 1.37 - 4.72 m BGS
Well Seal Interval: 0.23 - 1.37 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
RC - rock core
ppm - parts per million by volume
n/a - not available

D-F - dioxin and furans
PAHs - polycyclic aromatic hydrocarbons
PCBs - polychlorinated biphenyls
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-02

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	28-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	79.80 m RTD
Number:	122170088	**Top of casing elevation:**	79.73 m RTD
Field investigator:	A. Parrott	**Easting:**	444449.4352
Contractor:	Strata Drilling Group	**Northing:**	5027137.48

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram / Description
			Ground Surface	79.80						
1			TOPSOIL black, organics, moist	0.00 79.50						Flushmount protective cover with concrete seal
2	0.5		SAND (FILL) brown-red, moist	0.30 79.19						
3	1.0		SILTY SAND brown-grey, trace gravel, moist	0.61	1	DP	40%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02	Backfilled with bentonite
4										
5	1.5									
6				77.90	2	DP	0%			50 mm ID PVC pipe
7	2.0		BEDROCK No soil samples recovered	1.91						Groundwater Level: 2.12 m BGS 3-Aug-17
8	2.5									
9										
10	3.0									
11										
12	3.5									
13	4.0				3	RC	n/a			
14										
15	4.5									Backfilled with silica sand
16										
17	5.0									50 mm ID slotted PVC pipe
18	5.5									
19										
20	6.0			73.71						
21			End of Borehole	6.10						
22	6.5									
23	7.0									
24										
25	7.5									
26	8.0									
27										
28	8.5									
29										
30	9.0									
31	9.5									
32										
33	10.0									
34	10.5									

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 6.10 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
RC - rock core
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-03

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	27-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	79.52 m RTD
Number:	122170088	**Top of casing elevation:**	79.42 m RTD
Field investigator:	A. Parrott	**Easting:**	444317.1276
Contractor:	Strata Drilling Group	**Northing:**	5027135.316

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	79.52							
1			TOPSOIL black, organics, moist	0.00 79.22							
2	0.5		SAND brown-black, trace gravel, moist	0.30 78.91	1	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Flushmount protective cover with concrete seal
3	1.0		SILTY SAND grey, trace gravel, moist	0.61							Backfilled with bentonite
4					2			H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		50 mm ID PVC pipe
5	1.5		- black organic soils, trace wood								Groundwater Level: 1.33 m BGS 3-Aug-17
6					3				<5 ● ○ <0.02		
7	2.0		- grey, wet			DP	40%				Backfilled with silica sand
8	2.5								<5 ● ○ <0.02		50 mm ID slotted PVC pipe
9					4						
10	3.0			76.32	5	DP	0%				
11			Refusal at inferred bedrock End of Borehole	3.20							
12	3.5										
13	4.0										
14											
15	4.5										
16											
17	5.0										
18	5.5										
19											
20	6.0										
21	6.5										
22											
23	7.0										
24											
25	7.5										
26	8.0										
27											
28	8.5										
29											
30	9.0										
31	9.5										
32											
33	10.0										
34	10.5										

Screen Interval: 1.68 - 3.20 m BGS
Sand Pack Interval: 1.37 - 3.20 m BGS
Well Seal Interval: 0.23 - 1.37 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

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Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-04

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	27-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	85.13 m RTD
Number:	122170088	**Top of casing elevation:**	85.06 m RTD
Field investigator:	A. Parrott	**Easting:**	444502.0718
Contractor:	Strata Drilling Group	**Northing:**	5026981.471

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV Comb● 200 400 600 800	Diagram	Description
			Ground Surface	85.13							
1			TOPSOIL black, organics, moist	0.00 84.82							
2	0.5		SILTY SAND brown, trace gravel, moist	0.30	1	DP	80%	PCBs, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 <0.02		Flushmount protective cover with concrete seal
3											Backfilled with bentonite
4	1.0				2						50 mm ID PVC pipe
5	1.5		- moist-wet								Groundwater Level: 1.61 m BGS 3-Aug-17
6					3	DP	80%	PCBs, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 <0.02		
7	2.0		- wet								Backfilled with silica sand
8	2.5			82.38	4				<5		50 mm ID slotted PVC pipe
9			Refusal at inferred bedrock	2.74							
10	3.0		End of Borehole						<0.02		
11											
12	3.5										
13	4.0										
14											
15	4.5										
16	5.0										
17											
18	5.5										
19											
20	6.0										
21	6.5										
22											
23	7.0										
24											
25	7.5										
26	8.0										
27											
28	8.5										
29											
30	9.0										
31	9.5										
32											
33	10.0										
34	10.5										

Screen Interval: 1.37 - 2.90 m BGS
Sand Pack Interval: 1.22 - 2.90 m BGS
Well Seal Interval: 0.23 - 1.22 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PCBs - polychlorinated biphenyls
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

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Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-05

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	26-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	94.49 m RTD
Number:	122170088	**Top of casing elevation:**	94.39 m RTD
Field investigator:	A. Parrott	**Easting:**	444231.6325
Contractor:	Strata Drilling Group	**Northing:**	5026850.536

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram	Description
			Ground Surface	94.49							
1	0.5		TOPSOIL black-brown, organics, moist	0.00 93.88	1	DP	100%	H-P, Metals, PAHs, Phenols, VOCs	<5 ● ○ <0.02		Flushmount protective cover with concrete seal
2			SILT brown-grey, moist	0.61	2			PHC F1-F4	<5 ● ○ <0.02		Backfilled with bentonite
3	1.0				3				<5 ● ○ <0.02		50 mm ID PVC pipe
4					4			H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		
5	1.5				5				<5 ● ○ <0.02		Groundwater Level: 3.43 m BGS 3-Aug-17
6					6				<5 ● ○ <0.02		
7	2.0			92.05	7				<5 ● ○ <0.02		Backfilled with silica sand
8	2.5		SILTY SAND brown, trace gravel, wet	2.44		DP	100%				
9											
10	3.0		- brown-grey								
11	3.5										
12			- grey								
13	4.0					DP	80%				
14											
15	4.5										
16											
17	5.0				8				<5 ● ○ <0.02		50 mm ID slotted PVC pipe
18						DP	80%				
19	5.5								<5 ● ○ <0.02		
20	6.0			88.39							
21			End of Borehole	6.10							
22	6.5										
23	7.0										
24											
25	7.5										
26	8.0										
27											
28	8.5										
29											
30	9.0										
31	9.5										
32											
33	10.0										
34	10.5										

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 6.10 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

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Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-06

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	26-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	95.09 m RTD
Number:	122170088	**Top of casing elevation:**	95.03 m RTD
Field investigator:	A. Parrott	**Easting:**	444175.7424
Contractor:	Strata Drilling Group	**Northing:**	5026815.478

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	95.09							
1			TOPSOIL black-brown, organics, moist	0.00 94.78							
2	0.5		SANDY SILT brown, trace gravel, moist	0.30	1	DP	75%	H-P, Metals, PAHs, Phenols, VOCs			
3	1.0			93.87					<5		Flushmount protective cover with concrete seal
4			SILTY SAND brown, trace gravel, moist to wet	1.22	2			PHC F1-F4	● 1 ○		Backfilled with bentonite
5	1.5										50 mm ID PVC pipe
6											
7	2.0										
8	2.5				3	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Backfilled with silica sand
9											
10	3.0		- brown-grey								50 mm ID slotted PVC pipe
11									<5		
12	3.5				4				● ○ <0.02		
13	4.0					DP	n/a		<5		
14				90.82	5				● ○ <0.02		
15	4.5		SAND brown, wet	4.27 90.48							Groundwater Level: dry on 3-Aug-17
16			Refusal at inferred bedrock End of Borehole	4.60	6	DP	n/a		● ○ <0.02		
17	5.0										
18	5.5										
19											
20	6.0										
21	6.5										
22											
23	7.0										
24	7.5										
25											
26	8.0										
27	8.5										
28											
29	9.0										
30	9.5										
31											
32	10.0										
33											
34	10.5										

Screen Interval: 1.55 - 4.60 m BGS
Sand Pack Interval: 1.25 - 4.60 m BGS
Well Seal Interval: 0.23 - 1.25 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

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Monitoring Well: MW17-07

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	26-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	94.64 m RTD
Number:	122170088	**Top of casing elevation:**	94.58 m RTD
Field investigator:	A. Parrott	**Easting:**	444240.9625
Contractor:	Strata Drilling Group	**Northing:**	5026754.904

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	94.64							
1			TOPSOIL black, organics, moist	0.00 94.34							
2	0.5		SILTY SAND brown, trace gravel, moist to wet	0.30	1	DP	40%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Flushmount protective cover with concrete seal
3											
4	1.0										Backfilled with bentonite
5	1.5										
6											
7	2.0				2	DP	40%		<5 ● ○ <0.02		50 mm ID PVC pipe
8	2.5										
9											
10	3.0										
11					3				<5 ● ○ <0.02		
12	3.5					DP	100%				
13	4.0								<5 ● ○ <0.02		
14			- brown-grey		4						
15	4.5										Backfilled with silica sand
16											
17	5.0										Groundwater Level: 4.58 m BGS 3-Aug-17
18	5.5				5	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		50 mm ID slotted PVC pipe
19											
20	6.0		- wet								
21											
22	6.5				6	DP	25%		<5 ● ○ <0.02		
23	7.0										
24											Slough
25	7.5			87.02							
26			End of Borehole	7.62							
27	8.0										
28											
29	8.5										
30											
31	9.0										
32											
33	9.5										
34	10.0										
	10.5										

Screen Interval: 3.66 - 6.71 m BGS
Sand Pack Interval: 3.35 - 7.01 m BGS
Well Seal Interval: 0.23 - 3.35 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

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Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-08

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	26-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	95.59 m RTD
Number:	122170088	**Top of casing elevation:**	95.52 m RTD
Field investigator:	A. Parrott	**Easting:**	444299.964
Contractor:	Strata Drilling Group	**Northing:**	5026787.713

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram	Description
			Ground Surface	95.59							
1	0.5		TOPSOIL black, organics, moist	0.00 94.98							Flushmount protective cover with concrete seal
2			SAND brown, trace silt and gravel, moist	0.61	1	DP	40%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	● <5 ○ <0.02		Backfilled with bentonite
3	1.0										50 mm ID PVC pipe
4											
5	1.5			94.07							
6			SILTY SAND brown, trace gravel, moist	1.52	2	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	● <5 ○ <0.02		
7	2.0										
8				93.15							
9	2.5		No soil samples recovered - augered through boulders	2.44	3	DP	20%				Backfilled with silica sand
10	3.0										
11											
12	3.5										50 mm ID slotted PVC pipe
13	4.0				4	RC	n/a				
14											
15	4.5										
16											
17	5.0			90.41							
18	5.5		SILTY SAND grey, trace gravel, moist	5.18 90.11							Groundwater Level: 5.21 m BGS 3-Aug-17
19			Refusal at inferred bedrock End of Borehole	5.49							
20	6.0										
21											
22	6.5										
23	7.0										
24											
25	7.5										
26	8.0										
27											
28	8.5										
29											
30	9.0										
31	9.5										
32											
33	10.0										
34	10.5										

Screen Interval: 2.23 - 5.28 m BGS
Sand Pack Interval: 1.93 - 5.49 m BGS
Well Seal Interval: 0.23 - 1.93 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
RC - rock core
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-09

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	27-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	99.19 m RTD
Number:	122170088	**Top of casing elevation:**	99.12 m RTD
Field investigator:	A. Parrott	**Easting:**	444493.9007
Contractor:	Strata Drilling Group	**Northing:**	5026676.009

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	99.19							
			TOPSOIL black, organics, moist	0.00 98.89							
			SAND (FILL) brown, trace gravel, moist	0.30	1	DP	30%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		Flushmount protective cover with concrete seal Backfilled with bentonite 50 mm ID PVC pipe
				97.97							
			SILTY SAND brown, trace gravel, moist	1.22	2 3	DP	70%		<5 ● ○ <0.02 <5 ● ○ <0.02		Groundwater Level: 2.24 m BGS 3-Aug-17
					4	DP	50%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● ○ <0.02		
					5	DP	25%		<5 ● ○ <0.02		Backfilled with silica sand
			- grey, wet		6 7	DP	80%		<5 ● ○ <0.02 <5 ● ○ <0.02		50 mm ID slotted PVC pipe
					8 9	DP	100%		<5 ● ○ <0.02 <5 ● ○ <0.02		Slough
				91.57							
			End of Borehole	7.62							

Screen Interval: 3.66 - 6.71 m BGS
Sand Pack Interval: 3.35 - 7.01 m BGS
Well Seal Interval: 0.23 - 3.35 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

Drawn By/Checked By: T. Pawlick / J. Yaraskavitch

Monitoring Well: MW17-10

Project:	Phase II Environmental Site Assessment	**Drilling method:**	Geoprobe (direct push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	27-Jul-2017
Location:	870 and 930 Carling Avenue and 520 Preston Street, Ottawa, Ontario	**Ground surface elevation:**	96.57 m RTD
Number:	122170088	**Top of casing elevation:**	96.48 m RTD
Field investigator:	A. Parrott	**Easting:**	444546.5613
Contractor:	Strata Drilling Group	**Northing:**	5026699.988

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m RTD) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram	Description
			Ground Surface	96.57							
1			TOPSOIL black, organics, moist	0.00 96.26							
2	0.5		SILTY SAND brown, trace gravel, wet	0.30	1	DP	60%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● / <0.02 ○		Flushmount protective cover with concrete seal
3											Backfilled with bentonite
4	1.0				2				<5 ● / <0.02 ○		50 mm ID PVC pipe
5	1.5		- moist								
6					3	DP	75%	H-P, Metals, PAHs, PHC F1-F4, Phenols, VOCs	<5 ● / <0.02 ○		
7	2.0										
8	2.5				4				<5 ● / <0.02 ○		Groundwater Level: 2.79 m BGS 3-Aug-17
9											
10	3.0				5	DP	75%		<5 ● / <0.02 ○		
11											
12	3.5				6				<5 ● / <0.02 ○		Backfilled with silica sand
13	4.0										
14					7	DP	50%		<5 ● / <0.02 ○		50 mm ID slotted PVC pipe
15	4.5		- grey								
16											
17	5.0				8				<5 ● / <0.02 ○		
18											
19	5.5										
20	6.0			90.47							
21			No sample recovered	6.10	9	DP	0%				Slough
22	6.5										
23	7.0			89.25							
24			End of Borehole	7.32							
25	7.5										
26											
27	8.0										
28	8.5										
29											
30	9.0										
31											
32	9.5										
33	10.0										
34	10.5										

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 6.40 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

H-P - herbicides and pesticides
PAHs - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOCs - volatile organic compounds
Comb - combustible soil vapour
TOV - total organic vapour

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